# INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

ANALYTICAL CHEMISTRY DIVISION COMMISSION ON EQUILIBRIUM DATA SUBCOMMITTEE ON SOLUBILITY DATA

# SOLUBILITY DATA SERIES

Volume 1

HELIUM AND NEON - Gas Solubilities

### SOLUBILITY DATA SERIES

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# SOLUBILITY DATA SERIES

Volume 1

# HELIUM AND NEON — Gas Solubilities

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OXFORD · NEW YORK · TORONTO · SYDNEY · PARIS · FRANKFURT

| υ.к.                           | Pergamon Press Ltd., Headington Hill Hall,<br>Oxford OX3 0BW, England                     |
|--------------------------------|---|
| U.S.A.                         | Pergamon Press Inc., Maxwell House, Fairview Park,<br>Elmsford, New York 10523, U.S.A.    |
| CANADA                         | Pergamon of Canada, Suite 104, 150 Consumers Road,<br>Willowdale, Ontario M2 J1P9, Canada |
| AUSTRALIA                      | Pergamon Press (Aust.) Pty. Ltd., P.O. Box 544,<br>Potts Point, N.S.W. 2011, Australia    |
| FRANCE                         | Pergamon Press SARL, 24 rue des Ecoles,<br>75240 Paris, Cedex 05, France                  |
| FEDERAL REPUBLIC<br>OF GERMANY | Pergamon Press GmbH, 6242 Kronberg-Taunus,<br>Pferdstrasse 1, Federal Republic of Germany |

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First edition 1979

#### **British Library Cataloguing in Publication Data**

Helium and neon. - (International Union of Pure and Applied Chemistry. IUPAC Solubility data series; vol. 1): 1. Helium - Solubility - Tables 2. Neon -Solubility - Tables 1. Clever, H. Lawrence II. Series 546'751'5420212 QD181.H4 78-40965 ISBN 0 08 022351 6

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Foreword

If the knowledge is undigested or simply wrong, more is not better

How to communicate and disseminate numerical data effectively in chemical science and technology has been a problem of serious and growing concern to IUPAC, the International Union of Pure and Applied Chemistry, for the last two decades. The steadily expanding volume of numerical scientific and technological information, the formation of new interdisciplinary areas in which chemistry is a partner, and the links between these and existing traditional subdisciplines in chemistry, along with an increasing number of users, have been considered as urgent aspects of the information problem in general, and of the numerical data problem in particular.

Among the several numerical data projects initiated and operated by various IUPAC commissions, the *Solubility Data Project* is probably one of the most ambitious ones. It is concerned with preparing a comprehensive critical compilation of data on solubilities in all physical systems, of gases, liquids and solids. Both the basic and applied branches of almost all scientific disciplines require a knowledge of solubilities as a function of solvent, temperature and pressure. Solubility data are basic to the fundamental understanding of processes relevant to agronomy, biology, chemistry, geology and oceanography, medicine and pharmacology, and metallurgy and materials science. Knowledge of solubility is very frequently of great importance to such diverse practical applications as drug dosage and drug solubility in biological fluids, anesthesiology, corrosion by dissolution of metals, properties of glasses, ceramics, concretes and coatings, phase relations in the formation of minerals and alloys, the deposits of minerals and radioactive fission products from ocean waters, the composition of ground waters, and the requirements of oxygen and other gases in life support systems.

The widespread relevance of solubility data to many branches and disciplines of science, medicine, technology and engineering, and the difficulty of recovering solubility data from the literature, lead to the proliferation of published data in an ever increasing number of scientific and technical primary sources. The sheer volume of data has overcome the capacity of the classical secondary and tertiary services to respond effectively.

While the proportion of secondary services - of the review article type - is generally increasing due to the rapid growth of all forms of primary literature, the review articles become more limited in scope and more specialized. The disturbing phenomenon is that in some disciplines, certainly in chemistry, authors are reluctant to treat even those limited-inscope reviews exhaustively. There is a trend to preselect the literature, sometimes under the pretext of reducing it to manageable size. The crucial problem with such preselection - as far as numerical data are concerned is that there is no indication as to whether the material excluded was done by design or by less than thorough literature search. We are equally concerned that most current secondary sources, critical in character as they may be, give scant attention to numerical data.

On the other hand, tertiary sources - handbooks, reference books, and other tabulated and graphical compilations - as they exist today, are comprehensive but, as a rule, uncritical. They usually attempt to cover whole disciplines, thus obviously are superficial in treatment. Since they command a wide market, we believe that their service to advancement of science is at least questionable. Additionally, the change which is taking place in the generation of new and diversified numerical data, and the rate by which this is done, is not reflected in an increased third-level service. The emergence of new tertiary literature sources does not parallel the shift that has occurred in the primary literature.

The status of current secondary and tertiary services being as they are briefly stated above, the innovative approach of the Solubility Data Project is that its compilation and critical evaluation work involve consolidation and reprocessing services when both activities are based on intellectual and scholarly reworking of information from primary sources. It comprises compact compilation, rationalization and simplification, and the fitting of isolated numerical data into a critically evaluated general framework.

The Solubility Data Project developed a mechanism which involves a number of innovations in exploiting the literature fully, and which contains new elements of a more imaginative approach of transfer of reliable information from primary to secondary/tertiary sources. The fundamental trend of the Solubility Data Project is toward integration of secondary and tertiary services with the objective of producing in-depth critical analysis and evaluation which are characteristic to secondary services, in a scope as broad as conventional tertiary services.

Fundamental to the philosophy of the project is the recognition that the basic element of strength is the active participation of career scientists in it. Consolidating primary literature data and producing a truly critically-evaluated set of numerical data, and synthesizing data in a meaningful relationship, are demands considered worthy of the efforts of top scientists. Career scientists, who themselves contribute to science by their involvement, in active scientific research, are the backbone of the project. The scholarly work is commissioned to recognized authorities, involving a process of careful selection in the best tradition of IUPAC. This selection in turn is the key to the quality of the output. These top experts are expected to view their specific topics dispassionately, paying equal attention to their own contributions and to those of their peers. They digest literature data into a coherent story by weeding out what is wrong from what is believed to be right. To fulfill this task, the evaluator must cover all relevant open literature. No reference is excluded by design and every effort is made to detect every bit of relevant primary source. Poor quality or wrong data are mentioned and explicitly disqualified as such. In fact, it is only when the reliable data are presented alongside the unreliable data that proper justice can be done. The user is bound to have incomparably more confidence in a succinct evaluative commentary and a comprehensive review with a complete bibliography to both good and poor data.

It is the standard practice that any given solute-solvent system consists of two essential parts: I. Critical Evaluation and Recommended Values, and II. Compiled Data Sheets.

The Critical Evaluation part gives the following information: (i) a verbal text of evaluation which discusses the numerical solubility information appearing in the primary sources located in the literature. The evaluation text concerns primarily the quality of data after consideration of the purity of the materials and their characterization, the experimental method employed and the uncertainties in control of physical parameters, the reproducibility of the data, the agreement of the worker's results on accepted test systems with standard values, and finally, the data fit to generally accepted graphical tests;

(ii) a set of recommended numerical data. Whenever possible, the set of recommended data includes weighted average and standard minimum deviations, and a set of smoothing equations derived from the experimental data endorsed by the evaluator;

(iii) a graphical plot of recommended data.

The compilation part consists of data sheets of the best experimental data in the primary literature. Generally speaking, such independent data sheets are given only to the best and endorsed data covering the known range of experimental parameters. Data sheets based on primary sources where the data are of a lower precision are given only when no better data are available. Experimental data with a precision poorer than considered acceptable are reproduced in the form of data sheets when they are the only known data for a particular system. Such data are considered to be still suitable for some applications, and their presence in the compilation should alert researchers to areas that need more work.

The typical data sheet carries the following information:

(i) components - definition of the system - their names, formulas and Chemical Abstracts registry numbers;

(ii) reference to the primary source where the numerical information is reported. In cases when the primary source is a less common periodical or a report document, published though of limited availability, abstract references are also given;

(iii) experimental variables;

(iv) identification of the compiler, his affiliation and the date of compilation;

(v) experimental values as they appear in the primary source. Whenever available, the data are given both in tabular and graphical form. If auxiliary information is available, the experimental data are converted also to SI units by the compiler.

Under the general heading of Auxiliary Information, the essential experimental details are summarized:

(vi) experimental method used for the generation of data;

(vii) type of apparatus and procedure employed;

(viii) source and purity of materials;

(ix) estimated error;

(x) references relevant to the generation of experimental data as cited in the primary source.

This new approach to numerical data presentation, developed during our four years of existence, has been strongly influenced by the diversity of background of those whom we are supposed to serve. We thus deemed it right to preface the evaluation/compilation sheets in each volume with a detailed discussion of the principles of the accurate determination of relevant solubility data and related thermodynamic information.

Finally, the role of education is more than corollary to the efforts we are seeking. The scientific standards advocated here are necessary to strengthen science and technology, and should be regarded as a major effort in the training and formation of the next generation of scientists and engineers. Specifically, we believe that there is going to be an impact of our project on scientific-communication practices. The quality of consolidation adopted by this program offers down-to-earth guidelines, concrete examples which are bound to make primary publication services more respon-sive than ever before to the needs of users. The self-regulatory message to scientists of 15 years ago to refrain from unnecessary publication has not achieved much. The literature is still, in 1978, cluttered with poor-quality articles. The Weinberg report (in "Reader in Science Information," Eds. J. Sherrod and A. Hodina, Microcard Editions Books, Indian Head Inc., 1973, p. 292) states that "admonition to authors to restrain themselves from premature, unnecessary publication can have little effect unless the climate of the entire technical and scholarly community encourages restraint...' We think that projects of this kind translate the climate into operational terms by exerting pressure on authors to avoid submitting low-grade mater-ial. The type of our output, we hope, will encourage attention to quality as authors will increasingly realize that their work will not be suited for permanent retrievability unless it meets the standards adopted in this project. It should help to dispel confusion in the minds of many authors of what represents a permanently useful bit of information of an archival value, and what does not.

If we succeed in that aim, even partially, we have then done our share in protecting the scientific community from unwanted and irrelevant, wrong numerical information.

A. S. Kertes

July 1978

#### Editor's Preface

The users of this volume will find (1) the best available experimental solubility data of helium and neon gas in liquids as reported in the scientific literature, (2) tables of smoothed mole fraction solubility data for the systems which were studied over a temperature interval and (3) tables of either tentative or recommended solubility data when two or more laboratories reported solubility data over the same range of temperature and pressure. Users have the option of using the experimental values either directly or in their own smoothing equations or of using the smoothed values prepared by the compilers and evaluators. The goal was to cover the literature thoroughly enough so that the user need not do a detailed literature search for helium and neon solubility data prior to 1978.

Some words of explanation are required with respect to units, corrections, smoothing equations, auxiliary data and data sources, nomenclature and other points. The experimental data are presented in the units found in the original paper. In addition the original data are often converted to other units, especially mole fraction. Temperatures have been converted to Kelvin. In evaluations of solubility data, S.I. units are used.

Only in the past 10 to 15 years have experimental methods for the determination of the solubility of gases in liquids developed to the point where 0.5 percent or better accuracy is attained. Only a small fraction of the literatures' gas solubility data are accurate to 0.5 percent. The corrections for non-ideal gas behavior and for expansion of the liquid phase on dissolution of the gas are small and well within the normal experimental error. Thus such corrections were not made for the helium and neon gas solubility data at low pressure.

The lack of high accuracy is also the reason that, excepting water as a solvent, only a two-constant equation is used to smooth and evaluate the gas solubility data. A Gibbs energy of solution equation linear in temperature is used

 $\Delta G^{\circ}/J \mod^{-1} = - RT \ln X_1 = A + BT$ 

or in alternate form

 $\ln X_1 = -\Delta G^{\circ}/RT = -(A/R)/T - (B/R)$ 

where A is  $\Delta H^{\circ}$ , B is  $-\Delta S^{\circ}$ , X<sub>1</sub> is the mole fraction solubility at a gas partial pressure of 101.325 kPa<sup>-1</sup> (1 atm), and R is 8.31433 J K<sup>-1</sup> mol<sup>-1</sup>.

An inconsistency, which we believe is justified, is found with respect to the solubility data in water. Much time and effort was expended in evaluating the solubility data of each gas in water. A recommended equation and table of values are presented. However, for systems which contain water and other solvent components such as electrolytes or water miscible polar organic compounds, the experimental gas solubility in water from that paper is given, even when it is at variance with our recommended values. These data of sometimes poorer quality are presented because the author's ratio of gas solubility in water to solubility in the aqueous solution may be more accurate than the solubility itself. This may be especially true of some of the solubility data in aqueous electrolyte solutions.

Solvent density data were often required in making solubility unit conversions. The density data were not directly referenced. The main sources of density data are Circular 461 of the U.S. National Bureau of Standards

American Petroleum Research Project 44 Publications

The International Critical Tables, Volume III (E.W. Washburn, Editor) McGraw-Hill Co., 1931 Smow Table, Pure and Applied Chemistry 1976, 45, 1-9

Smow Table, Pure and Applied Chemistry 1976, 45, 1-9
Thermodynamic Properties of Aliphatic Alcohols, R. C. Wilhoit and B. J. Zwolinski, J. Phys. Chem. Ref. Data 1973, 2, Supplement No. 1
Organic Solvents, J. A. Riddick and W. B. Bunger (Technique of Chemistry, Volume II, A. Weissberger, Editor) Wiley-Interscience, New York, 1970, 3rd Ed. The Ostwald Coefficient, L

The Ostwald coefficient, L, is defined as the ratio of the volume of gas absorbed to the volume of the absorbing liquid, all measured at the same temperature:

 $L = \frac{V(q)}{V(1)}$ 

If the gas is ideal and Henry's Law is applicable, the Ostwald coefficient is independent of the partial pressure of the gas. It is necessary, in practice, to state the temperature and total pressure for which the Ostwald coefficient is measured. The mole fraction solubility, X, is related to the Ostwald coefficient by

$$X = \left[ \frac{RT}{P(g) L V^{O}(1)} + 1 \right]^{-1}$$

where P is the partial pressure of gas. The mole fraction solubility will be at a partial pressure of P(g).

The Absorption Coefficient, B

There are several "absorption coefficients", the most commonly used one being defined as the volume of gas, reduced to 273.15K and 1 atmosphere, absorbed per unit volume of liquid when the total pressure is 1 atmosphere.  $\beta$  is related to the Bunsen coefficient by

 $\beta = \alpha (1-P(1))$ 

where P(1) is the partial pressure of the liquid in atmosphere.

The Henry's Law Constant

A generally used formulation of Henry's Law may be expressed as

 $P(g) = K_H X$ 

where  ${\rm K}_{\rm H}$  is the Henry's Law constant and X the mole fraction solubility. Other formulations are

 $P(g) = K_2C(1)$ 

or

 $C(g) = K_{c}C(1)$ 

where  $K_2$  and  $K_c$  are constants, C the concentration, and (1) and (g) refer to the liquid and gas phases. Unfortunately,  $K_H$ ,  $K_2$  and  $K_c$  are all sometimes referred to as Henry's Law constants. Henry's Law is a limiting law but can sometimes be used for converting solubility data from the experimental pressure to a partial gas pressure of 1 atmosphere, provided the mole fraction of the gas in the liquid is small, and that the difference in pressures is small. Great caution must be exercised in using Henry's Law.

The Mole Ratio, N

The mole ratio, N, is defined by

N = n(g)/n(1)

Table 1 contains a presentation of the most commonly used inter-conversions not already discussed.

For gas solubilities greater than about 0.01 mole fraction at a partial pressure of 1 atmosphere there are several additional factors which must be taken into account to unambiguously report gas solubilities. Solution densities or the partial molar volume of gases must be known. Corrections should be made for the possible non-ideality of the gas or the non-applicability of Henry's Law.

The solubility data are supplemented with partial molal volume and calorimetric enthalpy of solution data when they are available.

Chemical Abstracts recommended names and registry numbers were used throughout. Common names are cross referenced to Chemical Abstract recommended names in the index.

The Editor would appreciate users calling errors and omissions to his attention.

The Editor gratefully acknowledges the advice and comments of members of the IUPAC Commission on Equilibrium Data and the Subcommittee on Solubility Data; the cooperation and hard work of the Evaluators and compilers; and the untiring efforts of the typists Peggy Tyler, Carolyn Dowie, and Lesley Flanagan.

Acknowledgment is made to the Donors of the Petroleum Research Fund, administered by the American Chemical Society, for partial support of the compilation and evaluation of the gas solubility data.

H. Lawrence Clever

July 1978

#### THE SOLUBILITY OF GASES IN LIQUIDS

C. L. Young, R. Battino, and H. L. Clever

#### INTRODUCTION

The Solubility Data Project aims to make a comprehensive search of the literature for data on the solubility of gases, liquids and solids in liquids. Data of suitable accuracy are compiled into data sheets set out in a uniform format. The data for each system are evaluated and where data of sufficient accuracy are available values recommended and in some cases a smoothing equation suggested to represent the variation of solubility with pressure and/or temperature. A text giving an evaluation and recommended values and the compiled data sheets are published on consecutive pages.

#### DEFINITION OF GAS SOLUBILITY

The distinction between vapor-liquid equilibria and the solubility of gases in liquids is arbitrary. It is generally accepted that the equilibrium set up at 300K between a typical gas such as argon and a liquid such as water is gas-liquid solubility whereas the equilibrium set up between hexane and cyclohexane at 350K is an example of vapor-liquid equilibrium. However, the distinction between gas-liquid solubility and vapor-liquid equilibrium is often not so clear. The equilibria set up between methane and propane above the critical temperature of methane and below the critical temperature of propane may be classed as vapor-liquid equilibrium or as gas-liquid solubility depending on the particular range of pressure considered and the particular worker concerned.

The difficulty partly stems from our inability to rigorously distinguish between a gas, a vapor, and a liquid, which has been discussed in numerous textbooks. We have taken a fairly liberal view in these volumes and have included systems which may be regarded, by some workers, as vapor-liquid equilibria.

#### UNITS AND QUANTITIES

The solubility of gases in liquids is of interest to a wide range of scientific and technological disciplines and not solely to chemistry. Therefore a variety of ways for reporting gas solubility have been used in the primary literature and inevitably sometimes, because of insufficient available information, it has been necessary to use several quantities in the compiled tables. Where possible, the gas solubility has been quoted as a mole fraction of the gaseous component in the liquid phase. The units of pressure used are bar, pascal, millimeters of mercury and atmosphere. Temperatures are reported in Kelvin.

#### EVALUATION AND COMPILATION

The solubility of comparatively few systems is known with sufficient accuracy to enable a set of recommended values to be presented. This is true both of the measurement near atmospheric pressure and at high pressures. Although a considerable number of systems have been studied by at least two workers, the range of pressures and/or temperatures is often sufficiently different to make meaningful comparison impossible.

Occasionally, it is not clear why two groups of workers obtained very different sets of results at the same temperature and pressure, although both sets of results were obtained by reliable methods and are internally consistent. In such cases, sometimes an incorrect assessment has been given. There are several examples where two or more sets of data have been classified as tentative although the sets are mutually inconsistent.

Many high pressure solubility data have been published in a smoothed form. Such data are particularly difficult to evaluate, and unless specifically discussed by the authors, the estimated error on such values can only be regarded as an "informed guess".

xv

Many of the high pressure solubility data have been obtained in a more general study of high pressure vapor-liquid equilibrium. In such cases a note is included to indicate that additional vapor-liquid equilibrium data are given in the source. Since the evaluation is for the compiled data, it is possible that the solubility data are given a classification which is better than that which would be given for the complete vapor-liquid data (or vice versa). For example, it is difficult to determine coexisting liquid and vapor compositions near the critical point of a mixture using some widely used experimental techniques which yield accurate high pressure solubility data. For example, conventional methods of analysis may give results with an expected error which would be regarded as sufficiently small for vapor-liquid equilibrium data but an order of magnitude too large for acceptable high pressure gas-liquid solubility.

It is occasionally possible to evaluate data on mixtures of a given substance with a member of a homologous series by considering all the available data for the given substance with other members of the homologous series. In this study the use of such a technique has been very limited.

The estimated error is often omitted in the original article and sometimes the errors quoted do not cover all the variables. In order to increase the usefulness of the compiled tables estimated errors have been included even when absent from the original article. If the error on *any* variable has been inserted by the compiler this has been noted.

#### PURITY OF MATERIALS

The purity of materials has been quoted in the compiled tables where given in the original publication. The solubility is usually more sensitive to impurities in the gaseous component than to liquid impurities in the liquid component. However, the most important impurities are traces of a gas dissolved in the liquid. Inadequate degassing of the absorbing liquid is probably the most often overlooked serious source of error in gas solubility measurements.

#### APPARATUS AND PROCEDURES

In the compiled tables brief mention is made of the apparatus and procedure. There are several reviews on experimental methods of determining gas solubilities and these are given in References 1-7.

#### METHODS OF EXPRESSING GAS SOLUBILITIES

Because gas solubilities are important for many different scientific and engineering problems, they have been expressed in a great many ways:

#### The Mole Fraction, X(g)

The mole fraction solubility for a binary system is given by:

$$X(g) = \frac{n(g)}{n(g) + n(1)}$$

 $= \frac{W(g)/M(g)}{\{W(g)/M(g)\} + \{W(1)/M(1)\}}$ 

here n is the number of moles of a substance (an *amount* of substance), W is the mass of a substance, and M is the molecular mass. To be unambiguous, the partial pressure of the gas (or the total pressure) and the temperature of measurement must be specified.

The Weight Per Cent Solubility, wt%

For a binary system this is given by

wt% =  $100 W(g) / \{W(g) + W(1)\}$ 

where W is the weight of substance. As in the case of mole fraction, the pressure (partial or total) and the temperature must be specified. The weight per cent solubility is related to the mole fraction solubility by

$$X(g) = \frac{\{wt\$/M(g)\}}{\{wt\$/M(g)\} + \{(100 - wt\$)/M(1)\}}$$

The Weight Solubility,  $\ensuremath{C_W}$ 

The weight solubility is the number of moles of dissolved gas per gram of solvent when the partial pressure of gas is 1 atmosphere. The weight solubility is related to the mole fraction solubility at one atmosphere partial pressure by

X(g) (partial pressure 1 atm) =  $\frac{C_{w}^{M}(1)}{1 + C_{w}^{M}(1)}$ 

where M(1) is the molecular weight of the solvent.

#### The Moles Per Unit Volume Solubility, n

Often for multicomponent systems the density of the liquid mixture is not known and the solubility is quoted as moles of gas per unit volume of liquid mixture. This is related to the mole fraction solubility by

$$X = \frac{n v^{0}(1)}{1 + n v^{0}(1)}$$

where  $v^{O}(1)$  is the molar volume of the liquid component.

#### The Bunsen Coefficient, $\alpha$

The Bunsen coefficient is defined as the volume of gas reduced to 273.15K and 1 atmosphere pressure which is absorbed by unit volume of solvent (at the temperature of measurement) under a partial pressure of 1 atmosphere. If ideal gas behavior and Henry's law is assumed to be obeyed,

$$\alpha = \frac{V(g)}{V(1)} \frac{273.15}{T}$$

where V(g) is the volume of gas absorbed and V(1) is the original (starting) volume of absorbing solvent. The mole fraction solubility X is related to the Bunsen coefficient by

X (l atm) = 
$$\frac{\alpha}{\alpha + \frac{273.15}{T} \frac{v^{O}(g)}{v^{O}(1)}}$$

where  $v^{\rm O}(g)$  and  $v^{\rm O}(1)$  are the molar volumes of gas and solvent at a pressure of one atmosphere. If the gas is ideal,

$$X = \frac{\alpha}{\alpha + \frac{273.15R}{v^{\circ}(1)}}$$

Real gases do not follow the ideal gas law and it is important to establish the real gas law used for calculating  $\alpha$  in the original publication and to make the necessary adjustments when calculating the mole fraction solubility.

#### The Kuenen Coefficient, S

This is the volume of gas, reduced to 273.15K and 1 atmosphere pressure, dissolved at a partial pressure of gas of 1 atmosphere by 1 gram of solvent. TABLE 1 Interconversion of parameters used for reporting solubility

$$L = \alpha(T/273.15)$$

$$C_{W} = \alpha/v_{o}\rho$$

$$K_{H} = \frac{17.033 \times 10^{6} \rho_{soln}}{\alpha M(1)} + 760$$

$$L = C_{W} v_{t,gas}\rho$$

where v is the molal volume of the gas in  $\rm cm^3 mol^{-1}$  at 0°C,  $\rho$  the density of the solvent at the temperature of the measurement,  $\rho_{\rm soln}$  the density of the solution at the temperature of the measurement, and v<sub>t</sub> gas the molal volume of the gas (cm<sup>3</sup>mol^{-1}) at the temperature of the measurement.

#### SALT EFFECTS

The effect of a dissolved salt in the solvent on the solubility of a gas is often studied. The activity coefficient of a dissolved gas is a function of the concentration of all solute species (see ref. 8). At a given temperature and pressure the logarithm of the dissolved gas activity coefficient can be represented by a power series in  $C_S$ , the electrolyte concentration, and C<sub>i</sub>, the nonelectrolyte solute gas concentration

$$\log f_{i} = \sum_{m,n} k_{mn} C_{s}^{n} C_{i}^{m}$$

It is usually assumed that only the linear terms are important for low  $\mathrm{C}_{\mathrm{S}}$ and Ci values when there is negligible chemical interaction between solute species.

$$\log f_i = k_s C_s + k_i C_i$$

where  $k_s$  is the salt effect parameter and  $k_i$  is the solute-solute gas interaction parameter. The dissolved gas activity is the same in the pure solvent and a salt solution in that solvent for a given partial pressure and temperature

$$a_i = f_i S_i = f_i^{\circ} S_i^{\circ}$$
 and  $f_i = f_i^{\circ} \frac{s}{s_i^{\circ}}$ 

where  $S_i$  and  $S_i^{o}$  are the gas solubility in the salt solution and in the pure solvent, respectively, and the f's are the corresponding activity coefficients. It follows that log  $\underline{f_i} = \log \underline{S_i}^o = k_s C_s + k_i (S_i - S_i^o)$ . When the fi

quantity  $(S_i - S_i^{0})$  is small the second term is negligible even though  $k_s$  and  $k_i$  may be of similar magnitude. This is generally the case for gas solubilities and the equation reduces to

$$\log \frac{f_i}{f_i^o} = \log \frac{s_i^o}{s_i} = k_s C_s$$

which is the form of the empirical Setschenow equation in use since the 1880's. A salt that increases the activity coefficient of the dissolved gas is said to salt-out and a salt that decreases the activity coefficient of the dissolved gas is said to salt-in.

Although salt effect studies have been carried out for many years, there appears to be no common agreement of the units for either the gas solubility or the salt concentration. Both molar (mol dm<sup>-3</sup>) and molal (mol kg<sup>-1</sup>) are used for the salt concentration. The gas solubility ratio  $S_i^{o}/S_i$  is given as Bunsen coefficient ratio and Ostwald coefficient ratio,

which would be the same as a molar ratio; Kueunen coefficient ratio, volume dissolved in 1 g or 1 kg of solvent which would be a molal ratio; and mole fraction ratio. Recent theoretical treatments use salt concentration in mol dm<sup>-3</sup> and  $S_1 S_1$  ratio as mole fraction ratio with each salt ion acting as a mole. Evaluations which compare the results of several workers are made in the units most compatible with present theory.

#### TEMPERATURE DEPENDENCE OF GAS SOLUBILITY

In a few cases it has been found possible to fit the mole fraction solubility at various temperatures using an equation of the form

 $\ln x = A + B / (T/100K) + C \ln (T/100K) + DT/100K$ 

It is then possible to write the thermodynamic functions  $\overline{\Delta G_1^0}$ ,  $\overline{\Delta H_1^0}$ ,  $\overline{\Delta S_1^0}$  and  $\Delta \overline{C}^{\circ} p_{j}$  for the transfer of the gas from the vapor phase at

101,325 Pa partial pressure to the (hypothetical) solution phase of unit mole fraction as:

> $\Delta \overline{G}_{1}^{\circ} = -RAT - 100 RB - RCT ln (T/100) - RDT^{2}/100$  $\Delta \overline{S}_{1}^{\circ} = RA + RC \ln (T/100) + RC + 2 RDT/100$  $\Delta \overline{H}_{1}^{\circ} = -100 \text{ RB} + \text{RCT} + \text{RDT}^{2}/100$ ∆<del>C</del>°<sub>p1</sub> = RC + 2 RDT/100

In cases where there are solubilities at only a few temperatures it is convenient to use the simpler equations

 $\Delta \overline{G}_1^\circ = - RT \ln x = A + BT$ 

in which case  $A = \Delta \overline{H}_1^\circ$  and  $-B = \Delta \overline{S}_1^\circ$ .

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| APPENDIX I. Conversion F  |         |                  | k                             |             |  |                          |        |                  | k <sup>-3</sup>        | L                     |   |                   |
|---|---------|------------------|-------------------------------|-------------|--|--------------------------|--------|------------------|------------------------|-----------------------|---|-------------------|
| Non-SI Unit   | :       | L (no            | on-S                          | īτ          | Jnit) =<br>I Unit  |                          | 1      | (ŞI              | Uni                    | t)                    | =<br>Uni  |                   |
| LENGTH  |         |                  | <u> </u>                      | (5)         | L OILL   | /                        |        | <u>K -</u>       |                        |                       | iit, 1  |                   |
|   |         |                  |                               |             |  |                          |        |                  |                        |                       |   |                   |
| Å (angstrom)<br>cm (centimeter)<br>in (inch)<br>ft (foot)   |         | 3                | 1<br>254                      | x<br>x      | $10^{-10}$<br>$10^{-2}$<br>$10^{-4}$<br>$10^{-4}$  | (*)<br>(*)<br>(*)<br>(*) | 3      | 937<br>280       | 1<br>008<br>840        | x<br>x<br>x<br>x      | $10^{10}$<br>$10^{2}$<br>$10^{-5}$<br>$10^{-6}$   | (*)<br>(*)        |
| AREA  |         |                  |                               |             |  |                          |        |                  | SI                     | Un                    | nit, 1  | m <sup>2</sup>    |
| cm <sup>2</sup><br>in <sup>2</sup><br>ft <sup>2</sup>   | 9       | 64<br>290        |                               |             | 10-4<br>10-8<br>10-8   | (*)<br>(*)<br>(*)        | 1      | 550<br>076       | 003                    | х                     | 10 <sup>4</sup><br>10-3<br>10-5   | (*)               |
| VOLUME  |         |                  |                               |             |  |                          |        |                  | SI                     | Un                    | nit, 1  | "3                |
| cm <sup>3</sup><br>in <sup>3</sup><br>ft <sup>3</sup><br>1 (litre)<br>UKgal (UK gallon)<br>USgal (US gallon)  | 16<br>2 | 45               | 461                           | х           | 10-6<br>10-12<br>10-8<br>10-3<br>10-7<br>10-7  | (*)<br>(*)<br>(*)        | 6<br>3 | 531<br>21        | 467<br>1<br>997        | x<br>x<br>x           | $     \begin{array}{r}       10^{6} \\       10^{-2} \\       10^{-5} \\       10^{3} \\       10^{-2} \\     $ | (*)               |
| MASS  |         |                  |                               |             |  |                          |        |                  | SI                     | Un                    | it, 1   | kg                |
| g (gram)<br>t (tonne)<br>lb (pound)   | 45      | 359              | 1                             | x           | 10 <sup>-3</sup><br>10 <sup>3</sup><br>10 <sup>-8</sup>  | (*)<br>(*)<br>(*)        | 2      | 204              | 1                      | х                     | 10 <sup>3</sup><br>10-3<br>10-6   | (*)<br>(*)        |
| DENSITY   |         |                  |                               |             |  |                          |        |                  | SIU                    | nit                   | :, kg   | m <sup>-3</sup>   |
| g cm <sup>-3</sup><br>g l <sup>-1</sup><br>lb in <sup>-3</sup><br>lb ft <sup>-3</sup><br>lb UKgal <sup>-1</sup><br>lb USgal <sup>-1</sup>   | 1       | 601<br>99        | 1<br>991<br>847               | x<br>x<br>x | $10^{3}$<br>$10^{-2}$<br>$10^{-5}$<br>$10^{-3}$<br>$10^{-4}$   | (*)<br>(*)               | 6      | 242<br>100       | 1<br>728<br>795<br>224 | x<br>x<br>x           | 10 <sup>-3</sup><br>10 <sup>-1:</sup><br>10 <sup>-8</sup><br>10 <sup>-7</sup><br>10 <sup>-9</sup>   | 1 (*)             |
| PRESSURE  |         |                  |                               |             | SI   | Unit,                    | Pa     | (pas             | cal,                   | kg                    |   | s <sup>-2</sup> ) |
| dyn cm <sup>-2</sup><br>at (kgf cm <sup>-2</sup> )<br>atm (atmosphere)<br>bar<br>lbf in <sup>-2</sup> (p.s.i.)<br>lbf ft <sup>-2</sup><br>inHg (inch of mercury)<br>mmHg (millimeter of<br>mercury, torr) |         | 101<br>894<br>47 | 665<br>325<br>1<br>757<br>880 | x<br>x<br>x | $10^{-1} \\ 10^{-1} \\ 10^{-3} \\ 10^{-3} \\ 10^{-3} \\ 10^{-4} \\ 10^{-4} \\ 10^{-4} \\ 10^{-1} \\ 10^{$ | (*)<br>(*)<br>(*)<br>(*) | 1      | 450<br>20<br>952 | 1<br>377<br>886<br>999 | x<br>x<br>x<br>x<br>x | 10<br>10-1:<br>10-1:<br>10-5<br>10-10<br>10-10<br>10-6<br>10-10<br>10-9   | o (*)<br>0        |

•

| APPENDIX I. Conversion Facto   | rs k and k <sup>-1</sup>              |   |
|--|---------------------------------------|---|
| Non-SI Unit  | k<br>l (non-SI Unit) =<br>k (SI Unit) | k <sup>-1</sup><br>1 (SI Unit) =<br><u>k-1 (non-SI Uni</u> t)   |
| ENERGY   | Uni                                   | t, J (joule, kg $m^2 s^{-2}$ )  |
| erg<br>cal <sub>IT</sub> (I.T. calorie)<br>cal <sub>th</sub> (thermochemical calorie<br>kW h (kilowatt hour)<br>l atm<br>ft lbf<br>hp h (horse power hour)<br>Btu (British thermal unit) | 2 684 519                             | $1 \times 10^{7} (*)$ 2 388 459 × 10 <sup>-7</sup><br>2 390 057 × 10 <sup>-7</sup><br>2 777 778 × 10 <sup>-13</sup><br>2 777 778 × 10 <sup>-9</sup><br>9 869 233 × 10 <sup>-9</sup><br>7 375 622 × 10 <sup>-7</sup><br>3 725 062 × 10 <sup>-13</sup><br>9 478 172 × 10 <sup>-10</sup> |

An asterisk (\*) denotes an exact relationship

| COMPONENTS:   | EVALUATOR:   |
|---|--|
| <pre>1. Helium; He; 7440-59-7 2. Water; H<sub>2</sub>O; 7732-18-5</pre> | R. Battino<br>Department of Chemistry<br>Wright State University<br>Dayton, OH 45431 USA |
|   | April 1977   |

CRITICAL EVALUATION:

The data produced by eight workers were considered to be sufficiently accurate to use for the smoothing equation. However, in fitting the data those points which showed deviations greater than two standard deviations were rejected. Thus we used 59 data points obtained as follows (reference number of data points used from that reference): 1-8, 2-5, 3-5, 4-24, 5-3, 6-1, 7-1, 8-1, 9-11. The fitting equation used was

 $\ln X_1 = A + B/(T/100K) + C \ln (T/100K) + DT/100K$ (1)

Using T/100K as the variable rather than T/K gives coefficients of approximately equal magnitude. The best fit for 59 points gave

 $\ln x_1 = -41.4611 + 42.5962/(T/100K) + 14.0094 \ln (T/100K)$ (2)

where  $X_1$  is the mole fraction solubility of helium at 101.325 Pa (1 atm) partial pressure of gas. The fit in  $\ln X_1$  gave a standard deviation of 0.54% taken at the middle of the temperature range. Table 1 gives smoothed values at 5K intervals for the mole fraction solubility at 101.325 Pa and the Ostwald coefficient.

Table 1 also gives the thermodynamic functions  $\Delta \overline{G}_{1}^{\circ}$ ,  $\Delta \overline{H}_{1}^{\circ}$ ,  $\Delta \overline{S}_{1}^{\circ}$ , and  $\Delta \overline{C}_{p}^{\circ}$  for the transfer of the gas from the vapor phase at 101.325 Pa partial 1 gas pressure to the (hypothetical) solution phase of unit mole fraction. These were calculated from the smoothing equation according to the following equations:

 $\Delta \overline{G}_{1}^{\circ} = -RAT - 100RB = RCT \ln (T/100) - RDT^{2}/100$ (3)  $\Delta \overline{S}_{1}^{\circ} = RA + RC \ln (T/100) + RC + 2RDT/100$ (4)  $\Delta \overline{H}_{1}^{\circ} = -100RB + RCT + RDT^{2}/100$ (5)  $\Delta \overline{C}_{P_{1}}^{\circ} = RC + 2RDT/100$ (6)

Since the three constant equations gave the best fit,  $\Delta \overline{C}_p^\circ$  is independent of temperature.

Several sets of data were rejected for purposes of the fitting equation or preparing separate data sheets. The data of Shoor, et al. (10) were obtained via a gas chromatographic method and were about 4% low. Friedman's single value (11) was 1.5\% low. Antropoff's values (12) were erratically very high. Hawkin's single value (13) was 12\% low. The measurements of Feillolay and Lucas (14) at 25 and 35°C were 2 to 5 percent high despite a reproducibility of ± 0.5 percent. Ramsay, Collie and Traver's (15) early value was only qualitative (± 10\%) and it is about 30 percent low. Valentiner's (16) measurements were done at three temperatures using a mixture of gases that was 70\% neon and 30\% helium. His values calculated using this mixture were only qualitative. Estreicher's measurements (17) were very high.<sup>a</sup>

Weiss (5) also measured the solubility of <sup>3</sup>He in water. Those data appear just following the natural helium in water data sheets.

Figure 1 shows the temperature dependence of solubility for helium obtained from the smoothing equation. There is a pronounced minimum at 303 K.

Experimental values of the partial molal enthalpy of solution and of the partial molal volume of the dissolved gas would complement the solubility data. No report of the direct calorimetric determination of the enthalpy of solution of helium in water was found. There are no reports of the partial molal volume of helium in water from experiments at atmospheric pressure. There are reports of the partial molal volume of helium in water

| COMPONENTS:   | EVALUATOR:   |
|---|--|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Water; H<sub>2</sub>O; 7732-18-5</li> </ol> | R. Battino<br>Department of Chemistry<br>Wright State University<br>Dayton, OH 45431 USA |
|   | April 1977   |

CRITICAL EVALUATION:

Table 1. Smoothed values of helium solubility in water and thermodynamic functions<sup>a</sup> using equation 1 at 101.325 kPa (1 atm) partial pressure of helium.

| Т/К    | Mol Fraction <sup>b</sup><br>X <sub>1</sub> x 10 <sup>6</sup> | Ostwald <sup>C</sup><br>L x 10 <sup>3</sup> | $\Delta \overline{G}_1^0 / kJ mol - 1^d$ | $\Delta \overline{H}_1^0 / J \text{ mol}^{-1}$ | $\Delta \overline{S}_{1}^{O}/JK^{-1}mol^{-1}$ |
|--------|---|---|--|--|---|
| 273.15 | 7.585   | 9.436                                       | 26.77                                    | -3600  | -111.2  |
| 278.15 | 7.389   | 9.361                                       | 27.32                                    | -3017  | -109.1  |
| 283.15 | 7.237   | 9.330                                       | 27.87                                    | -2435  | -107.0  |
| 288.15 | 7.123   | 9.341                                       | 28.40                                    | -1853  | -105.0  |
| 293.15 | 7.044   | 9.389                                       | 28.91                                    | -1270  | -103.0  |
| 298.15 | 6.997   | 9.474                                       | 29.42                                    | - 688  | -101.0  |
| 303.15 | 6.978   | 9.594                                       | 29.92                                    | - 105  | - 99.06                                       |
| 308.15 | 6.987   | 9.748                                       | 30.42                                    | + 477  | - 97.16                                       |
| 313.15 | 7.020   | 9.935                                       | 30.90                                    | 1059   | - 95.28                                       |
| 318.15 | 7.077   | 10.16                                       | 31.37                                    | 1642   | - 93.44                                       |
| 323.15 | 7.158   | 10.41                                       | 31.83                                    | 2224   | - 91.62                                       |
| 328.15 | 7.261   | 10.70                                       | 32.28                                    | 2807   | - 89.83                                       |
| 333.15 | 7.385   | 11.02                                       | 32.73                                    | 3389   | - 88.07                                       |
| 338.15 | 7.532   | 11.38                                       | 33.17                                    | 3971   | - 86.33                                       |
| 343.15 | 7.700   | 11.77                                       | 33.59                                    | 4554   | - 84.62                                       |
| 348.15 | 7.890   | 12.20                                       | 34.01                                    | 5136   | - 82.94                                       |

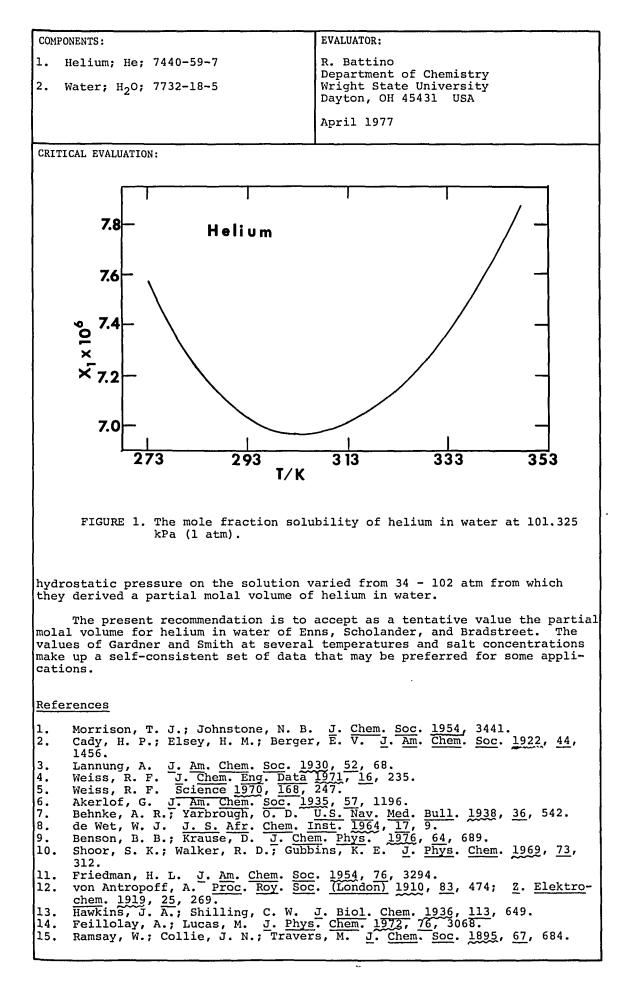
a ▲Cp was independent of temperature and has the value 116 J K<sup>-1</sup> mol<sup>-1</sup>.
 b The mole fraction solubility of helium at 101.325 kPa (1 atm) partial pressure of the gas.

c Ostwald coefficient.

d cal<sub>th</sub> = 4.184 joule.

and aqueous salt solutions derived from high pressure gas solubility data, from high pressure density data, and from a study of aqueous helium solutions under hydrostatic pressure. The values of the partial molal volume of helium in water from the high pressure studies are summarized in Table 2.

Four of the sets of values of the helium partial molal volume in water depend on the high helium pressure solubility measurements of Wiebe and Gaddy (19). Both Michaels, Gerver, and Bijl (18), and Namiot (21) have derived the partial molal volume values for helium in water from the least square fit of the Krichevskii - Kasarnovskii equation (20) to the Wiebe and Gaddy solubility data. It is generally accepted that although the Krichevskii - Kasarnovskii equation often fits the experimental gas solubility data well, the partial molal volumes derived from the equation are low. This seems to be the case for the helium and water system. Gardner and Smith (23) have fitted both the Wiebe and Gaddy and their own data to a theoretical equation which is a quadratic in pressure and which assumes a pressure dependent partial molal volume of the dissolved gas. Popov and Draken (24) calculated an apparent molal volume of helium in water from their measurement of density of the gas saturated solutions at pressures of 20 to 100 atm. They used the Wiebe and Gaddy solubility data to calculate the gas concentration in the solutions. Their value of the helium apparent molal volume is so high when compared with values by the other methods that it must be considered dubious unless it is substantiated by future work. Enns, Scholander, and Bradstreet (22) studied the equilibrium pressure of helium required to maintain a constant concentration of dissolved gas as the



| COMPONENTS:  | EVALUATOR:  |  |  |  |  |
|--|---|--|--|--|--|
| 1. Helium; He; 7440-59-7   | R. Battino<br>Department of Chemistry   |  |  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  | Wright State University<br>Dayton, OH 45431 USA   |  |  |  |  |
|  | April, 1977   |  |  |  |  |
| CRITICAL EVALUATION:   |   |  |  |  |  |
| Table 2. Summary of literature<br>dissolved in water.  | values of the partial molal volume of helium  |  |  |  |  |
| T/K P/atm <sup>a</sup> V <sub>1</sub> /cm <sup>3</sup> mol <sup>-1</sup>   | Reference and Comments  |  |  |  |  |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | Michaels, Gerver, and Bijl (18). High pres-<br>sure helium solubility data of Wiebe and<br>Gaddy (19) fitted to the Krichevskii and<br>Kasarnovskii (20) equation.  |  |  |  |  |
| 273.15 25 - 1000 17  | Namiot (21). Same data and treatment as above.  |  |  |  |  |
| 298.15 34 - 102 29.7<br>29.7   | Enns, Scholander, and Bradstreet (22). A<br>study of the helium equilibrium pressure re-<br>quired to maintain a fixed concentration of<br>helium dissolved in water as the hydrostatic<br>pressure increased from 34 to 102 atm.   |  |  |  |  |
| 298.1525 - 100014.8323.1525 - 100020.0   | Gardiner and Smith (23). The Wiebe and<br>Gaddy (19) data treated as described below.   |  |  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | Gardiner and Smith (23). Their high pressure<br>(100 - 600 atm) gas solubility data were fit-<br>ted to a theoretical equation which was<br>quadratic in pressure. A pressure dependent<br>partial molal volume was assumed. They also<br>report partial molal volumes of helium dis-<br>solved in 1 and 4 molal aqueous NaCl solu-<br>tions. |  |  |  |  |
| 373.15       (1)       43.6         200       30.7         400       17.8         600       4.9  |   |  |  |  |  |
| 298.15 20 - 100 78.4 ± 1.9   | Popov and Drakin (24). The density of the<br>helium saturated water was measured over the<br>pressure range and apparent molal volumes<br>were calculated using the solubility data of<br>Wiebe and Gaddy (19).   |  |  |  |  |
| <sup>a</sup> 1 atm = 101.325 kPa   |   |  |  |  |  |
| <ol> <li>Valentiner, S. Preuss. Bergakad. Clausthal Festschrift 1925, 414.</li> <li>Estreicher, S. Z. Physik. Chem. 1899, 31, 176.</li> <li>Michaels, A.; Gerver, J.; Bijl, A. Physica 1936, 3, 797.</li> <li>Wiebe, R.; Gaddy, V. L. J. Am. Chem. Soc. 1935, 57, 847.</li> <li>Krichevskii, I. R.; Kasarnovskii, J. S. J. Am. Chem. Soc. 1935, 57, 2168.</li> <li>Namiot, A. Yu. Zh. Strukt. Khim. 1961, 2, 408.</li> <li>Enns, T.; Scholander, P.; Bradstreet, E. D. J. Phys. Chem. 1965, 69, 389.</li> <li>Gardiner, G. E.; Smith, N. O. J. Phys. Chem. 1972, 76, 1195.</li> <li>Popov, G. A.; Drakin, S. I. Zh. Fiz. Khim. 1974, 48, 631.</li> <li>Abrosimov, V.K.; Strakhov, A.N.; Krestov, G.A.; Izv. Vyssh. Ucheb. Zaved., Khim. Khim Tekhnol. 1974, 17, 1463.</li> </ol> |   |  |  |  |  |
| of the solubility of helium in v<br>from 13 % high to 2 % low. The v   | and Krestov (25) made five determinations<br>water from 10 - 45 $^{\rm OC}$ and their values ranged<br>values were too erratic to use. However, a<br>ubility values in $H_2O + D_2O$ mixtures and in  |  |  |  |  |

| ] <u>, , , , , , , , , , , , , , , , , , ,</u>       |   |   | ORIGINAL MEASUREMENTS:  |
|--|---|---|---|
| ⊥. Hellum;   | He; 7440-59-7   |   | Cady, H.P.; Elsey, H.M.; Berger, E.V.   |
| 2. Water;  | H <sub>2</sub> O; 7732-18-5   |   |   |
|  | 2   |   | J.Am.Chem. Soc. 1922, 44, 1456-1461.  |
| VARIABLES:   |   |   | PREPARED BY:  |
| т  | /K: 275.15 - 30   | 3.15  | R. Battino  |
|  |   |   |   |
| EXPERIMENTAL   |   |   |   |
| т/к  | Mol Fraction $x_1 \times 10^4$  | Bunsen<br>Coefficient/  | <u>΄α</u>   |
| 275.15<br>275.15                                     | 0.07540*<br>0.07523*  | 0.00938<br>0.00936  |   |
| 283.15<br>283.15                                     | 0.07260*<br>0.07139   | 0.00903<br>0.00888  |   |
| 298.15<br>298.15                                     | 0.06949*<br>0.06925*  | 0.00862<br>0.00859  |   |
| 303.15<br>303.15<br>303.15<br>303.15                 | 0.06539<br>0.06482<br>0.06628<br>0.06749  | 0.00810<br>0.00803<br>0.00821<br>0.00836  |   |
|  |   |   |   |
|  |   |   |   |
|  |   | AUXILIARY   | INFORMATION   |
| determined<br>Gentle sti<br>hours diss<br>gas dissol | olume of degass<br>by displacemer<br>rring for more<br>olves the gas.<br>ved is determin<br>ated and thermo | sed water is<br>nt of mercury,<br>than 24<br>The amount of<br>ned by read-                                | gas by liquefaction and absorption  |
| APPARATUS/PR<br>Procedure                            | by displacement<br>rring for more<br>olves the gas.<br>ved is determint<br>ated and thermo                  | sed water is<br>nt of mercury.<br>than 24<br>The amount of<br>ned by read-<br>ostated gas<br>described in | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Extracted from natural<br>gas by liquefaction and absorptio<br>on charcoal. "Pure" by spectro-<br>scopic examination. |

|   |   | ORIGI   | INAL MEASUREMENTS:   |  |
|---|---|---|--|--|
| 59-7  |   | Lan   | nnung, A.  |  |
| <ol> <li>Helium; He; 7440-59-7</li> <li>Water; H<sub>2</sub>O; 7732-18-5</li> </ol> |   |   |  |  |
| 18-2  |   |   |  |  |
|   |   | <u> 7</u> .   | <u>Am. Chem. Soc. 1930, 52, 68 - 8</u>   |  |
|   | ·   | PREPARED BY:  |  |  |
| T/K: 288.15 - 303.15  |   |   | R.Battino  |  |
|   | · · · · · · · · · · · · · · · · · · ·   | <u></u>   |  |  |
|   | N-1 P   |   | <b>D</b>   |  |
| 17K   |   |   | Coefficient  |  |
|   | $x_1 \times 1$  | 0*  | ≪ x 10 <sup>2</sup>  |  |
|   | 0.071   | 6 <b>*</b>  | 0.89<br>0.88   |  |
| 293.15  | 0.071   | 7   | 0.89   |  |
| 293.15  | 0.070   | 1*<br>4*  | 0.87   |  |
|   | 0.069   | 4 <sup></sup><br>4*   | 0.86<br>0.86   |  |
|   |   |   |  |  |
|   |   |   |  |  |
|   | AUXILIARY   | INFOR   | RMATION  |  |
|   | AUXILIARY   |   | RMATION<br>CE AND PURITY OF MATERIALS:   |  |
| c proced  | ure.  | SOURC   | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit   |  |
| c proced<br>ile sett<br>measured  | ure.<br>ing on  | SOURC   | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.   |  |
| ile sett  | ure.<br>ing on  | SOURC   | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit   |  |
| ile sett  | ure.<br>ing on  | SOURC   | CE AND PURITY OF MATERIALS;<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific   |  |
| ile sett  | ure.<br>ing on  | SOURC   | CE AND PURITY OF MATERIALS;<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific   |  |
| ile sett  | ure.<br>ing on  | SOURC   | CE AND PURITY OF MATERIALS;<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific   |  |
| ile sett  | ure.<br>ing on  | SOUR(<br>1. 1<br>2. 1   | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific<br>conductivity was 2 x 10 <sup>-7</sup> .  |  |
| ile sett  | ure.<br>ing on  | SOUR(<br>1. 1<br>2. 1   | CE AND PURITY OF MATERIALS;<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific   |  |
| ile sett<br>measured  | ure.<br>ing on<br>on gas  | SOUR(<br>1. 1<br>2. 1   | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific<br>conductivity was 2 x 10 <sup>-7</sup> .<br>MATED ERROR:  |  |
| ed on the app   | ure.<br>ing on<br>on gas<br>e design<br>aratus<br>re appar-   | SOUR(<br>1.<br>2.<br>ESTI   | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific<br>conductivity was 2 x 10 <sup>-7</sup> .<br>MATED ERROR:<br>& T/K = 0.03  |  |
| ile sett<br>measured<br>ed on th<br>The app   | ure.<br>ing on<br>on gas<br>e design<br>aratus<br>re appar-   | SOUR(<br>1. 1<br>2. 1<br>ESTIN<br>REFE  | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific<br>conductivity was 2 x 10 <sup>-7</sup> .<br>MATED ERROR:<br>\$T/K = 0.03<br>CRENCES:                            |  |
| ed on the app   | ure.<br>ing on<br>on gas<br>e design<br>aratus<br>re appar-   | SOUR(<br>1. 1<br>2. 1<br>ESTIN<br>REFE  | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific<br>conductivity was 2 x 10 <sup>-7</sup> .<br>MATED ERROR:<br>& T/K = 0.03  |  |
| ed on the app   | ure.<br>ing on<br>on gas<br>e design<br>aratus<br>re appar-   | SOUR(<br>1. 1<br>2. 1<br>ESTIN<br>REFE  | CE AND PURITY OF MATERIALS:<br>Helium. Linde. 99.5 percent wit<br>0.5 per cent neon.<br>Water. Distilled. The specific<br>conductivity was 2 x 10 <sup>-7</sup> .<br>MATED ERROR:<br>$\delta T/K = 0.03$<br>CRENCES:<br>v. Antropoff, A. |  |
|   | - 303.1<br>- 303.1<br>T/K<br>288.15<br>293.15<br>293.15<br>303.15<br>303.15<br>solubilit<br>raction<br>which we | - 303.15<br>T/K Mol Frac<br>X <sub>1</sub> x 1<br>288.15 0.071<br>288.15 0.070<br>293.15 0.070<br>303.15 0.069<br>303.15 0.069<br>303.15 0.069<br>olubility at 101.<br>raction solubility<br>which were used in | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| Son ONEN13.   | Akerlof, A.   |
| l. Helium; He; 7440-59-7  |   |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |   |
| 2   | <u>J. Am. Chem. Soc</u> . 1935, <u>57</u> , 1196-1201                     |
|   |   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 298.15   | R.Battino   |
|   |   |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Frac  |   |
| x <sub>1</sub> x 10   | $^{4}$ Coefficient $\sim \times 10^{2}$                                   |
|   |   |
| 298.15 0.0693   | 3* 0.86   |
|   | <u></u>   |
| The mole fraction solubility at 101.33<br>helium was calculated by the compiler | 25 kPa (l atm) partial pressure of<br>•                                   |
| *Solubility value which was used in the   | ne final smoothing equation for the                                       |
| recommended solubility values given in  | n the critical evaluation.  |
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| AUXILIARY   | INFORMATION   |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:   |
| Volume of solution determined by the direct displacement of mercury. Gas        | <ol> <li>Helium. Source not given. Gas 98<br/>per cent helium.</li> </ol> |
| uptake determined by using a gas  |   |
| buret. Water degassed by boiling in vacuum.                                     | 2. Water. No information given.   |
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| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:  |
| Details of procedure and diagram of   |   |
| apparatus in original paper.  |   |
|   | REFERENCES :  |
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| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| l. Helium; He; 7440-59-7  | Behnke, A.R.; Yarbrough, O.D.   |
| 1. Hellum; He; /440-39-7  |   |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |   |
|   | U. <u>S</u> . <u>Nav</u> . <u>Med</u> . <u>Bull</u> . 1938, <u>36</u> , 542 - |
|   | 548.  |
| VARIABLES:  | PREPARED BY:  |
| T/K: 311.15   |   |
|   | R. Battino  |
| EXPERIMENTAL VALUES:  |   |
|   |   |
| T/K Mol Fract   | cion Bunsen<br>Coefficient  |
| X <sub>1</sub> x 10   | $a^4 \propto 10^2$  |
|   |   |
| 311.15 0.0705   | 58* 0.872   |
|   |   |
| The mole fraction solubility at 101.32 gas. The mole fraction solubility calc | 25 kPa (1 atm) partial pressure of the pulated by the compiler.               |
| *Solubility value which was used in th  | e final smoothing equation for the  |
| recommended solubility values given in  | the critical evaluation.  |
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| AUXILIARY   | INFORMATION   |
|   |   |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:   |
|   | <ol> <li>Helium. Source not given. 97.65<br/>percent helium.</li> </ol>       |
|   | 2. Water. No information given.   |
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|   | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE:  |   |
| Used the Van Slyke procedure (1).   |   |
|   | REFERENCES :  |
|   |   |
|   | <pre>1. Van Slyke, D.D.; Dillon, R.T.;<br/>Margaria, R.</pre>                 |
|   | J. Biol. Chem. 1934, 105, 571.  |
|   |   |
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| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |  |  |  |  |
|---|--|--|--|--|--|
|   | Morrison, T.J.; Johnstone, N.B.  |  |  |  |  |
| 1. Helium; He; 7440-59-7  |  |  |  |  |  |
| <pre>2. Water; H<sub>2</sub>0; 7732-18-5</pre>  | J. Chem. Soc. 1954, 3441 - 3446.   |  |  |  |  |
|   |  |  |  |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |  |  |
| т/к: 277.75 - 346.15  | R. Battino   |  |  |  |  |
|   |  |  |  |  |  |
| EXPERIMENTAL VALUES:  |  |  |  |  |  |
| T/K Mol Fraction Kuenen<br>Coefficient<br>$X_1 \times 10^4$ S x $10^3$  | T/K Mol Fraction Kuenen<br>Coefficient<br>X <sub>1</sub> x 10 <sup>4</sup> S x 10 <sup>3</sup>   |  |  |  |  |
| 277.75 0.07588 9.44   | 313.55 0.06814 8.41  |  |  |  |  |
| 279.15 0.07515 9.35<br>284.15 0.07269 9.04  | 318.05 0.06858 8.45<br>322.05 0.06984 8.59   |  |  |  |  |
| 285.15 0.07213" 8.97  | 327.55 0.07100 8.71  |  |  |  |  |
| 286.35 0.0/134 8.8/   | 329.05 0.07187 8.81  |  |  |  |  |
| 289.75         0.07009         8.71           294.85         0.06871         8.53   | 331.75       0.07262       8.89         333.65       0.07376*       9.02         340.55       0.07576*       9.23  |  |  |  |  |
| 297.85 0.06827 8.47   | 340.55 0.07576 9.23  |  |  |  |  |
| 297.85         0.06827         8.47           300.55         0.06816         8.45   | 340.55 0.07576* 9.23<br>343.65 0.07746* 9.42   |  |  |  |  |
| 300.550.068168.45306.150.067398.34307.750.067998.41   | 343.65 0.07746* 9.42<br>344.55 0.07750* 9.42<br>346.15 0.07790* 9.46   |  |  |  |  |
| 307.75 0.06799 8.41   | 548.15 0:07750 5:40  |  |  |  |  |
| Kuenen coefficient x $10^3$ at a helium y<br>The mole fraction solubility at a heli<br>(l atm) was calculated by the compiler | ubility value is reported above as the<br>partial pressure of 101.325 kPa (1 atm)<br>ium partial pressure of 101.325 kPa<br>r.<br>the final smoothing equation for the<br>n the critical evaluation. |  |  |  |  |
| AUXILIARY   | INFORMATION  |  |  |  |  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:  |  |  |  |  |
| The previously degassed solvent is flowed in a thin film through the  | <ol> <li>Helium. British Oxygen Co. Ltd.<br/>Spectroscopically pure.</li> </ol>  |  |  |  |  |
| gas in a glass absorption spiral.<br>Volume changes are measured in burets  | 2. Water. No information given.  |  |  |  |  |
|   |  |  |  |  |  |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:   |  |  |  |  |
|   |  |  |  |  |  |
| The apparatus described by<br>Morrison and Billett (1) was used.  |  |  |  |  |  |
|   | REFERENCES:  |  |  |  |  |
|   | 1. Morrison, T.J.; Billett, F.<br>J. <u>Chem</u> . <u>Soc</u> . 1952, 3819.  |  |  |  |  |
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| COMPONENTS:  |  |  | ORIGI  | NAL MEASUREMENTS   | 5:<br>  |
|--|--|--|--|--|---|
|  |  |  |  | Wet, W.J.  |   |
| l. Helium; He; 7440-59-7   |  |  |  |  |   |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |  |  |  |   |
| 2.,  |  |  | <u>J</u> .                                     | S. Afr. Chem.  | <u>Inst</u> . 1964, <u>17</u> , 9-13  |
| VARIABLES:   |  |  | PREPA  | ARED BY:   | · · · · · · · · · · · · · · · · · · ·   |
| T/K: 291.25  | - 305.75   |  |  | R. Bat   | tino  |
| EXPERIMENTAL VALUES:   |  |  | l  | ······································   | <u> </u>  |
|  |  | N = 3 13   |  |  |   |
|  | T/K Mol Fract                                    |  |  | Bunsen<br>Coefficient  |   |
|  |  | X <sub>1</sub> x 10                                    | 0 <sup>4</sup>                                 | $\propto \times 10^2$  |   |
|  | 291.25   | 0.0716   | 5  | 0.89   |   |
|  | 298.45   |  |  | 0.88   |   |
|  | 305.75   | 0.0695   | 5*   | 0.86   |   |
|  |  |  |  |  |   |
| Mole fraction solubi<br>helium calculated by   |  |  | Pa (1  | atm) partial   | pressure of the   |
| *Solubility value wh   | nich was   | used in th   | ne fi  | nal smoothing  | equation for the  |
|  |  |  |  |  |   |
|  |  |  |  |  |   |
|  |  | AUXILIARY  | INFOR  | MATION   |   |
| METHOD:  |  | AUXILIARY  |  | MATION<br>CE AND PURITY OF   | MATERIALS ;   |
| METHOD:<br>Degassed liquid is<br>film through a glas<br>ing the gas. Volume<br>calibrated burets.  | s spiral   | n a thin<br>contain-                                   | SOUR   | CE AND PURITY OF<br>Helium. Conta:<br>per cent impu:   | MATERIALS:<br>ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air                            |
| Degassed liquid is<br>film through a glas<br>ing the gas. Volume   | s spiral   | n a thin<br>contain-                                   | SOUR<br>1. 1                                   | CE AND PURITY OF<br>Helium. Conta:<br>per cent impur<br>activated char   | ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air  |
| Degassed liquid is<br>film through a glas<br>ing the gas. Volume   | s spiral   | n a thin<br>contain-                                   | SOUR<br>1. 1                                   | CE AND PURITY OF<br>Helium. Conta:<br>per cent impur<br>activated char<br>temperatures.                              | ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air  |
| Degassed liquid is<br>film through a glas<br>ing the gas. Volume   | s spiral   | n a thin<br>contain-                                   | SOUR<br>1. 1                                   | CE AND PURITY OF<br>Helium. Conta:<br>per cent impur<br>activated char<br>temperatures.                              | ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air  |
| Degassed liquid is<br>film through a glas<br>ing the gas. Volume   | s spiral   | n a thin<br>contain-                                   | SOUR<br>1. 1                                   | CE AND PURITY OF<br>Helium. Conta:<br>per cent impur<br>activated char<br>temperatures.                              | ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air  |
| Degassed liquid is<br>film through a glas<br>ing the gas. Volume   | s spiral   | n a thin<br>contain-                                   | SOUR(  | CE AND PURITY OF<br>Helium. Conta:<br>per cent impur<br>activated char<br>temperatures.<br>Water. Distil             | ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air  |
| Degassed liquid is<br>film through a glas<br>ing the gas. Volume   | s spiral   | n a thin<br>contain-                                   | SOUR(  | CE AND PURITY OF<br>Helium. Conta:<br>per cent impur<br>activated char<br>temperatures.                              | ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air  |
| Degassed liquid is<br>film through a glas<br>ing the gas. Volume<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification o<br>Billett (1) apparat | s spiral<br>s determ:<br>of Morriso<br>us. Degas | n a thin<br>contain-<br>ined via<br>on and<br>ssing as | SOUR(  | CE AND PURITY OF<br>Helium. Conta:<br>per cent impur<br>activated char<br>temperatures.<br>Water. Distil             | ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air  |
| Degassed liquid is<br>film through a glas<br>ing the gas. Volume<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification o                        | s spiral<br>s determ:<br>of Morriso<br>us. Degas | n a thin<br>contain-<br>ined via<br>on and<br>ssing as | SOUR(<br>1. 1)<br>2. 1<br>ESTI<br>REFE<br>1. 1 | CE AND PURITY OF<br>Helium. Conta:<br>per cent impurativated char<br>temperatures.<br>Nater. Distil:<br>MATED ERROR: | ined less than 0.3<br>rity. Passed over<br>rcoal at liquid air<br>led.<br>.; Billett, F.<br>1948, 2033; |

| COMPONENTS :  | ODICINAL NEACURENEURS  |
|---|--|
|   | ORIGINAL MEASUREMENTS:   |
| 1. Helium; He; 7440-59-7  | Weiss, R.F.  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |  |
|   | <u>Science</u> 1970, <u>168</u> , 247  |
| VARIABLES:  | PREPARED BY:   |
| T/K: 273.15 - 313.29  | R. Battino   |
| EXPERIMENTAL VALUES:  |  |
|   |  |
| T/K Mol Fraction Bunsen<br>$X_1 \times 10^4$ Coefficient/ $\alpha$                |  |
| 273.75 0.07520* 0.009355  |  |
| 293.26 0.07025* 0.008724  |  |
| 313.29 0.07058* 0.008713  |  |
| The mole fraction solubility is at 10<br>the helium. The mole fraction solubility | 01.325 kPa (1 atm) partial pressure of<br>lity was calculated by the compiler.                               |
| *Solubility values which were used in   | the final smoothing equation for the   |
| recommended solubility values given i   | in the critical evaluation.  |
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|   | INFORMATION  |
| METHOD: The Scholander micro-gasometric technique as adapted by Douglas (1)       | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Air Reduction reactor  |
| was used. The gas is dissolved in   | grade. Better than 99.99 per cent.   |
| previously degassed water over mercury<br>All volumes are read on a micrometer    | 2. Water. Distilled.   |
| which displaces mercury.  |  |
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| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:   |
| THE FRANCE FERE   |  |
|   |  |
|   | REFERENCES:  |
|   | LDouglas, E. J. Phys. <u>Chem</u> . 1964, <u>68</u> ,<br>169; <u>ibid</u> ., 1965, <u>69</u> , <u>2608</u> . |
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| COMPONENTS:                           | <del></del>                      |                                 | ORIGINA             | L MEASUREMENTS:                 |  |  |  |  |
|---------------------------------------|----------------------------------|---------------------------------|---------------------|---------------------------------|--|--|--|--|
| l. Heliur                             | m; He; 7440-59                   | -7                              | Weiss               | Weiss, R.F.                     |  |  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5 |                                  |                                 |                     |                                 |  |  |  |  |
|                                       | ,                                | -                               |                     |                                 |  |  |  |  |
|                                       |                                  |                                 | J.Che               | m.Eng.Data 19                   | 71, <u>16</u> , 235-241.               |  |  |  |
| VARIABLES:                            |                                  | ······                          | Danatan             |                                 |  |  |  |  |
| VARIABLES.                            | т/к: 273.75                      | - 313.30                        | PREPARE             | R. Batti                        | no                                     |  |  |  |
|                                       | -,                               |                                 |                     |                                 |  |  |  |  |
| EXPERIMENTA                           | L VALUES:                        |                                 | <u> </u>            | <u></u>                         |  |  |  |  |
| т/к                                   | Mol Fraction                     |                                 | т/к                 | Mol Fraction                    |  |  |  |  |
|                                       | $x_1 \times 10^4$                | Coefficient                     |                     | $x_1 \times 10^4$               | Coefficient                            |  |  |  |
| 273.75                                | 0.07525*                         | 0.009361                        | 303.41              | 0.06974*                        | 0.008639                               |  |  |  |
| 273.75<br>273.75                      | 0.07518*<br>0.07521*             | 0.009353<br>0.009356            | 303.39<br>303.37    | 0.06953*<br>0.06971*            | 0.008612<br>0.008602                   |  |  |  |
| 273.75                                | 0.07517*                         | 0.009351                        | 303.37              | 0.06944*                        | 0.008601                               |  |  |  |
|                                       |                                  |                                 | 303.40              | 0.06953*                        | 0.008612                               |  |  |  |
| 283.42<br>283.44                      | 0.07267*<br>0.07218*             | 0.009038<br>0.008978            | 303.39              | 0.06949*                        | 0.008607                               |  |  |  |
| 283.43                                | 0.07242*                         | 0.009008                        | 313.29              | 0.07021*                        | 0.008667                               |  |  |  |
| 283.44                                | 0.07218*<br>0.07236*             | 0.008978                        | 313.29              | 0.07088<br>0.07071*             | 0.008750                               |  |  |  |
| 283.44                                | 0.07236"                         | 0.009000                        | 313.30<br>313.29    | 0.07052*                        | 0.008729<br>0.008705                   |  |  |  |
| 293.25                                | 0.07018*                         | 0.008716                        |                     |                                 |  |  |  |  |
| 293.26<br>293.26                      | 0.07047*<br>0.07005*             | 0.008752<br>0.008700            |                     |                                 |  |  |  |  |
| 293.26                                | 0.07042*                         | 0.008746                        |                     |                                 |  |  |  |  |
| 293.23                                | 0.07033*                         | 0.008734                        |                     |                                 |  |  |  |  |
| 293.28                                | 0.07001*                         | 0.008695                        |                     |                                 |  |  |  |  |
| The mole<br>the heli                  | e fraction sol<br>ium. The mole  | ubility is at<br>fraction solub | 101.325<br>ility wa | kPa (1 atm) p<br>s calculated   | artial pressure of<br>by the compiler. |  |  |  |
| *Solubil                              | ity values wh                    | ich were used :                 | in the f            | inal smoothing                  | g equation for the                     |  |  |  |
| recommen                              | laea solubilit                   | y values given                  | in the              | critical evalu                  | lation.                                |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |
|                                       |                                  |                                 | Y INFORMAT          |                                 |  |  |  |  |
| METHOD: The                           | e Scholander m                   | icro-gasometri                  |                     | AND PURITY OF MA                | TERIALS;<br>uction. Better than        |  |  |  |
| vas used.                             | e as adapted b<br>. The gas is d | issolved in                     |                     | .99 per cent                    |  |  |  |  |
| previous                              | ly degassed wa                   | ter over                        |                     | -                               |  |  |  |  |
|                                       | All volumes a<br>er which displ  |                                 | 2. Wa               | ter. Distille                   | d.                                     |  |  |  |
| MICI OMECE                            | si which dispi                   | aces mercury.                   |                     |                                 |  |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |
|                                       |                                  |                                 | 100000              |                                 |  |  |  |  |
| APPARATUS/H                           | PROCEDURE :                      | <u></u>                         |                     | ED ERROR:                       |  |  |  |  |
|                                       |                                  |                                 | 8T/K                | = 0.01                          |  |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |
|                                       |                                  |                                 | DEPENDEN            | ICEC .                          |  |  |  |  |
|                                       |                                  |                                 | REFEREN             |                                 |  |  |  |  |
|                                       |                                  |                                 |                     | as, E.<br>ys. <u>Chem</u> . 196 | 4, 68, 169.                            |  |  |  |
|                                       |                                  |                                 | ībid.               | 1965, <u>69</u> , 26            | 08.                                    |  |  |  |
|                                       |                                  |                                 |                     | · • • •                         |  |  |  |  |
|                                       |                                  |                                 | ļ                   |                                 |  |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |
|                                       |                                  |                                 |                     |                                 |  |  |  |  |

|   | COMPONENTS:   |   |  | ORIGINAL MEASUREMENTS:   |          |  |
|---|---|---|--|--|----------|--|
| l. Helium; He; 7440-59-7  |   |   |  | Benson, B.B.; Krause, D.   |          |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |   |   |  |  |          |  |
| 2. water, n <sub>2</sub> 0; //.   | 32-18-5   |   | }  |  |          |  |
|   |   |   | <u>J</u> .   | <u>Chem. Phys. 1976, 64, 689 - 70</u>  | )9.      |  |
| VARIABLES:  |   |   | PPFP   | ARED BY:   |          |  |
| T/K: 274.1  | 15 - 325.15   |   | f KEr  | R. Battino   |          |  |
|   |   |   |  |  |          |  |
| EXPERIMENTAL VALUES:  |   |   | L  |  |          |  |
|   | т/к   | Mol Frac  | tion   |  |          |  |
|   |   | $x_1 \times 1$  | 0 <sup>4</sup>   | Coefficient  |          |  |
|   | 274.151   | 0.0763  | 01   | 0.9502   |          |  |
|   | 278.143   | 0.0743  |  | 0.9264   |          |  |
|   | 278.145   | 0.0744  |  | 0.9272   |          |  |
|   | 283.147   | 0.0728  |  | 0.9069   |          |  |
|   | 288.149<br>288.152  | 0.0717<br>0.0716  | 85 <sup>*</sup>  | 0.8930<br>0.8920   |          |  |
|   | 293.150   | 0.0708  | 01*  | 0.8801   |          |  |
|   | 298.147   | 0.0705  | 22*  | 0.8757   |          |  |
|   | 303.159   | 0.0703  | 04*  | 0.8717   |          |  |
|   | 308.153   | 0.0703  | 73*  | 0.8712   |          |  |
|   | 313.153   | 0.0708  |  | 0.8754   |          |  |
|   | 318.152   | 0.0712  |  | 0.8789   |          |  |
|   | 325.153   | 0.0718  | 55"  | 0.8910   |          |  |
| helium was calcula  | ated by the   | compiler  | 25 KJ  | Pa (1 atm) partial pressure of   |          |  |
| helium was calcula<br>*Solubility values  | s which wer   | compiler<br>e used in   | the  | final smoothing equation for t<br>critical evaluation.   | the      |  |
| helium was calcula<br>*Solubility values  | s which wer   | compiler<br>e used in   | the<br>n the   | final smoothing equation for t<br>e critical evaluation.   | the      |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa   | s which were<br>ility values  | compiler<br>e used in<br>s given i:<br>AUXILIARY  | the<br>n the<br>INFOI  | final smoothing equation for t<br>e critical evaluation.<br>RMATION  | the      |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated.  | s which were<br>ility values<br>ater and the<br>and volume  | compiler<br>e used in<br>s given in<br>AUXILIARY<br>e pure gas  | the<br>n the<br>INFOI  | final smoothing equation for t<br>e critical evaluation.   |          |  |
| helium was calcula<br>*Solubility values<br>recommended solubs<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The  | s which were<br>ility values<br>ater and the<br>and volumes<br>and gaseous<br>gas dissoly   | compiler<br>e used in<br>s given i:<br>AUXILIARY<br>e pure gas<br>tric samp<br>s phases<br>ved in the   | the<br>n the<br>INFOI  | final smoothing equation for t<br>e critical evaluation.<br>RMATION<br>RCE AND PURITY OF MATERIALS;  | the      |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of   | s which were<br>ility values<br>ater and the<br>and volumes<br>and gaseous<br>gas dissolv<br>and the no<br>on a special   | compiler<br>e used in<br>s given i<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>umber of<br>mercury  | the<br>n the<br>INFOI<br>SOUR<br>1.<br>2.                          | final smoothing equation for the critical evaluation.<br>RMATION<br>RCE AND PURITY OF MATERIALS:<br>Helium. No information given.  |          |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined commonweter. After r   | ater and the<br>and volume<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of v  | compiler<br>e used in<br>s given is<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-   | the<br>n the<br>INFOI<br>SOUR<br>1.<br>2.                          | final smoothing equation for the critical evaluation.<br>RMATION<br>RCE AND PURITY OF MATERIALS:<br>Helium. No information given.  |          |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined co<br>manometer. After r<br>or, the number of<br>the gaseous phase   | ater and the<br>and volumet<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of v<br>moles of he<br>sample is n   | compiler<br>e used in<br>s given in<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>elium in<br>neasured   | the<br>n the<br>INFOI  | final smoothing equation for the critical evaluation.<br>RMATION<br>RCE AND PURITY OF MATERIALS:<br>Helium. No information given.  |          |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>manometer. After r<br>or, the number of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo   | ater and the<br>and volumet<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>removal of w<br>moles of he<br>sample is no<br>ometer. The<br>powe the solu  | compiler<br>e used in<br>s given in<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>elium in<br>measured<br>pressure   | the<br>n the<br>INFOI  | final smoothing equation for the critical evaluation.<br>RMATION<br>RCE AND PURITY OF MATERIALS:<br>Helium. No information given.  |          |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>manometer. After r<br>or, the number of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from   | ater and the<br>and volume<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>removal of w<br>moles of he<br>sample is n<br>ometer. The<br>ove the solu   | compiler<br>e used in<br>s given i:<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>elium in<br>measured<br>pressure<br>ition may<br>m analysi                           | the<br>n the<br>INFOI  | final smoothing equation for the critical evaluation.<br>RMATION<br>RCE AND PURITY OF MATERIALS:<br>Helium. No information given.  |          |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>manometer. After r<br>or, the number of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from<br>Real gas correction<br>ted maximum error                         | s which were<br>ility values<br>ater and the<br>and volumes<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>removal of w<br>moles of he<br>sample is no<br>ometer. The<br>ove the solution<br>the helium                           | compiler<br>e used in<br>s given i<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>elium in<br>measured<br>pressure<br>ition may<br>a nalysi<br>e. Predic-               | the<br>n the<br>INFOI  | final smoothing equation for the critical evaluation.<br>RMATION<br>RECE AND FURITY OF MATERIALS:<br>Helium. No information given.<br>Water. No information given.   |          |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>manometer. After r<br>or, the number of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from<br>Real gas correction<br>ted maximum error<br>APPARATUS/PROCEDURE: | ater and the<br>and volumet<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of w<br>moles of he<br>sample is n<br>ometer. The<br>ove the solu<br>a the heliur<br>ons are made<br>is 0.02 per                               | compiler<br>e used in<br>s given is<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>slium in<br>measured<br>pressure<br>ition may<br>n analysis<br>e. Predic-<br>c cent. | the<br>n the<br>SOUR<br>1.<br>2.                                   | final smoothing equation for the critical evaluation.<br>RMATION<br>RCE AND PURITY OF MATERIALS:<br>Helium. No information given.  | .0       |  |
| helium was calcula<br>*Solubility values<br>recommended solub:<br>METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>manometer. After r<br>or, the number of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from<br>Real gas correction<br>ted maximum error                         | ater and the<br>and volumes<br>and gaseous<br>gas dissolv<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of v<br>moles of he<br>sample is n<br>ometer. The<br>ove the solu<br>a the heliur<br>ons are made<br>is 0.02 per | compiler<br>e used in<br>s given is<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>slium in<br>measured<br>pressure<br>ition may<br>n analysis<br>e. Predic-<br>c cent. | the<br>n the<br>SOUR<br>1.<br>2.<br>ESTI<br>0.1<br>Cal             | final smoothing equation for the critical evaluation.<br>RMATION<br>RECE AND FURITY OF MATERIALS:<br>Helium. No information given.<br>Water. No information given.<br>IMATED ERROR: Smoothed data fit t  |          |  |
| METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from<br>Real gas correction<br>ted maximum error<br>APPARATUS/PROCEDURE:<br>No drawings of the  | ater and the<br>and volumes<br>and gaseous<br>gas dissolv<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of v<br>moles of he<br>sample is n<br>ometer. The<br>ove the solu<br>a the heliur<br>ons are made<br>is 0.02 per | compiler<br>e used in<br>s given is<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>slium in<br>measured<br>pressure<br>ition may<br>n analysis<br>e. Predic-<br>c cent. | the<br>n the<br>SOUR<br>1.<br>2.<br>5.<br>ESTI<br>0.1<br>Cal<br>is | final smoothing equation for the critical evaluation.<br>RMATION<br>RMATION<br>RECE AND PURITY OF MATERIALS:<br>Helium. No information given.<br>Water. No information given.<br>Water. No information given.<br>IMATED ERROR: Smoothed data fit to<br>12 per cent rms in the solubilities of the solubilities | :o<br>ty |  |
| METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from<br>Real gas correction<br>ted maximum error<br>APPARATUS/PROCEDURE:<br>No drawings of the  | ater and the<br>and volumes<br>and gaseous<br>gas dissolv<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of v<br>moles of he<br>sample is n<br>ometer. The<br>ove the solu<br>a the heliur<br>ons are made<br>is 0.02 per | compiler<br>e used in<br>s given is<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>slium in<br>measured<br>pressure<br>ition may<br>n analysis<br>e. Predic-<br>c cent. | the<br>n the<br>SOUR<br>1.<br>2.<br>5.<br>ESTI<br>0.1<br>Cal<br>is | final smoothing equation for the critical evaluation.<br>RMATION<br>RECE AND FURITY OF MATERIALS:<br>Helium. No information given.<br>Water. No information given.<br>IMATED ERROR: Smoothed data fit the<br>L2 per cent rms in the solubilities of the solubiliti     | :o<br>ty |  |
| METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from<br>Real gas correction<br>ted maximum error<br>APPARATUS/PROCEDURE:<br>No drawings of the  | ater and the<br>and volumes<br>and gaseous<br>gas dissolv<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of v<br>moles of he<br>sample is n<br>ometer. The<br>ove the solu<br>a the heliur<br>ons are made<br>is 0.02 per | compiler<br>e used in<br>s given is<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>slium in<br>measured<br>pressure<br>ition may<br>n analysis<br>e. Predic-<br>c cent. | the<br>n the<br>SOUR<br>1.<br>2.<br>5.<br>ESTI<br>0.1<br>Cal<br>is | final smoothing equation for the critical evaluation.<br>RMATION<br>RECE AND FURITY OF MATERIALS:<br>Helium. No information given.<br>Water. No information given.<br>IMATED ERROR: Smoothed data fit the<br>L2 per cent rms in the solubilities of the solubiliti     | :o<br>ty |  |
| METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from<br>Real gas correction<br>ted maximum error<br>APPARATUS/PROCEDURE:<br>No drawings of the  | ater and the<br>and volumes<br>and gaseous<br>gas dissolv<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of v<br>moles of he<br>sample is n<br>ometer. The<br>ove the solu<br>a the heliur<br>ons are made<br>is 0.02 per | compiler<br>e used in<br>s given is<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>slium in<br>measured<br>pressure<br>ition may<br>a analysis<br>e. Predic-<br>c cent. | the<br>n the<br>SOUR<br>1.<br>2.<br>5.<br>ESTI<br>0.1<br>Cal<br>is | final smoothing equation for the critical evaluation.<br>RMATION<br>RECE AND FURITY OF MATERIALS:<br>Helium. No information given.<br>Water. No information given.<br>IMATED ERROR: Smoothed data fit the<br>L2 per cent rms in the solubilities of the solubiliti     | :o<br>ty |  |
| METHOD: Gas-free wa<br>are equilibrated,<br>les of the liquid<br>are isolated. The<br>water is extracted<br>moles determined of<br>the gaseous phase<br>with the same mano<br>(and fugacity) abo<br>be calculated from<br>Real gas correction<br>ted maximum error<br>APPARATUS/PROCEDURE:<br>No drawings of the  | ater and the<br>and volumes<br>and gaseous<br>gas dissolv<br>and gaseous<br>gas dissolv<br>and the nu<br>on a special<br>cemoval of v<br>moles of he<br>sample is n<br>ometer. The<br>ove the solu<br>a the heliur<br>ons are made<br>is 0.02 per | compiler<br>e used in<br>s given is<br>AUXILIARY<br>e pure gas<br>tric samp-<br>s phases<br>yed in the<br>imber of<br>l mercury<br>water vap-<br>slium in<br>measured<br>pressure<br>ition may<br>a analysis<br>e. Predic-<br>c cent. | the<br>n the<br>SOUR<br>1.<br>2.<br>5.<br>ESTI<br>0.1<br>Cal<br>is | final smoothing equation for the critical evaluation.<br>RMATION<br>RECE AND FURITY OF MATERIALS:<br>Helium. No information given.<br>Water. No information given.<br>IMATED ERROR: Smoothed data fit the<br>L2 per cent rms in the solubilities of the solubiliti     |          |  |

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| COMPONENTE -   |                                    |              | OPICINAL MEASUREMENTS .   |  |  |
|--|------------------------------------|--------------|---|--|--|
| COMPONENTS:<br>1. Helium; He; 7440-59-7  |                                    |              | ORIGINAL MEASUREMENTS:<br>Abrosimov, V.K.; Strakhov, A.N.;  |  |  |
|  |                                    |              | Krestov, G.A.   |  |  |
| 2. Water-d <sub>2</sub> ; D <sub>2</sub> O; 7789-20-0  |                                    |              |   |  |  |
|  |                                    |              | Izv. Vyssh. Ucheb. Zaved., Khim.  |  |  |
|  |                                    |              | Khim. <u>Tekhnol</u> .1974, <u>17</u> , 1463-1465.  |  |  |
| VARIABLES:   |                                    |              | PREPARED BY:  |  |  |
| T/K: 283.38 - 318.45<br>P/kPa: 101.325 (1 atm)   |                                    |              | R. Battino  |  |  |
|  |                                    |              | <u> </u>  |  |  |
| EXPERIMENTAL VALUES:   | т/к                                | Mol Frac     | tion Bunsen   |  |  |
|  | 1/10                               |              | Coefficient   |  |  |
|  |                                    | X1 × 1       | $\frac{0^4}{\alpha \times 10^2}$  |  |  |
|  | 283.38                             | 0.092        | 276 1.148   |  |  |
|  | 292.72                             | 0.086        |   |  |  |
|  | 298.15<br>308.25                   |              |   |  |  |
|  | 318.45                             | 0.089        | 541 1.050   |  |  |
| ·  |                                    |              |   |  |  |
| Mole fraction solub  | ilitv at 1                         | 101.325 P;   | a (1 atm) partial pressure of gas   |  |  |
| calculated by compil   |                                    |              |   |  |  |
|  |                                    |              |   |  |  |
|  |                                    |              |   |  |  |
|  |                                    |              |   |  |  |
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|  |                                    |              |   |  |  |
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|  |                                    |              |   |  |  |
|  |                                    |              |   |  |  |
|  |                                    |              |   |  |  |
|  |                                    | AUXILIARY    | INFORMATION   |  |  |
| METHOD:  |                                    |              | INFORMATION<br>SOURCE AND PURITY OF MATERIALS;  |  |  |
| The authors also   |                                    | the          | ·   |  |  |
| 1  | m in pure                          | the          | ·   |  |  |
| The authors also<br>solubility of heliu  | m in pure                          | the          | ·   |  |  |
| The authors also<br>solubility of heliu  | m in pure                          | the          | ·   |  |  |
| The authors also<br>solubility of heliu  | m in pure                          | the          | ·   |  |  |
| The authors also<br>solubility of heliu  | m in pure                          | the          | ·   |  |  |
| The authors also<br>solubility of heliu  | m in pure                          | the          | ·   |  |  |
| The authors also<br>solubility of heliu  | m in pure                          | the          | ·   |  |  |
| The authors also<br>solubility of heliu  | m in pure                          | the          | ·   |  |  |
| The authors also<br>solubility of heliu<br>and mixtures of H <sub>2</sub> O<br>APPARATUS/PROCEDURE:<br>The apparatus (1                          | m in pure<br>and D <sub>2</sub> O. | the<br>water | SOURCE AND PURITY OF MATERIALS:<br>- ESTIMATED ERROR:<br>- 6X (X = 0.01 (compiler)  |  |  |
| The authors also<br>solubility of heliuw<br>and mixtures of H <sub>2</sub> O<br>APPARATUS/PROCEDURE:<br>The apparatus (1<br>of the apparatus us  | m in pure<br>and D <sub>2</sub> O. | the<br>water | SOURCE AND PURITY OF MATERIALS:<br>- ESTIMATED ERROR:<br>- 6X (X = 0.01 (compiler)  |  |  |
| The authors also<br>solubility of heliu<br>and mixtures of H <sub>2</sub> O<br>APPARATUS/PROCEDURE:<br>The apparatus (1                          | m in pure<br>and D <sub>2</sub> O. | the<br>water | SOURCE AND PURITY OF MATERIALS:<br>ESTIMATED ERROR:<br>$\delta x_1/x_1 = 0.01$ (compiler)   |  |  |
| The authors also<br>solubility of heliuw<br>and mixtures of H <sub>2</sub> O<br>APPARATUS/PROCEDURE:<br>The apparatus (1<br>of the apparatus us  | m in pure<br>and D <sub>2</sub> O. | the<br>water | SOURCE AND PURITY OF MATERIALS:<br>ESTIMATED ERROR:<br>$\delta X_1 / X_1 = 0.01$ (compiler)<br>REFERENCES:  |  |  |
| The authors also<br>solubility of heliuw<br>and mixtures of H <sub>2</sub> O<br>APPARATUS/PROCEDURE:<br>The apparatus (1<br>of the apparatus us  | m in pure<br>and D <sub>2</sub> O. | the<br>water | SOURCE AND PURITY OF MATERIALS:<br>ESTIMATED ERROR:<br>$\delta X_1 / X_1 = 0.01$ (compiler)<br>REFERENCES:  |  |  |
| The authors also<br>solubility of heliuw<br>and mixtures of H <sub>2</sub> O<br>APPARATUS/PROCEDURE:<br>The apparatus (1<br>of the apparatus us  | m in pure<br>and D <sub>2</sub> O. | the<br>water | SOURCE AND PURITY OF MATERIALS:<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.01 \text{ (compiler)}$<br>REFERENCES:<br>1. Patsatsiya, K.M.; Krestov, G.A.<br><u>Zh. Fiz. Khim.</u> 1970, <u>44</u> , 1835.   |  |  |
| The authors also<br>solubility of heliuw<br>and mixtures of H <sub>2</sub> O<br>APPARATUS/PROCEDURE:<br>The apparatus (1<br>of the apparatus us  | m in pure<br>and D <sub>2</sub> O. | the<br>water | SOURCE AND PURITY OF MATERIALS:<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.01$ (compiler)<br>REFERENCES:<br>1. Patsatsiya, K.M.; Krestov, G.A.<br><u>Zh. Fiz. Khim.</u> 1970, <u>44</u> , 1835.<br>2. Ben-Naim, A.; Baer, S.<br><u>Trans. Faraday Soc</u> . 1963, <u>59</u> , |  |  |
| The authors also<br>solubility of heliuw<br>and mixtures of H <sub>2</sub> O<br>APPARATUS/PROCEDURE:<br>The apparatus (1<br>of the apparatus use | m in pure<br>and D <sub>2</sub> O. | the<br>water | SOURCE AND PURITY OF MATERIALS:<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.01$ (compiler)<br>REFERENCES:<br>1. Patsatsiya, K.M.; Krestov, G.A.<br><u>Zh. Fiz. Khim.</u> 1970, <u>44</u> , 1835.<br>2. Ben-Naim, A.; Baer, S.  |  |  |

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1 14

| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
| 1. Helium-3; <sup>3</sup> He; 14762-55-1                                     | Weiss, R.F.  |
|  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |
|  | <u>Science</u> 1970, <u>168</u> , 247 - 248.   |
| VARIABLES:   | DREDADED DV  |
| T/K: 273.75 - 313.29   | PREPARED BY:   |
| P/kPa: 101.325 (1 atm)   | H.L. Clever  |
| EXPERIMENTAL VALUES:   |  |
| T/K Bunsen   | Ostwald  |
| Coefficient<br>α x 10 <sup>2</sup>   | Coefficient<br>L x 10 <sup>2</sup>   |
| $\overline{273.75}$ 0.9254 ± 0.002   |  |
| 293.26 0.8620 ± 0.001  |  |
| 313.29 0.8574 ± 0.001  |  |
| The Bunsen coefficients are the mean of                                      | of A and E magningments  |
|  |  |
| The Ostwald coefficients were calculat                                       | ed by the compiler.  |
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|  | INFORMATION  |
| METHOD: The Scholander microgasometric                                       | SOURCE AND PURITY OF MATERIALS:  |
| technique as adapted by Douglas (1)<br>was used. The equilibrium chamber was | 1. Helium-3. Monsanto Research.  |
| enlarged to contain approximately 10   | Greater than 99.97 per cent helium with ${}^{3}\text{He}/{}^{4}\text{He} = 10^{4}$ . |
| ml of solvent. The procedures for<br>degassing the water and transferring    |  |
| the gas were checked for air contamin-                                       | 2. Water. No information given.  |
| ation by gas chromatography. All vol-  |  |
| umes were read on a micrometer which displaces mercury.                      |  |
| -  |  |
|  |  |
| APPARATUS/PROCEDURE:   | ESTIMATED ERROR:   |
|  | Bunsen coefficient 0.3 per cent.   |
|  |  |
|  | REFERENCES :   |
|  | 1.Douglas, E.  |
|  | J. Phys. Chem. 1964, 68, 169;  |
|  | <u>ibid</u> . 1965, <u>69</u> , 2608.  |
| 1  |  |
|  |  |
|  |  |

COMPONENTS: 1. Helium; He; 7440-59-7 2. Sea Water University Atlanta, Georgia 30322 U.S.A. January 1978

CRITICAL EVALUATION:

Evaluation of the Solubility of Helium in Sea Water.

There are three reports of the solubility of helium in sea water (1,2,3). König (1) reports helium solubility values at four temperatures which he estimates to have an uncertainty of five percent. Weiss (2,3) reports four to five helium solubility values at each of five temperatures which he estimates to have an uncertainty of one-half of one percent. The three sets of data agree within the accuracy estimates of the two authors.

Presented here are the helium Bunsen solubility values determined by Weiss in water, sea water and in two dilutions of sea water. Weiss has fitted his data by the method of least squares to an equation for the natural logarithm of the Bunsen coefficient,  $\alpha$ , which is consistent with both the integrated form of the Vant Hoff equation and the Setschenow salt effect equation. The equation, which is valid for the temperature range of 272.15 to 313.15 K and the salinity range of 0 to 40 S % reproduced Weiss' helium Bunsen values with root-mean-square deviation of 2 x 10<sup>-5</sup> at S % = 18.152. The equation is

 $\ln \alpha = - 34.6261 + 43.0285 (100/T) + 14.1391 \ln (100/T)$ 

+ S %,  $[-0.042340 + 0.022624 (T/100) - 0.0033120 (T/100)^2]$ 

Weiss gave equations for the solubility of helium from moist air at one atm total pressure in units of ml He(STP) dm<sup>-3</sup> sea water and ml He(STP) kg<sup>-1</sup> sea water which assumed that the helium behaves as an ideal gas and has a mol fraction of  $5.24 \times 10^{-6}$  (3) in dry air. The equations are

 $\ln[m1 \text{ He}(\text{STP}) \text{ dm}^{-3}] = -152.9405 + 196.8840 (100/T) + 126.8015 \ln (T/100)$ 

- 20.6767 (T/100) + S %. [-0.040543 + 0.021315 (T/100)

 $-0.0030732 (T/100)^2$ ]

and

 $\ln[\text{ml He}(\text{STP}) \text{ kg}^{-1}] = -167.2178 + 216.3442 (100/T) + 139.2032 \ln (T/100)$ 

- 22.6202 (T/100) + S % [-0.044781 + 0.023541 (T/100)

-0.0034266 (T/100)<sup>2</sup>]

Weiss' paper (2) gives extensive tables of the helium Bunsen coefficient and of the ml He(STP) from moist air  $kg^{-1}$  sea water as a function of temperature and salinity as calculated from the above equations.

In addition to the natural helium solubility in sea water, Weiss also reports the solubility of  $^{3}$ He in sea water. The  $^{3}$ He solubility data sheet follows the natural helium solubility data sheet.

1. König, H. Z. Naturforsch. 1963, 18a, 363.

2. Weiss, R. F. J. Chem. Eng. Data 1971, 16, 235.

3. Weiss, R. F. Science 1970, 168, 247.

4. Glukauf, E. <u>Proc. Roy. Soc.</u> A 1946, <u>185</u>, 98. and <u>Compendium of Meteorology</u>, American Meteorological Soc., Boston, MA 1951, <u>3</u> - 11.

| COMPONENTS  | COMPONENTS:              |                  |                             |                  | ORIGINAL MEASUREMENTS: |                             |                           |   |       |
|---|--------------------------|------------------|-----------------------------|------------------|------------------------|-----------------------------|---------------------------|---|-------|
| l. Heli   | l. Helium; He; 7440-59-7 |                  |                             | Weiss, R. F.     |                        |                             |                           |   |       |
| (   |                          |                  |                             |                  |                        |                             |                           |   |       |
| 2. Sea  | 2. Sea Water             |                  |                             |                  |                        |                             |                           |   |       |
| 4   |                          |                  | J. (                        | chem. Eng.       | Data 197               | 1, 16, 235-2                | 241.                      |   |       |
|   |                          |                  |                             |                  |                        |                             |                           |   |       |
| VARIABLES: T/K: 271.57 - 313.61   |                          |                  | PREPARED BY:                |                  |                        |                             |                           |   |       |
| He P/kPa: 101.325 (1 atm)<br>Salinity /mil <sup>-1</sup> : 0 - 36.425     |                          |                  | H.L.Clever, S.A.Johnson     |                  |                        |                             |                           |   |       |
|   |                          |                  |                             |                  |                        |                             |                           |   |       |
|   | TAL VALUES:              | 18               | Sal<br>1.152                | ini              | ty o/                  | 3.668                       | 3                         | 6.425   |       |
| T/K   | Bunsen<br>x 103          | T/K              | Bunsen<br>x 103             | Ŧ7               |                        | Bunsen<br>x 10 <sup>3</sup> | T/K                       | Bunsen<br>x 10 <sup>3</sup>                   | ]     |
| 273.75  | 9.361                    |                  | <u> </u>                    |                  | 1.57                   | 7.977                       | 273.21                    | 7.766   |       |
| 273.75  | 9.353<br>9.356           | 278.21           | 8.346                       |                  | 1.57                   | 7.978<br>7.980              | 273.21<br>273.21          | 7.736<br>7.795                                |       |
| 273.75  | 9.351                    | 278.22           | 8.387                       |                  |                        |                             | 273.22                    | 7.764   |       |
| 283.42  | 9.038                    | 278.22<br>278.22 | 8.367<br>8.360              |                  | 7.07                   | 7.746<br>7.705              | 273.23                    | 7.795   |       |
| 283.43  | 9.008                    | 278.22           | 8.371                       |                  | 7.07                   | 7.714                       | 283.72                    | 7.554   |       |
| 283.44  | 8.978<br>8.978           |                  |                             | 28               | 3.11                   | 7.610                       | 283.72<br>283.72          | 7.475<br>7.538                                |       |
| 283.44  | 9.000                    |                  |                             | 28               | 3.11                   | 7.637                       | 283.72                    | 7.471   |       |
| 293.23  | 8.734                    |                  |                             | 28               | 3.11                   | 7.642                       | 283.73                    | 7.462   |       |
| 293.25  | 8.716                    |                  |                             |                  | 3.40                   |                             | 293.27                    | 7.464   |       |
| 293.26  | 8.752<br>8.700           | 298.29           | 8.018                       | -                | 3.40<br>3.40           | 7.511<br>7.537              | 293.29<br>293.29          | 7.409<br>7.402                                |       |
| 293.26  | 8.746<br>8.695           | 298.29<br>298.29 | 8.034<br>8.033              | 20               | 8.26                   | 7.453                       | 293.30                    | 7.405   | Í     |
|   | 0.095                    | 298.29           | 8.037                       |                  | 8.26                   | 7.433                       | 303.28                    | 7.402   |       |
| 303.37  | 8.602<br>8.612           |                  |                             | 29               | 8.26                   | 7.503                       | 303.29<br>303.29          | 7.457<br>7.407                                | }     |
| 303.39  | 8.635                    |                  |                             |                  | 3.50                   |                             | 303.30                    | 7.431   | }     |
| 303.39<br>303.39  | 8.601<br>8.607           |                  |                             |                  | 3.50                   | 7.532<br>7.496              | 303.30                    | 7.435   |       |
| 303.40  | 8.612                    |                  |                             | 50               | 5.50                   | /1150                       | 313.61                    | 7.487   |       |
| 303.41  | 8.639                    |                  |                             | 31               | 3.31                   | 7.646                       | 313.61<br>313.61          | 7.488<br>7.471                                | ĺ     |
| 313.29<br>313.29  | 8.667                    |                  |                             | 31               | 3.31                   | 7.637                       | 313.61                    | 7.501   | ]     |
| 313.29  | 8.705                    |                  | AUXILI                      |                  |                        |                             |                           | <u>, , , , , , , , , , , , , , , , , , , </u> |       |
| 313.30  | 8.729                    |                  |                             |                  |                        |                             |                           |   | {     |
| the Sch   | Solubility<br>Slander mi | v determin       | ations by                   | 7                | SOURC                  |                             | Y OF MATERI.<br>Air Reduc | ALS:<br>tion. Specif                          | Fed   |
| nique as  | s used by                | Douglas (        | (1), with                   | •                | 1 - •                  | > 99.99 %                   | pure. G                   | as chromato-                                  | -     |
| minor mo  | odificatio               | on.              |                             |                  | l I                    | graphic c<br>air.           | hecks show                | wed ≥ 0.01 %                                  | 5     |
|   |                          |                  |                             |                  |                        |                             |                           |   | .     |
|   |                          |                  |                             |                  | 2.                     |                             |                           | through 0.45<br>nd poisoned                   | , µ   |
| 1   |                          |                  |                             |                  | l                      | with 1 mg                   | /l of HgC                 | 12.   |       |
|   |                          |                  |                             |                  | Į                      |                             |                           |   |       |
|   |                          |                  |                             |                  | Į                      |                             |                           |   |       |
|   |                          |                  |                             | ESTIMATED ERROR: |                        |                             |                           |   |       |
| APPARATUS/PROCEDURE: An equilibrium<br>chamber, containing pure gas satu- |                          |                  | $\delta T/K = 0.01^{\circ}$ |                  |                        |                             |                           |   |       |
| rated wi  | ith water                | vapor, is        | s separate                  | ed               |                        |                             | δsalinity                 | = 0.004 %                                     |       |
| by mercu  | ury from a<br>ing degass | a closed a       | side chamb                  | ber              |                        |                             |                           |   |       |
| ratus is  | s tipped o               | on its sid       | le, allowi                  | ing              | 1                      | RENCES :                    |                           |   |       |
| equilib   | l water to<br>rium chamb | o flow int       | o the solution i            | İs               | 1.                     | Douglas,<br>68, 169.        |                           | hys. <u>Chem</u> . 1                          | L964, |
| aided by  | y mechanic               | al shakir        | ng.                         |                  | ł                      |                             | 5, <u>69</u> , 26         | 08.   |       |
|   |                          |                  |                             |                  |                        |                             |                           |   |       |
|   |                          |                  |                             |                  | l                      |                             |                           |   |       |
|   |                          |                  |                             |                  | [                      |                             |                           |   |       |

| ORIGINAL MEASUREMENTS:  |  |  |
|---|--|--|
| Weiss, R.F.   |  |  |
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| Egiongo 1070 169 247-240  |  |  |
| <u>Science</u> 1970, <u>168</u> , 247-248.                                    |  |  |
| PREPARED BY:  |  |  |
| S.A.Johnson   |  |  |
|   |  |  |
|   |  |  |
| Ostwald<br>t Coefficient<br>L x 10 <sup>2</sup>                               |  |  |
|   |  |  |
| .0025 0.7773<br>.0029 0.7967  |  |  |
| .0015 0.8597  |  |  |
|   |  |  |
| of 4 or 5 measurements.   |  |  |
| ated by the compiler.   |  |  |
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| Y INFORMATION   |  |  |
| SOURCE AND PURITY OF MATERIALS;   |  |  |
| 1. Helium. Air Reduction Co.  |  |  |
| Reactor grade, better than 99,99  |  |  |
| percent He. The ratio $^{3}\text{He}/^{4}\text{He}$ was less than $10^{-6}$ . |  |  |
| 2. Sea Water. No information given.   |  |  |
| 2. Sea water. No information given.   |  |  |
|   |  |  |
|   |  |  |
|   |  |  |
| ESTIMATED ERROR:  |  |  |
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|   |  |  |
| REFERENCES:   |  |  |
| 1. Douglas, E.  |  |  |
| J. Phys. Chem. 1964, 68, 169;<br>ibid. 1965, 69, 2608.                        |  |  |
| <u>1910</u> . 1903, <u>05</u> , 2000.   |  |  |
|   |  |  |
|   |  |  |

| 1. Helium-3; He: 14762-55-1       Weiss, R.F.         2. Sea Water       Science 1970, 168, 247 - 248.         VARIABLES:       FREPARED BY:         T/K: 273.21 - 313.61       PREPARED BY:         Salinity/mil-1: 36.425       S.A.Johnson         EXPERIMENTAL VALUES:       T/K       Bunsen<br>Coefficient<br>a x 10 <sup>2</sup> 273.21       0.7655 ± 0.0012       0.7657         293.28       0.7339 ± 0.0009       0.7680         313.61       0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.       The Ostwald coefficients were calculated by the compiler.         METHOD: The Scholander microgasometric technique as adapted by Douglas (1)<br>was urad The equilibrium obamber was       SOURCE AND FURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.  |   |   |
|---|---|---|
| 2. Sea Water       Science 1970, 168, 247 - 248.         WARLARLES:<br>T/K: 273.21 - 313.61<br>P/KPa: 101.325 (1 atm)<br>Salinity/mil-1, 36.425       FREFARED BY:<br>S.A.Johnson         EXPERIMENTAL VALUES:       T/K       Bunsen<br>Coefficient<br>a × 10 <sup>2</sup> Ostwald<br>Coefficient<br>L × 10 <sup>2</sup> 273.21       0.7655 + 0.0012       O.7657<br>0.7657       Ostwald<br>Coefficient<br>L × 10 <sup>2</sup> District Coefficient<br>L × 10 <sup>2</sup> 293.28       0.7336 ± 0.0028       0.8434       The Bunsen coefficients are the mean of four measurements.         The Ostwald coefficients were calculated by the compiler.       NUMELIARY INFORMATION         METHOD: The Scholander microgasometric<br>technique as adapted by Douglas (1)<br>was used. The equilibrium chamber woo<br>field to nothe the produces for<br>degessing the water and transferring<br>the gas were checked for air contamin-<br>tation by gas chromatography. All volumes<br>placed mercury.       Summer coefficient 0.4 per cent.         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.   | COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
| Science 1970, 168, 247 - 248.           WARLARLES:           T/K: 273.21 - 313.61           PKPARED BY:           S.A.Johnson           SA.Johnson           SA.Johnson           Control of the second secon | l. Helium-3; He: 14762-55-1   | Weiss, R.F.   |
| VARIABLES:<br>T/K: 273.21 - 313.61<br>P/kPa: 101.325 (1 atm)<br>S.A.Johnson         EXPERIMENTAL VALUES:         T/K       Bunson<br>Coefficient<br>a x 10 <sup>0</sup> Ostwald<br>Coefficient<br>L x 10 <sup>0</sup> 273.21       0.7655 ± 0.0012       0.7657         233.61       0.7339 ± 0.0009       0.7657         313.61       0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.       The Ostwald coefficients were calculated by the compiler.         METHOD: The Scholander microgasometric<br>change as adapted by Douglas (1)<br>Was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>tation by gas chromotography. All volumes       1. Helium-3. Nonsanto Research.<br>Greater than 99.97 per cent heliu<br>with 3Re/4He = 104.         2. Sea Water. No information given.       2. Sea Water. No information given.         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.  | 2. Sea Water  |   |
| VARIABLES:<br>T/K: 273.21 - 313.61<br>P/kPa: 101.325 (1 atm)<br>S.A.Johnson         EXPERIMENTAL VALUES:         T/K       Bunson<br>Coefficient<br>a x 10 <sup>0</sup> Ostwald<br>Coefficient<br>L x 10 <sup>0</sup> 273.21       0.7655 ± 0.0012       0.7657         233.61       0.7339 ± 0.0009       0.7657         313.61       0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.       The Ostwald coefficients were calculated by the compiler.         METHOD: The Scholander microgasometric<br>change as adapted by Douglas (1)<br>Was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>tation by gas chromotography. All volumes       1. Helium-3. Nonsanto Research.<br>Greater than 99.97 per cent heliu<br>with 3Re/4He = 104.         2. Sea Water. No information given.       2. Sea Water. No information given.         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.  |   |   |
| T/K: 273.21 - 313.61       P/kPa: 101.325 (1 atm)         Salinity/mill': 36.425       S.A.Johnson         EXPERIMENTAL VALUES:       T/K       Bunsen         0.7657       0.7655 ± 0.0012       0.7657         233.28 0.7339 ± 0.0002       0.8434         The Bunsen coefficients are the mean of four measurements.         The Ostwald coefficients were calculated by the compiler.         METHOD: The Scholander microgasometric technique as adapted by Douglas (1)         Was end a maproximately 10         Million of solvent. The procedures for degassing the water and transforring the gas were checked for air contamination given.         AMPARATUS/PROCEDURE:         APPARATUS/PROCEDURE:         APPARATUS/PROCEDURE:  |   | <u>Science</u> 1970, <u>168</u> , 247 - 248.  |
| P/kPa: 101.325 (1 atm)<br>Salinity/mi1 <sup>-1</sup> : 36.425       S.A.Johnson         EXPERIMENTAL VALUES:  | VARIABLES:  | PREPARED BY:  |
| Salinity/mill       136.425         EXPERIMENTAL VALUES:  | ·   | S.A.Johnson   |
| T/K       Bunsen<br>Coefficient<br>a x 10 <sup>2</sup> Ostwald<br>Coefficient<br>L x 10 <sup>2</sup> 273.21       0.7655 ± 0.0012       0.7657         293.28       0.7339 ± 0.0009       0.7680         313.61       0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.         The Ostwald coefficients were calculated by the compiler.         METHOD: The Scholander microgasometric<br>technique as adapted by Douglas (1)<br>was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the 938 were checked for air contanin-<br>ation by gas chromatography. All volumes       Souwer. No information given.         2. Sea Water. No information given.       SSTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.  | P/kPa: 101.325 (1 atm)<br>Salinity/mil <sup>-1</sup> : 36.425   |   |
| Coefficient<br>a × 10 <sup>2</sup> Coefficient<br>L × 10 <sup>2</sup> 273.21       0.7655 ± 0.0012       0.7657         293.28       0.7339 ± 0.0009       0.7880         313.61       0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.         The Scholander microgasometric<br>technique as adapted by Douglas (1)<br>was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>stion by gas chromatography. All volumes       Source AND FURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.<br>Greater than 99.97 per cent heliu<br>with <sup>3</sup> He/ <sup>4</sup> He = 10 <sup>4</sup> .         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.   |   |   |
| a x 10 <sup>2</sup> L x 10 <sup>2</sup> 273.21       0.7655 ± 0.0012       0.7657         293.28       0.7339 ± 0.0009       0.7880         313.61       0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.         The Ostwald coefficients were calculated by the compiler.         AUXILIARY INFORMATION         METHOD: The Scholander microgasometric technique as adapted by Douglas (1)         METHOD: The Scholander microgasometric technique as adapted by Douglas (1)         METHOD: The Scholander microgasometric technique as adapted by Douglas (1)         METHOD: The Scholander microgasometric technique as adapted by Douglas (1)         MERITY OF MATERIALS:         SOURCE AND PURITY OF MATERIALS:         Content of the procedures for degassing the water and transferring the gas were checked for air contamination by gas chromatography. All volumes         ESTIMATED ERROR:         Bunsen coefficient 0.4 per cent.         REFERENCES:         J. Phys. Chem. 1964, <u>68</u> , 169;  |   |   |
| 273.21       0.7655 ± 0.0012       0.7657         293.28       0.7339 ± 0.0009       0.7880         313.61       0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.         The Sunsen coefficients were calculated by the compiler.         AUXILIARY INFORMATION         METHOD: The Scholander microgasometric         SOURCE AND PURITY OF MATERIALS:         technique as adapted by Douglas (1)         National approximately 10         Method colspan="2">Helium-3. Monsanto Research.         Grateer than 99.97 per cent heliu         with "He/"He = 104.         Gegassing the water and transferring         to gas chromatography. All volumes         ESTIMATED ERROR:         Were read on a micrometer which dis-         Placed mercury.         APPARATUS/PROCEDURE:         ESTIMATED ERROR:         LESTIMATED ERROR:         J. Phys. Chem. 1964, 68, 169;  | Coefficient<br>a x 10 <sup>2</sup>  |   |
| 293.28       0.7339 ± 0.0009       0.7880         313.61       0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.         The Ostwald coefficients were calculated by the compiler.         MULLIARY INFORMATION         METHOD: The Scholander microgasometric technique as adapted by Douglas (1) was used. The equilibrium chamber was enlarged to contain approximately 10 ml of solvent. The procedures for degassing the water and transferring the gas were checked for air contamination given. All volumes       SOURCE AND PURITY OF MATERIALS:         2. Sea Water. No information given.       Sea Water. No information given.         APPARATUS/PROCEDURE:  | ·   | ······································  |
| 313.61 0.7346 ± 0.0028       0.8434         The Bunsen coefficients are the mean of four measurements.         The Ostwald coefficients were calculated by the compiler.         METHOD: The Scholander microgasometric technique as adapted by Douglas (1) was used. The equilibrium chamber was enlarged to contain approximately 10 ml of solvent. The procedures for degassing the water and transferring the gas were checked for air contamination by gas chromatography. All volumes       SOURCE AND PURITY OF MATERIALS:         APPARATUS/PROCEDURE:       SOURCE AND PURITY OF MATERIALS:         APPARATUS/PROCEDURE:       ESTIMATED ERROR:         Bunsen coefficient 0.4 per cent.       REFERENCES:         I. Douglas, E. J. Phys. Chem. 1964, 68, 169;       J. Phys.   |   |   |
| AUXILIARY INFORMATION         METHOD: The Scholander microgasometric technique as adapted by Douglas (1) was used. The equilibrium chamber was enlarged to contain approximately 10 ml of solvent. The procedures for degassing the water and transferring the gas were checked for air contamination by gas chromatography. All volumes       SOURCE AND PURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.<br>Greater than 99.97 per cent heliu with <sup>3</sup> He/ <sup>4</sup> He = 10 <sup>4</sup> .         2. Sea Water. No information given.<br>ation by gas chromatography. All volumes       2. Sea Water. No information given.         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.         REFERENCES:<br>1. Douglas, E.<br>J. Phys. Chem. 1964, <u>68</u> , 169;   |   |   |
| AUXILIARY INFORMATION         METHOD: The Scholander microgasometric technique as adapted by Douglas (1) was used. The equilibrium chamber was enlarged to contain approximately 10 ml of solvent. The procedures for degassing the water and transferring the gas were checked for air contamination by gas chromatography. All volumes       SOURCE AND PURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research. Grater than 99.97 per cent heliu with <sup>3</sup> He/ <sup>4</sup> He = 10 <sup>4</sup> .         2. Sea Water. No information given. ation by gas chromatography. All volumes       2. Sea Water. No information given.         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>1. Douglas, E.<br>J. Phys. Chem. 1964, <u>68</u> , 169;  |   |   |
| AUXILIARY INFORMATION<br>METHOD: The Scholander microgasometric<br>technique as adapted by Douglas (1)<br>was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volumes<br>were read on a micrometer which dis-<br>placed mercury.<br>APPARATUS/FROCEDURE:<br>ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.<br>REFERENCES:<br>1. Douglas, E.<br>J. Phys. Chem. 1964, <u>68</u> , 169;   | The Bunsen coefficients are the mean of   | of four measurements.   |
| AUXILIARY INFORMATION<br>METHOD: The Scholander microgasometric<br>technique as adapted by Douglas (1)<br>was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volumes<br>were read on a micrometer which dis-<br>placed mercury.<br>APPARATUS/FROCEDURE:<br>ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.<br>REFERENCES:<br>1. Douglas, E.<br>J. Phys. Chem. 1964, <u>68</u> , 169;   | The Ostwald coefficients were calculat  | ed by the compiler.   |
| METHOD: The Scholander microgasometric<br>technique as adapted by Douglas (1)<br>was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volumes       SOURCE AND PURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.<br>Greater than 99.97 per cent heliu<br>with <sup>3</sup> He/ <sup>4</sup> He = 10 <sup>4</sup> .         2. Sea Water. No information given.<br>ation by gas chromatography. All volumes       Source AND PURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.<br>Greater than 99.97 per cent heliu<br>with <sup>3</sup> He/ <sup>4</sup> He = 10 <sup>4</sup> .         2. Sea Water. No information given.       Sea Water. No information given.         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.         REFERENCES:<br>1. Douglas, E.<br><u>J. Phys. Chem.</u> 1964, <u>68</u> , 169;  |   |   |
| METHOD: The Scholander microgasometric<br>technique as adapted by Douglas (1)<br>was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volumes<br>were read on a micrometer which dis-<br>placed mercury.       SOURCE AND PURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.<br>Greater than 99.97 per cent heliu<br>with <sup>3</sup> He/ <sup>4</sup> He = 10 <sup>4</sup> .         2. Sea Water. No information given.         PPARATUS/PROCEDURE:         ESTIMATED ERROR:         Bunsen coefficient 0.4 per cent.         REFERENCES:<br>1. Douglas, E.<br><u>J. Phys. Chem.</u> 1964, <u>68</u> , 169;   |   |   |
| METHOD: The Scholander microgasometric<br>technique as adapted by Douglas (1)<br>was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volumes       SOURCE AND PURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.<br>Greater than 99.97 per cent heliu<br>with <sup>3</sup> He/ <sup>4</sup> He = 10 <sup>4</sup> .         2. Sea Water. No information given.<br>ation by gas chromatography. All volumes       Source AND PURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.<br>Greater than 99.97 per cent heliu<br>with <sup>3</sup> He/ <sup>4</sup> He = 10 <sup>4</sup> .         APPARATUS/PROCEDURE:       ESTIMATED ERROR:<br>Bunsen coefficient 0.4 per cent.         REFERENCES:<br>1. Douglas, E.<br>J. Phys. Chem. 1964, <u>68</u> , 169;  |   |   |
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| the gas were checked for air contamination       2. Sea water. No information given.         ation by gas chromatography. All volumes         were read on a micrometer which displaced mercury.         APPARATUS/PROCEDURE:         ESTIMATED ERROR:         Bunsen coefficient 0.4 per cent.         REFERENCES:         1. Douglas, E.         J. Phys. Chem. 1964, 68, 169;  | technique as adapted by Douglas (1)   | SOURCE AND PURITY OF MATERIALS:   |
| APPARATUS/PROCEDURE:<br>Bunsen coefficient 0.4 per cent.<br>REFERENCES:<br>1. Douglas, E.<br>J. Phys. Chem. 1964, <u>68</u> , 169;  | was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for  | SOURCE AND PURITY OF MATERIALS:<br>1. Helium-3. Monsanto Research.<br>Greater than 99.97 per cent helium  |
| APPARATUS/PROCEDURE:<br>Bunsen coefficient 0.4 per cent.<br>REFERENCES:<br>1. Douglas, E.<br>J. Phys. Chem. 1964, <u>68</u> , 169;  | was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volum<br>were read on a micrometer which dis-                    | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium-3. Monsanto Research. Greater than 99.97 per cent helium with <sup>3</sup>He/<sup>4</sup>He = 10<sup>4</sup>. 2. Sea Water. No information given.</pre>  |
| REFERENCES:<br>1. Douglas, E.<br>J. Phys. Chem. 1964, <u>68</u> , 169;  | was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volum<br>were read on a micrometer which dis-                    | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium-3. Monsanto Research. Greater than 99.97 per cent helium with <sup>3</sup>He/<sup>4</sup>He = 10<sup>4</sup>. 2. Sea Water. No information given. hes</pre>  |
| <pre>1. Douglas, E.<br/>J. Phys. Chem. 1964, 68, 169;</pre>   | was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volum<br>were read on a micrometer which dis-<br>placed mercury. | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium-3. Monsanto Research. Greater than 99.97 per cent helium with <sup>3</sup>He/<sup>4</sup>He = 10<sup>4</sup>. 2. Sea Water. No information given. es ESTIMATED ERROR:</pre>  |
| <pre>1. Douglas, E.<br/>J. Phys. Chem. 1964, 68, 169;</pre>   | was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volum<br>were read on a micrometer which dis-<br>placed mercury. | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium-3. Monsanto Research. Greater than 99.97 per cent helium with <sup>3</sup>He/<sup>4</sup>He = 10<sup>4</sup>. 2. Sea Water. No information given. es ESTIMATED ERROR:</pre>  |
|   | was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volum<br>were read on a micrometer which dis-<br>placed mercury. | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium-3. Monsanto Research. Greater than 99.97 per cent helium with <sup>3</sup>He/<sup>4</sup>He = 10<sup>4</sup>. 2. Sea Water. No information given. es ESTIMATED ERROR:</pre>  |
|   | was used. The equilibrium chamber was<br>enlarged to contain approximately 10<br>ml of solvent. The procedures for<br>degassing the water and transferring<br>the gas were checked for air contamin-<br>ation by gas chromatography. All volum<br>were read on a micrometer which dis-<br>placed mercury. | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium-3. Monsanto Research. Greater than 99.97 per cent helium with <sup>3</sup>He/<sup>4</sup>He = 10<sup>4</sup>. 2. Sea Water. No information given. es ESTIMATED ERROR: Bunsen coefficient 0.4 per cent. REFERENCES: 1. Douglas, E. J. Phys. Chem. 1964, <u>68</u>, 169;</pre> |

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| COMPONENTS:                           | EVALUATOR:                            |
|---------------------------------------|---------------------------------------|
| l. Helium; He; 7440-59-7              | H. L. Clever<br>Chemistry Department  |
| 2. Water; H <sub>2</sub> O; 7732-18-5 | Emory University<br>Atlanta, GA 30322 |
| 3. Electrolyte                        | USA                                   |
|                                       | February 1978                         |

CRITICAL EVALUATION: The Solubility of Helium in Electrolyte Solutions.

TABLE 1. The salt effect parameter, k<sub>sX</sub>, for helium dissolved in various elctrolyte solutions.

| Solvent  | т/к                                  |                     | $k_{sX} = (1/m) 1$  | og (X <sup>O</sup> /X) |  |
|--|--------------------------------------|---------------------|---|------------------------|--|
| System   |                                      | Akerlof<br>1935 (3) | Morrison, Clever,<br>Johnstone Reddy<br>1955 (4) 1964 (7) |                        | Shoor,<br>Walker,<br>Gubbins<br>1969 (5)   |
| кон + н <sub>2</sub> о   | 298.15<br>313.15<br>333.15<br>353.15 |                     |   |                        | 0.15 <sup>a</sup><br>0.15 <sup>a</sup><br>0.15 <sup>a</sup><br>0.15 <sup>a</sup> |
| $HC1 + H_2O$   | 298.15                               |                     | 0.023   |                        |  |
| $HC10_4 + H_20$  | 298.15                               | -0.034              |   |                        |  |
| $HNO_3 + H_2O$   | 298.15                               |                     | 0.002   |                        |  |
| $LiCl + H_2O$<br>$LiI + H_2O$  | 298.15<br>298.15                     | -0.017<br>-0.028    | 0.065   |                        |  |
| $NaC1 + H_2O$  | 298.15                               | 0.067               | 0.096   |                        |  |
| NaBr + $H_2O$  | 298.15<br>298.15                     | 0.069               | 0.102<br>0.083  |                        |  |
| $KC1 + H_2O$<br>$KI + H_2O$  | 298.15                               | 0.009               | 0.098   |                        |  |
| $NaNO_3 + H_2O$<br>$Na_2SO_4 + H_2O$   | 298.15<br>298.15                     | 0.064               | 0.141   |                        |  |
| $BaCl_2 + H_2O$  | 298.15                               |                     | 0.109   |                        |  |
| $MH_4Cl + H_2O$<br>(CH <sub>3</sub> ) <sub>4</sub> NI + H <sub>2</sub> O<br>(C <sub>2</sub> H <sub>5</sub> ) <sub>4</sub> NBr + H <sub>2</sub> |                                      |                     | 0.042<br>0.014<br>-0.009                                  |                        |  |
| $(C_{4}H_{9})_{4}NBr + H_{2}$  | 0298.15<br>308.15                    |                     |   | -0.017<br>-0.033       |  |
| NaI + CH <sub>3</sub> OH   | 303.15                               |                     | 0.116   |                        |  |

a These values are  $(1/C) \log (X^O/X)$ , but for KOH solutions near unit molarity the molar and molal values differ by only about one percent. The values for KOH + H<sub>2</sub>O are a factor of 10 greater than reported in the original paper which appears to contain a decimal error.

There are four reports (3,4,5,6) of the solubility of helium at 1 atm in aqueous salt solutions, and there is one report (7) of the solubility of helium at 1 atm in a methanol and salt solution.

The results are summarized below as the Setschenow salt effect parameter,  $K_{SX} = (1/m) \log (X^{\circ}/X)$  where m is the salt molality and  $X^{\circ}/X$  is the mole fraction ratio of the helium solubility in the pure solvent,  $X^{\circ}$ , to the helium solubility in the salt solution, X. This form of the salt effect parameter has come into use in the past several years as a result of the theoretical developments based on scaled particle theory (1,2).

Actually the theory defines the salt effect parameter as  $k_s = (1/C)\log(X^{\circ}/X)$  in the limit C+O, where C is the electrolyte concentration in moles dm<sup>-3</sup>. In the limit of infinite dilution  $k_{sc}$  and  $k_{sx}$  should go to the same value in aqueous solutions. Much of the literature's salt effect data are in the form of an S°/S ratio where S° is the gas volume (STP) dissolved

EVALUATOR:

USA

H. L. Clever

Chemistry Department

Emory University Atlanta, GA 30322

COMPONENTS:

1. Helium; He; 7440-59-7

2. Water; H<sub>2</sub>O; 7732-18-5

3. Electrolyte

CRITICAL EVALUATION:

in 1.000 kg of pure solvent, and S is the gas volume (STP) dissolved in the salt solution containing 1.000 kg of solvent.

The relationship between the X°/X and S°/S ratios is

$$X^{\circ}/X = \frac{S^{\circ}/V_{m}}{1000/M} / \frac{S/V_{m}}{(1000/M) + m_{M}^{+} + m_{n}^{-}}$$

where V<sub>m</sub> is the molar volume of the gas at 273.15 K and 101.325 kPa (1 atm), and M is the solvent molecular weight, and  $m_{M+}$  and  $m_{A-}$  are the molalities of the salt cation and anion, respectively.

For a one molal solution of a 1 - 1 electrolytes dissolved in water

 $X^{\circ}/X = 57.50 S^{\circ}/55.50 S$ 

and  $k_{sy} = (1/1)\log(X^{\circ}/X) = \log(S^{\circ}/S) + \log(57.50/55.50) = \log S^{\circ}/S + 0.015$ 

The salt effect parameters, k<sub>sx</sub>, are summarized in Table 1.

Akerlof's (3) tabulation of values appears to contain several errors. Akerlof reports a helium in water Bunsen coefficient of 0.0086 which he compares with Lannung's earlier value of 0.0087. Akerlof appears to have used the Lannung value in his calculation of the salt effect parameters. We have recalculated the values using Akerlof's value for helium in water. In addition Akerlof's values of  $k_s$  for helium in aqueous LiCl and aqueous LiI are not consistent with the salt molalities and helium solubilities reported in the paper. They have been recalculated using the molalities and solubilities in the paper.

Both the Morrison and Johnstone (4) and the Akerlof (3) salt effect parameters are based on only two solubility measurements, the solubility of helium in pure water and the solubility of helium in one salt solution. Morrison and Johnstone used a salt concentration near 1 g. equivalent  $Kg^{-1}$ H<sub>2</sub>O and estimate an uncertainty of 0.010 in k<sub>s</sub>. Akerlof used much higher salt concentrations. Both Akerlof (3) and Morrison and Johnstone (4) report salt effect parameters for helium in LiCl, NaCl, and KCl solutions.

The  $k_{SX}$  values of the two laboratories do not agree within the expected experimental error for the three salt solutions. The  $k_{SX}$  values for aqueous LiCl even differ in sign. The difference in values may reflect a concentration effect on  $k_{SX}$  but more experimental work is needed to confirm such an effect. At present we recommend the Morrison and Johnstone values as the more probable values, especially for comparison with theories that apply in the limit of infinite dilution.

Both Shoor, Walker and Gubbins (5) and Feillolay and Lucas (6) carried out their studies as a function of both temperature and salt concentration. Both of their data sets appear to be internally consistent, and are recommended as tentative values. Feillolay and Lucas (6) have theoretical reasons to suggest the  $k_s$  values go through a maximum at a salt concentration some place between 1 and 2 molal. Their experimental data appear to show the predicted trend at two temperatures, but more studies of this point are needed to make a convincing case. In Table 1 we have recorded only the average  $k_{SX}$  value, but Feillolay and Lucas' complete set of data are given on the data page for their paper.

The  $k_{sx}$  value for helium dissolved in NaI and CH<sub>3</sub>OH based on the report of Clever and Reddy (7) appears to fall within the same numerical range expected for helium in NaI and H<sub>2</sub>O. The value contains uncertainties because of assumptions about the solution vapor pressure and the validity of Henry's law in the system.

COMPONENTS: EVALUATOR: Helium; He; 7440-59-7 H. L. Clever 1. Chemistry Department 2. Water; H<sub>2</sub>O; 7732-18-5 Emory University Atlanta, Georgia 30322 USA 3. Electrolyte CRITICAL EVALUATION: Shoor, S. K.; Gubbins, K. E. J. Phys. Chem. 1969, 73, 498. Masterton, W. L.; Lee, T. P. J. Phys. Chem. 1970, 74, 1776. Akerlof, G. J. Am. Chem. Soc. 1935, 57, 1196. Morrison, T. S.; Johnstone, N. B. B. J. Chem. Soc. 1955, 3655. Shoor, S. K.; Walker, R. D., Jr.; Gubbins, K. E. J. Phys. Chem 1. 2. з. 4. 5. J. Phys. Chem. 1969, 73, 312. Feillolay, A.; Lucas, M. J. Phys. Chem. 1972, 76, 3068. Clever, H. L.; Reddy, G. S. J. Chem. Eng. Data 1963, 8, 191. 6. 7. ADDED NOTE. Mishnina, Avdeeva, and Bozhovskaya (8) give a table of smoothed values of Bunsen coefficients for helium dissolved in aqueous sodium chloride solutions. The table was prepared from the water solubility data of Morrison and Johnstone (9) and the helium solubility in sodium chloride solution of Cherepennikov (10). The Cherepennikov paper was not available to the Evaluator, and the Setschenow parameters were not included in the evaluation. However, a data sheet is included which shows the smoothed Bunsen coefficients from 278.15 - 318.15 K and NaCl concentrations from 0 - 5.4 g eq dm<sup>-3</sup>, and the Setschenow parameters at five degree intervals over the 40 degree range as quoted by Mishnina, Avdeeva, and Bozhovskaya (8). 8. Mishnina, T.A.; Avdeeva, O.I.; Bozhovskaya, T.K. Materialy Vses. Nauchn. Issled. <u>Geol. Inst.</u> 1961, <u>46</u>, 93. 9. Morrison, T.J.; Johnstone, N.B. J. Chem. Soc. 1954, 3441. 10. Cherepennikov, A. A. Coll. Reports of the Sci. Conf. 1958, LICI, L.

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |  |  |  |
|---|--|--|--|--|
| 1. Helium; He; 7440-59-7  | Morrison, T.J.; Johnstone, N.B.B.  |  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   | T Cham Car JOFF Sere Sere  |  |  |  |
| 3. Acids  | <u>J</u> . <u>Chem</u> . <u>Soc.</u> 1955, 3655-3659.                            |  |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |  |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)   | T.D.Kittredge, H.L.Clever  |  |  |  |
| EXPERIMENTAL VALUES:  |  |  |  |  |
| T/K $k_s = (1/m) \log (s^{o}/s) k_{sX}$   | = $(1/m) \log (X^{O}/X)$   |  |  |  |
| Hydrochloric acid; HCl; 7647-01-0   |  |  |  |  |
| 298.15 0.008  | 0.023  |  |  |  |
| Nitric acid; HNO <sub>3</sub> ; 7697-37-2   |  |  |  |  |
| 298.15 -0.013   | +0.002   |  |  |  |
| The values of the Setschenow salt effect parameters, $k_s$ , were apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S <sup>O</sup> , and the solubility of helium in a near one equivalent of acid per 1.000 kg of water solution, S. Neither solubility value is given in the paper. The S <sup>O</sup> /S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter $k_{sX}$ from the mole fraction solubility ratio X <sup>O</sup> /X. The acids were assumed to be 100 per cent ionized and both cation and anion were used in the mole fraction calculation. |  |  |  |  |
| AUXILIARY   | INFORMATION  |  |  |  |
| ME THOD:  | SOURCE AND PURITY OF MATERIALS:  |  |  |  |
| Gas absorption in a flow system.  | 1. Helium. British Oxygen Co. Ltd.   |  |  |  |
| Sas apportant in a riow system.   |  |  |  |  |
|   | 2. Water. No information given.  |  |  |  |
|   | 3. Acids. No information given.  |  |  |  |
|   |  |  |  |  |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:<br>$\mathbf{S} \mathbf{k}_{e} = 0.010$                          |  |  |  |
| The previously degassed solvent flows<br>in a thin film down an absorption  |  |  |  |  |
| spiral containing helium gas plus   |  |  |  |  |
| solvent vapor at a total pressure of<br>l atm. The volume of gas absorbed is<br>measured in attached calibrated<br>burets (1).  | REFERENCES:<br>1. Morrison, T.J.;Billett, F.<br><u>J. Chem. Soc.</u> 1952, 3819. |  |  |  |
|   |  |  |  |  |
|   |  |  |  |  |

| COMPONENTS:  |   |                                     | ORIGINAL MEASUREMEN             | TS:  |
|--|---|-------------------------------------|---------------------------------|--|
|  |   | Akerlof, G.                         |                                 |  |
|  | ; He; 7440-59-7   |                                     |                                 |  |
| 2. Water;  | H <sub>2</sub> O; 7732-18-5   |                                     | J. Am. Chem. So                 | c. 1935, <u>57</u> ,1196-1201.                                 |
| 3. Perchlo   | oric Acid; HClO <sub>4</sub> ; 7601-9   | 90-3                                |                                 | ,,   |
| VARIABLES:   |   |                                     | PREPARED BY:                    |  |
|  | /K: 298.15<br>Pa: 101.325 (1 atm)   | 1                                   | T.D.Kit                         | tredge, H.L.Clever   |
| EXPERIMENTAL   | VALUES:   |                                     |                                 |  |
| т/к  | He Solubility mol a<br>dm <sup>3</sup> (STP) 1.000 b  | acid                                | k=                              | k <sub>sX</sub> =  |
|  | dm <sup>3</sup> (STP) 1.000 }<br>1.000 kg H <sub>2</sub> O  | cg H <sub>2</sub> O                 | (1/m) log (S <sup>O</sup> /     | S) (1/m)log(X <sup>O</sup> /X)                                 |
| <u> </u>   | - 2   |                                     |                                 |  |
| 298.15   | 0.0086 0.0<br>0.0187 6.89   | 9                                   | -0.049                          | -0.034   |
| solution   | r is not clear as to wh<br>is for 1.000 kg of H <sub>2</sub> O<br>arameter, k <sub>SX</sub> , was cafc<br>olubility was for salt a                              | or fo                               | or 1.000 kg of so               | lution. The salt   |
|  |   |                                     |                                 |  |
|  |   |                                     |                                 |  |
|  |   |                                     |                                 |  |
|  |   |                                     |                                 |  |
| ·····  | AUX   | LIARY                               | INFORMATION                     |  |
| METHOD: C  |   |                                     | SOURCE AND PURITY O             | F MATERIALS.   |
| presatura<br>solvent<br>mined by<br>the solve<br>displaces | absorption. The helium<br>ated with water vapor, a<br>salt concentration was o<br>a density measurement,<br>ent volume was measured<br>ment of an equivalent vo | the<br>deter-<br>and<br>by<br>olume | 1. Helium. Sour<br>stated to be | ce not given. Gas<br>98 per cent He with<br>ity present in the |
|  | ry. The gas-liquid inter<br>ly stirred for two hours  |                                     | 2. Water. No in                 | formation given.   |
| although   | equilibrium appeared to<br>hed within a matter of n   | o be                                | 3. Perchloric a                 | cid. No information.   |
|  |   |                                     |                                 |  |
| APPARATUS/PI   | ROCEDURE:   |                                     | ESTIMATED ERROR:                | K = 0.01   |
|  |   |                                     | 01/                             | K = 0.01   |
|  |   |                                     | REFERENCES :                    |  |
|  |   |                                     |                                 |  |
|  |   |                                     |                                 |  |
|  |   | I                                   |                                 |  |
|  |   |                                     |                                 |  |
|  |   |                                     |                                 |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| our onenis.   | Morrison, T.J.; Johnstone, N.B.B.  |
| l. Helium; He; 7440-59-7  | Morrison, 1.0., Jonnstone, N.B.B.  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |  |
| 3. Ammonium Type Salts  | <u>J. Chem. Soc</u> . 1955, 3655 - 3659.   |
| VARIABLES:  | PREPARED BY:   |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)   | T.D.Kittredge, H.L.Clever  |
|   | I.D.AICHEdge, A.H.CIEVEL   |
| EXPERIMENTAL VALUES:  |  |
| T/K $k_s = (1/m) \log (S^0/S) k_s$  | $x = (1/m) \log (x^{o}/x)$   |
| Ammonium chloride ; NH <sub>4</sub> Cl; 12125-  | -02-9  |
| 298.15 0.027  | 0.042  |
| N, N, N-Trimethyl methanaminium :<br>C <sub>4</sub> H <sub>l2</sub> NI; 75-58-1   | iodide (Tetramethyl ammonium iodide);  |
| 298.15 -0.001   | +0.014   |
| N, N, N-Triethyl ethanaminium bro<br>C <sub>8</sub> H <sub>20</sub> NBr; 71-91-0  | omide (Tetraethyl ammonium bromide);   |
| 298.15 -0.024   | -0.009   |
| containing 1.000 kg of water. The c<br>parameter k <sub>SX</sub> from the mole fraction<br>were assumed to be 100 per cent ion<br>together in the mole fraction calcu | n solubility ratio X <sup>0</sup> /X. The salts<br>ized and cation and anion were summed |
| AUXILIARY   | INFORMATION  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS;  |
| Gas absorption in a flow system.  | 1. Helium. British Oxygen Co. Ltd.   |
|   | 2. Water. No information given.  |
|   | 3. Salts. No information given.  |
|   |  |
|   |  |
|   |  |
|   |  |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:<br>$\delta k_5 = 0.010$   |
| The previously degassed solvent flo   | ~  |
| in a thin film down an absorption spiral containing helium gas plus   |  |
| solvent vapor at a total pressure<br>of 1 atm. The volume of the gas  | REFERENCES:<br>1.Morrison, T.J.; Billett, F.   |
| absorbed is measured in attached  | J. Chem. Soc. 1952, 3819.  |
| calibrated burets.(1).  |  |
|   |  |
|   |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |  |
|---|--|--|
| 1. Helium; He; 7440-59-7  |  |  |
| <ol> <li>Refium; Re; 7440-59-7</li> <li>Water; H<sub>2</sub>O; 7732-18-5</li> </ol>   | Feillolay, A.;Lucas, M.  |  |
| 2. water, h <sub>2</sub> O, 7732-18-5 3. N,N,N-Tributy1-1-butanaminium Brom-<br>ide (Tetrabuty1 Ammonium Bromide);<br>C <sub>16</sub> H <sub>36</sub> NBr 1643-19-2   | <u>J. Phys</u> . <u>Chem</u> .1972, <u>76</u> , 3068 - 3072.   |  |
| VARIABLES:  | PREPARED BY:   |  |
| T/K: 298.15 - 308.15<br>Salt/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 4   | P.L.Long, H.L.Clever   |  |
| EXPERIMENTAL VALUES: Solubility<br>T/K ml He (STP) kg <sup>-1</sup> H <sub>2</sub> O  | Salt $k_s = (1/m) \log(s^{\circ}/s)$<br>mole kg <sup>-1</sup> H <sub>2</sub> O   |  |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  |  |
|   | INFORMATION  |  |
| METHOD:   | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. 1'Air Liquide. Stated to<br/>be of 99.99 per cent purity.</li> <li>2. Water. No information given.</li> <li>3. N,N,N-Tributy1-1-butanaminium<br/>bromide. Southwestern Analytical<br/>Chemical. Polarographic grade,<br/>used as received.</li> </ul> |  |
| APPARATUS/PROCEDURE: The apparatus is<br>modeled after the apparatus used by<br>Hung (1). The procedure was the same<br>as that used by Hung except that the<br>time allowed for equilibration is<br>longer. In the present work the gas-<br>liquid equilibration required about<br>16 hours. | ESTIMATED ERROR:<br>6 S/S = 0.005<br>REFERENCES:<br>1. Hung, J.H. 1968, Ph.D. thesis,<br>Clark University, Worcester, MA.  |  |

| COMPONENTS:  |  |
|--|--|
|  | ORIGINAL MEASUREMENTS:<br>Morrison, T.J.; Johnstone, N.B.B.  |
| l. Helium; He; 7440-59-7   | Notifison, 1.5., boundedne, N.B.B.   |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |
| 3. Barium Chloride; BaCl <sub>2</sub> ; 10361-37-2   | J. Chem. Soc. 1955, 3655 - 3659.   |
|  |  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)  | T.D.Kittredge, H.L.Clever  |
|  |  |
| EXPERIMENTAL VALUES:   |  |
| $T/K$ $k_s =$  | k <sub>sX</sub> =  |
| (1/m) log (S <sup>O</sup> /S   | $(1/m) \log (X^{O}/X)$   |
| 298.15 0.086   | 0.109  |
| The value of the Setschenow salt effe  | ct parameter, k <sub>a</sub> , was apparently  |
| determined from only two solubility m  | easurements. They were the solubility  |
| of helium in pure water, S <sup>O</sup> , and the<br>equivalent of salt per kg of water so   | solubility of helium in a near one<br>lution, S. The S <sup>o</sup> /S ratio was referenced  |
| to a solution containing 1.000 kg of   | water. The compiler calculated the salt  |
| effect parameter, k <sub>sX</sub> .  |  |
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| AUXILIARY  |  |
| METHOD:  | INFORMATION  |
|  | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:   |
|  |  |
| Gas absorption in a flow system.   | SOURCE AND PURITY OF MATERIALS:  |
|  | SOURCE AND PURITY OF MATERIALS;<br>1. Helium. British Oxygen Co. Ltd.<br>2. Water. No information given.<br>3. Barium chloride. No information   |
|  | SOURCE AND PURITY OF MATERIALS;<br>1. Helium. British Oxygen Co. Ltd.<br>2. Water. No information given.   |
|  | SOURCE AND PURITY OF MATERIALS;<br>1. Helium. British Oxygen Co. Ltd.<br>2. Water. No information given.<br>3. Barium chloride. No information   |
|  | SOURCE AND PURITY OF MATERIALS;<br>1. Helium. British Oxygen Co. Ltd.<br>2. Water. No information given.<br>3. Barium chloride. No information   |
|  | SOURCE AND PURITY OF MATERIALS;<br>1. Helium. British Oxygen Co. Ltd.<br>2. Water. No information given.<br>3. Barium chloride. No information   |
| Gas absorption in a flow system.   | SOURCE AND PURITY OF MATERIALS;<br>1. Helium. British Oxygen Co. Ltd.<br>2. Water. No information given.<br>3. Barium chloride. No information   |
|  | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium. British Oxygen Co. Ltd. 2. Water. No information given. 3. Barium chloride. No information given. ESTIMATED ERROR:</pre>   |
| Gas absorption in a flow system.<br>APPARATUS/PROCEDURE:<br>The previously decassed solvent flows  | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium. British Oxygen Co. Ltd. 2. Water. No information given. 3. Barium chloride. No information given. ESTIMATED ERROR:</pre>   |
| Gas absorption in a flow system.<br>APPARATUS/PROCEDURE:<br>The previously degassed solvent flows<br>in a thin film down an absorption<br>spiral containing helium gas plus  | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. British Oxygen Co. Ltd.<br>2. Water. No information given.<br>3. Barium chloride. No information given.<br>ESTIMATED ERROR:<br>$\delta k_s = 0.010$                |
| Gas absorption in a flow system.<br>APPARATUS/PROCEDURE:<br>The previously degassed solvent flows<br>in a thin film down an absorption<br>spiral containing helium gas plus<br>solvent vapor at a total pressure of  | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium. British Oxygen Co. Ltd. 2. Water. No information given. 3. Barium chloride. No information given. ESTIMATED ERROR:</pre>   |
| Gas absorption in a flow system.<br>APPARATUS/PROCEDURE:<br>The previously degassed solvent flows<br>in a thin film down an absorption<br>spiral containing helium gas plus<br>solvent vapor at a total pressure of<br>1 atm. The volume of gas absorbed is<br>measured in attached calibrated | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium. British Oxygen Co. Ltd. 2. Water. No information given. 3. Barium chloride. No information given. ESTIMATED ERROR:</pre>   |
| Gas absorption in a flow system.<br>APPARATUS/PROCEDURE:<br>The previously degassed solvent flows<br>in a thin film down an absorption<br>spiral containing helium gas plus<br>solvent vapor at a total pressure of<br>l atm. The volume of gas absorbed is                                    | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. British Oxygen Co. Ltd.<br>2. Water. No information given.<br>3. Barium chloride. No information given.<br>ESTIMATED ERROR:<br>$\delta k_s = 0.010$<br>REFERENCES: |
| Gas absorption in a flow system.<br>APPARATUS/PROCEDURE:<br>The previously degassed solvent flows<br>in a thin film down an absorption<br>spiral containing helium gas plus<br>solvent vapor at a total pressure of<br>1 atm. The volume of gas absorbed is<br>measured in attached calibrated | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium. British Oxygen Co. Ltd. 2. Water. No information given. 3. Barium chloride. No information given. ESTIMATED ERROR:</pre>   |

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| COMPONENTS:  |  | ORIGINAL MEASUREMENTS:                     |  |  |                                    |
|--|--|--|--|--|------------------------------------|
| 1. Helium; He; 7440-59-7   |  | Shoor, S.K.;Walker, R.D.;<br>Gubbins, K.E. |  |  |                                    |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  | 0000-1107                                  |  |  |                                    |
|  | 2  | 1010 50                                    |  |  |                                    |
| 3. Potas<br>-3   | sium Hydroxide; KOH;                         | 1310-58                                    | J. Phys.   | <u>Chem</u> . 1969,  | <u>73</u> , 312 - 317.             |
| VARIABLES:   | т/к: 298.15 - 353.15                         |  | PREPARED BY:   | P.L.Long, H  | .L.Clever                          |
| KOH/mol dm <sup>-3</sup> : 0 - 7.60  |  |  |  |  |                                    |
| EXPERIMENT   | AL VALUES:                                   |  |  | ·····  |                                    |
| т/к  | Helium Solubility<br>Mol Fraction x 106      | Solubilit<br>Ratio X <sup>O</sup> /        | y Potassiu<br>/X Wt %  | m Hydroxide<br>mol dm <sup>-3</sup>  | $k_{s} = \frac{\log (x^{o}/x)}{C}$ |
| 298.15   | 6.7  | 1.00<br>1.39<br>1.75<br>3.57<br>13.1       | 0.00<br>5.00<br>9.00<br>19.00<br>32.40                                       | 0.00<br>0.92<br>1.70<br>3.99<br>7.60   | 0.155<br>0.143<br>0.139<br>0.147   |
| 313.15   | 6.7  | 1.00<br>1.36<br>1.73<br>3.71<br>12.7       | 5.00<br>9.00   | 0.00<br>0.92<br>1.70<br>3.99<br>7.60   | 0.145<br>0.140<br>0.142<br>0.145   |
| 333.15   | 7.2  | 1.00<br>1.39<br>1.96<br>3.59<br>13.0       | 0.00<br>5.00<br>9.00<br>19.00<br>32.40                                       | 0.00<br>0.92<br>1.70<br>3.99<br>7.60   | 0.155<br>0.172<br>0.139<br>0.147   |
| 353.15   | 8.0  | 1.00<br>1.44<br>1.89<br>3.77<br>13.7       | 0.00<br>5.00<br>9.00<br>19.00<br>32.40                                       | 0.00<br>0.92<br>1.70<br>3.99<br>7.60   | 0.172<br>0.163<br>0.144<br>0.150   |
| The k <sub>s</sub> v<br>of 10 er   | alues were calculate<br>Fror in the original | d by the c<br>paper. The                   | compiler. T<br>KOH molar   | here appears<br>ities are at   | to be a factor<br>298.15 K.        |
|  |  | AUXILIARY                                  | INFORMATION  |  |                                    |
| METHOD:<br>Ga  | METHOD:<br>Gas chromatograph (1).            |  |  | PURITY OF MATER<br>Source not<br>99.99 per c                                     | given. Minimum                     |
|  |  |  | <ol> <li>Water. Distilled and degassed in<br/>glass-teflon still.</li> </ol> |  |                                    |
|  |  | yzed r<br>a maxin                          | eagent grade   | e. Baker Anal-<br>which contained<br>2 <sup>CO</sup> 3. KOH solu-<br>om atm CO2. |                                    |
| APPARATUS  | APPARATUS/PROCEDURE:                         |  | ESTIMATED E  | RROR:<br><sub>\$T/K</sub> =  | 0.05                               |
| Gas chromatographic analysis, thermal<br>conductivity detector, nitrogen<br>carrier gas. The helium saturated<br>solutions were prepared by bubbling<br>the gas through presaturators and<br>then through the KOH solution. Samp-<br>les were withdrawn from the solution<br>over a period of 48 hours to deter-<br>mine equilibrium. Samples transfered<br>from saturator to gas chromatograph<br>in gas-tight Hamilton syringes. |  |  | K.E.; Carden   | , S.N.; Walker,<br><u>og</u> . 1965, <u>3</u> , 98.                              |                                    |

| COMPONENTS :                 |  |                                       | ORIGINAL MEASUREMENTS:                                     |                                 |
|------------------------------|--|---------------------------------------|--|---------------------------------|
|                              |  |                                       | Akerlof, G.  |                                 |
| l. Helium;                   | He; 7440-59-7  |                                       |  |                                 |
| 2. Water; H                  | 20; 7732-18-5  |                                       | J Am. Chem. Soc.   | 1935, <u>57</u> , 1196-1201     |
| 3. Alkali                    | Halides  |                                       | <u><u><u></u></u>. <u>Al</u>. <u>Olem</u>. <u>Doc</u>.</u> | 1999, <u>97</u> , 1190 1201     |
| VARIABLES:                   |  |                                       | PREPARED BY:   |                                 |
| T/K<br>P/kPa                 | : 298.15<br>: 101.325 (1   | atm)                                  | T.D.Kitt   | redge, H.L.Clever               |
| EXPERIMENTAL V               |  | ·····                                 |  |                                 |
| Т/К Н<br>d<br>1              | le solubility<br>m <sup>3</sup> (STP)<br>.000 kg H <sub>2</sub> 0  | mol salt<br>1.000 kg H <sub>2</sub> ( | $(1/m) \log (S^{O}/S)$ $= k_{S}$                           | $(1/m) \log (X^{O}/X) = k_{SX}$ |
| Lithium                      | Chloride; LiCl   | ; 7447-41-8                           |  |                                 |
| 298.15                       | 0.0086<br>0.0136   | 0.0<br>6.18                           | -0.032   | -0.017                          |
| )                            | Iodide; LiI; 1   |                                       |  |                                 |
| 298.15                       | 0.0086<br>0.0109   | 0.0<br>2.40                           | -0.043   | -0.028                          |
| Sodium                       | Chloride; NaCl;  | 7647-14-5                             |  |                                 |
| 298.15                       | 0.0086<br>0.0043   | 0.0<br>5.81                           | 0.052  | 0.067                           |
| Potassi                      | um Chloride; KC  | 1; 7447-40-3                          | 7  |                                 |
| 298.15                       | 0.0086<br>0.0048   | 0.0<br>4.72                           | 0.054  | 0.069                           |
| solutions i<br>  effect para | The paper is not clear as to whether the solubility of helium in the salt solutions is for 1.000 kg of $H_2O$ or for 1.000 kg of solution. The salt effect parameter, $k_{\rm SX}$ , was calculated by the compiler, assuming the solubili was for 1.000 kg $H_2O$ . |                                       |  |                                 |
|                              |  | AUXILIARY                             | INFORMATION  |                                 |
| METHOD: Gas a                | bsorption. The   | helium was                            | SOURCE AND PURITY OF M                                     |                                 |
| solvent sal                  | t concentration  | was deter-                            | 1. Helium. Source<br>cent He with N <sub>2</sub>           | the impurity                    |
| the solvent                  | density measure<br>volume was mea  | sured by                              | present in the<br>2. Water. No infor                       | greatest amount.                |
| of mercury.                  | t of an equival<br>The gas-liquid  | interface                             | 3. Alkali Halides.   |                                 |
| was gently<br>although eq    | stirred for two<br>uilibrium appea<br>within a matte   | hours,<br>red to be                   | given.   |                                 |
| 100                          |  |                                       | ESTIMATED ERROR:   |                                 |
| APPARATUS/PRO                | CEDURE :   |                                       | ESTIMATED ERROR: $\delta$ T/K                              | = 0.01                          |
|                              |  |                                       |  |                                 |
|                              |  |                                       | REFERENCES :   |                                 |
|                              |  |                                       |  |                                 |
| 1                            |  |                                       |  |                                 |
|                              |  |                                       |  |                                 |
| L                            |  |                                       | 1  |                                 |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:                            |  |  |
|---|---|--|--|
|   | Morrison, T.J.; Johnstone, N.B.B.                 |  |  |
| l. Helium; He; 7440-59-7  |   |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   | <u>J</u> . Chem. Soc. 1955, 3655 - 3659.          |  |  |
| 3. Alkali Halides   | <u>o. citem. 300</u> . 1955, 3655 - 3659.         |  |  |
|   |   |  |  |
| VARIABLES:<br>T/K: 298.15   | PREPARED BY:                                      |  |  |
| P/kPa: 101.325 (1 atm)  | T.D.Kittredge                                     |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |
| T/K $k_s = (1/m) \log (S^{O}/S) k_{s_x} = (1/m) \log (X^{O}/X)$   |   |  |  |
|   | (1/, 109 (x / x)                                  |  |  |
|   |   |  |  |
| Lithium Chloride; LiCl; 7447-41-8<br>298.15 0.050   | 0.065   |  |  |
|   | 0.005   |  |  |
| Sodium Chloride; NaCl; 7647-14-5<br>298.15 0.081  | 0,096   |  |  |
|   | 0.090   |  |  |
| Sodium Bromide; NaBr; 7647-15-6   | 0.102   |  |  |
|   |   |  |  |
| Potassium Chloride; KCl; 7447-40-7<br>298.15 0.068  | 0.083   |  |  |
|   | 0.003   |  |  |
| Potassium Iodide; KI; 7681-11-0   |   |  |  |
| 298.15 0.083  | 0.098   |  |  |
| The values of the Setschenow salt effect parameters, $k_s$ , were apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S <sup>O</sup> , and the solubility of helium in a near one equivalent of salt per kg of water solution, S. The S <sup>O</sup> /S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter $k_{SX}$ from the mole fraction solubility ratio X <sup>O</sup> /X. |   |  |  |
| AUXILIARY   | INFORMATION                                       |  |  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:                   |  |  |
| Gas absorption in a flow system.  | 1. Helium. British Oxygen Co. Ltd.                |  |  |
|   | 2. Water. No information given.                   |  |  |
|   | 3. Alkali Halides. No information                 |  |  |
|   | given.  |  |  |
|   |   |  |  |
|   |   |  |  |
|   |   |  |  |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:                                  |  |  |
| The previously degassed solvent flows   | $\delta k_{s} = 0.010$                            |  |  |
| in a thin film down an absorption<br>spiral containing helium gas plus  |   |  |  |
| solvent vapor at a total pressure of<br>1 atm. The volume of gas absorbed is  | REFERENCES :                                      |  |  |
| measured in attached calibrated   | 1. Morrison, T.J.; Billett, F.                    |  |  |
| burets (1).   | <u>J</u> . <u>Chem</u> . <u>Soc</u> . 1952, 3819. |  |  |
|   |   |  |  |
|   |   |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |  |  |
|---|---|--|--|
| l. Helium; He; 7440-59-7  | Mishnina, T.A.; Avdeeva, O.I.;  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   | Bozhovskaya, T.K.   |  |  |
| 3. Sodium Chloride; NaCl; 7647-14-5   | <u>Materialy Vses. Nauchn. Issled.</u><br><u>Geol. Inst. 1961, 46</u> , 93 - 110.   |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |
| T/K: 278.15 - 318.15<br>NaCl/ g eq dm <sup>-3</sup> : 0 - 5.4<br>P/kPa: 101.325 (1 atm)   | A. L. Cramer  |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |
| Bunsen Coeffic:<br>NaCl/g eg dm <sup>-3</sup>   | Setschenow  |  |  |
|   | Parameter,  |  |  |
| 0.0 0.5 1.0 1.5 2.0 2.5   | 3.0 3.5 4.0 4.5 5.0 5.4 k <sub>s</sub>  |  |  |
| 278.15         9.4         8.6         7.9         7.3         6.7         6.2           283.15         9.1         8.3         7.6         7.0         6.4         5.9   | 5.7         5.2         4.8         4.4         4.1         3.8         0.073           5.4         5.0         4.6         4.2         3.9         3.6         0.074 |  |  |
| 288.15         8.8         8.0         7.4         6.8         6.2         5.7           293.15         8.6         7.9         7.2         6.6         6.0         5.5   | 5.3 4.8 4.4 4.2 3.7 3.5 0.076<br>5.0 4.6 4.2 3.9 3.6 3.3 0.077  |  |  |
| 298.15         8.5         7.8         7.1         6.5         5.9         5.4           303.15         8.4         7.7         6.9         6.4         5.8         5.3   | 4.9       4.5       4.1       3.8       3.4       3.2       0.079         4.8       4.4       4.0       3.7       3.3       3.1       0.080                           |  |  |
| 308,15 8,4 7.6 6.9 6.3 5.8 5.2  | 4.8 4.3 4.0 3.6 3.3 3.0 0.082   |  |  |
| 313.15         8.4         7.6         6.9         6.3         5.7         5.2           318.15         8.5         7.6         6.9         6.3         5.7         5.2   | 4.7 4.3 3.9 3.5 3.2 2.8 0.084<br>4.7 4.3 3.9 3.5 3.2 2.9 0.086  |  |  |
|   |   |  |  |
| AUXILIARY   | INFORMATION   |  |  |
| METHOD: SOURCE AND PURITY OF MATERIALS;   |   |  |  |
| The table of smoothed Bunsen coeffici-<br>ents of helium dissolved in aqueous<br>sodium chloride solutions was prepared<br>by the authors from the data of<br>Morrison and Johnstone (1) and of<br>Cherepennikov (2). The secondary<br>source of data is used because the<br>original Cherepennikov solubility data<br>was not available to the compiler. |   |  |  |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:  |  |  |
|   | <pre>REFERENCES: 1. Morrison, T.J.; Johnstone, N.B. J. Chem. Soc. 1954, 3441. 2. Cherepennikov, A.A. Coll. Reports of the Sci. Conf. 1958, LICI, L.</pre>             |  |  |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |
|--|---|--|--|
|  |   |  |  |
| l. Helium; He; 7440-59-7   | Morrison, T.J.; Johnstone, N.B.B.   |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |   |  |  |
| 3. Sodium Sulfate; Na <sub>2</sub> SO <sub>4</sub> ; 7757-82-6   | <u>J. Chem</u> . <u>Soc</u> . 1955, 3655 - 3659                                     |  |  |
| VARIABLES:   | PREPARED BY:  |  |  |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)  | T.D.Kittredge, H.L.Clever   |  |  |
| EXPERIMENTAL VALUES:   |   |  |  |
| $T/K$ $k_s =$  | k <sub>sX</sub> =   |  |  |
| (1/m) log (S <sup>O</sup> /S)  | (1/m) log (X <sup>O</sup> /X)   |  |  |
| 298.15 0.118   | 0.141   |  |  |
| The value of the Setschenow salt effect parameter, $k_{\rm g}$ , was apparently determined from only two solubility measurements. They were the solubility of helium in pure water, S <sup>o</sup> , and the solubility of helium in a near one equivalent of salt per 1.000 kg of water solution, S. The S <sup>o</sup> /S ratio was referenced to a solution containing 1.000 kg of water. The compiler calculated the salt effect parameter, $k_{\rm SX}$ . |   |  |  |
|  | TUDODUARTON   |  |  |
|  | INFORMATION   |  |  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. British Oxygen Co., Ltd.              |  |  |
| Gas absorption in a flow system.   |   |  |  |
|  | 2. Water. No information given.   |  |  |
|  | 3. Sodium Sulfate. No information given   |  |  |
|  | 32,70   |  |  |
|  |   |  |  |
|  |   |  |  |
|  |   |  |  |
| APPARATUS/PROCEDURE:   | ESTIMATED ERROR:  |  |  |
| The previously degassed solvent flows<br>in a thin film down an absorption   | δk <sub>s</sub> = 0.010   |  |  |
| spiral containing helium gas plus<br>solvent vapor at a total pressure of  | REFERENCES:   |  |  |
| l atm. The volume of gas absorbed is<br>measured in attached calibrated<br>burets (l).   | 1. Morrison, T.J.; Billett, F.<br><u>J</u> . <u>Chem</u> . <u>Soc</u> . 1952, 3819. |  |  |
|  |   |  |  |

|  |  |  | ORIGINAL MEASUREMENTS:   |   |
|--|--|--|--|---|
| 1 11-1-2   | . II 7440 FO. 7  |  | Akerlof, G.  |   |
|  | ; He; 7440-59-7  |  |  |   |
| 2. Water;  | H <sub>2</sub> O; 7732-18-5  |  | J. Am. Chem. Soc.  | 1935, <u>57</u> ,1196-1201.   |
| 3. Sodium Nitrate; NaNO <sub>3</sub> ;7631-99-4  |  |  |  |   |
| VARIABLES:   |  |  | PREPARED BY:   |   |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)  |  | T.D.Kittro   | edge, H.L.Clever   |   |
| EXPERIMENTAL   | L VALUES:  |  |  |   |
| T/K  | He solubility<br>dm <sup>3</sup> (STP) He  | mol salt   | $k_s =$  | k <sub>sX</sub> =   |
|  | 1.000 kg H <sub>2</sub> O  | 1.000 kg H <sub>2</sub> C  | ,<br>(l/m)log(S <sup>O</sup> /S)   | $(1/m) \log (X^O/X)$  |
|  |  |  |  |   |
| 298.15   | 0.0086<br>0.0039   | 0.0<br>6.95  | 0.049  | 0.064   |
|  |  |  |  |   |
|  |  |  |  |   |
|  |  |  | INFORMATION  |   |
| METHOD: Gas  | absorption. The  | helium was   | SOURCE AND PURITY OF   |   |
| solvent<br>mined by<br>the solv  | absorption. The<br>rated with water<br>salt concentrati<br>a density measu<br>rent volume was m<br>ment of an equiv  | helium was<br>vapor, the<br>on was deter-<br>rement, and<br>easured by   | SOURCE AND PURITY OF 1<br>1. Helium. Source<br>stated to be 9<br>N <sub>2</sub> the impurit<br>greatest amoun  | not given. Gas<br>8 per cent He with<br>y present in the<br>t.  |
| solvent<br>mined by<br>the solv<br>displace<br>of mercu  | salt concentrati<br>y a density measu<br>yent volume was m<br>ment of an equiv<br>ary. The gas-liqu  | helium was<br>vapor, the<br>on was deter-<br>rement, and<br>easured by<br>alent volume<br>id interface                             | SOURCE AND PURITY OF 1<br>1. Helium. Source<br>stated to be 9<br>$N_2$ the impurit<br>greatest amoun<br>2. Water. No info  | not given. Gas<br>8 per cent He with<br>y present in the<br>t.<br>rmation given.                      |
| solvent<br>mined by<br>the solv<br>displace<br>of mercu<br>was gent<br>although                                  | salt concentration a density measurement volume was memory of an equiv   | helium was<br>vapor, the<br>on was deter-<br>rement, and<br>easured by<br>alent volume<br>id interface<br>wo hours,<br>eared to be | SOURCE AND PURITY OF 1<br>1. Helium. Source<br>stated to be 9<br>N <sub>2</sub> the impurit<br>greatest amoun  | not given. Gas<br>8 per cent He with<br>y present in the<br>t.<br>rmation given.                      |
| plesatur<br>solvent<br>mined by<br>the solv<br>displace<br>of mercu<br>was gent<br>although<br>establis<br>utes. | salt concentrati<br>salt concentrati<br>a density measu<br>ent volume was m<br>mment of an equiv<br>ry. The gas-liqu<br>ly stirred for t<br>equilibrium app<br>shed within a mat | helium was<br>vapor, the<br>on was deter-<br>rement, and<br>easured by<br>alent volume<br>id interface<br>wo hours,<br>eared to be | SOURCE AND PURITY OF 1<br>1. Helium. Source<br>stated to be 9<br>$N_2$ the impurit<br>greatest amoun<br>2. Water. No info  | not given. Gas<br>8 per cent He with<br>y present in the<br>t.<br>rmation given.                      |
| solvent<br>mined by<br>the solv<br>displace<br>of mercu<br>was gent<br>although<br>establis                      | salt concentrati<br>salt concentrati<br>a density measu<br>ent volume was m<br>mment of an equiv<br>ry. The gas-liqu<br>ly stirred for t<br>equilibrium app<br>shed within a mat | helium was<br>vapor, the<br>on was deter-<br>rement, and<br>easured by<br>alent volume<br>id interface<br>wo hours,<br>eared to be | SOURCE AND PURITY OF 1<br>1. Helium. Source<br>stated to be 9<br>N <sub>2</sub> the impurit<br>greatest amoun<br>2. Water. No info<br>3. Sodium Nitrate<br>ESTIMATED ERROR:            | not given. Gas<br>8 per cent He with<br>y present in the<br>t.<br>rmation given.                      |
| plesatur<br>solvent<br>mined by<br>the solv<br>displace<br>of mercu<br>was gent<br>although<br>establis<br>utes. | salt concentrati<br>salt concentrati<br>a density measu<br>ent volume was m<br>mment of an equiv<br>ry. The gas-liqu<br>ly stirred for t<br>equilibrium app<br>shed within a mat | helium was<br>vapor, the<br>on was deter-<br>rement, and<br>easured by<br>alent volume<br>id interface<br>wo hours,<br>eared to be | SOURCE AND PURITY OF 1<br>1. Helium. Source<br>stated to be 9<br>N <sub>2</sub> the impurity<br>greatest amoun<br>2. Water. No info<br>3. Sodium Nitrate<br>ESTIMATED ERROR:<br>\$ T/K | not given. Gas<br>8 per cent He with<br>y present in the<br>t.<br>rmation given.<br>. No information. |
| solvent<br>mined by<br>the solv<br>displace<br>of mercu<br>was gent<br>although<br>establis<br>utes.             | salt concentrati<br>salt concentrati<br>a density measu<br>ent volume was m<br>mment of an equiv<br>ry. The gas-liqu<br>ly stirred for t<br>equilibrium app<br>shed within a mat | helium was<br>vapor, the<br>on was deter-<br>rement, and<br>easured by<br>alent volume<br>id interface<br>wo hours,<br>eared to be | SOURCE AND PURITY OF 1<br>1. Helium. Source<br>stated to be 9<br>N <sub>2</sub> the impurit<br>greatest amoun<br>2. Water. No info<br>3. Sodium Nitrate<br>ESTIMATED ERROR:            | not given. Gas<br>8 per cent He with<br>y present in the<br>t.<br>rmation given.<br>. No information. |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Helium; He; 7440-59-7 Clever, H.L.; Reddy, G.S. 2. Methanol; CH4O; 67-56-1 3. Sodium Iodide; NaI; 7681-82-5 J. Chem. Eng. Data 1963, 8, 191 - 192. VARIABLES: T/K: 303.15 PREPARED BY: NaI/mol  $dm^{-3}$ : 0 - 3.53 S.A.Johnson Total P/kPa: 101.325 (1 atm) **EXPERIMENTAL VALUES:** Solubility Salt Effect Parameters T/K Ostwald Sodium Ratio SO/S Coefficient Iodide  $L \times 10^2$ mol dm-3 <sup>k</sup>sC <sup>k</sup>sm <sup>k</sup>sX 3.75 (S<sup>O</sup>) 0.0 303.15 1.0 1.065 3.52 0.171 0.254 0.198 0.116 0.419 2.92 1.285 2.225 1.69 1.32 (Values at infinite dilution) 2.560 1.46 2.31 1.10 3.395 2.82 4.165 3.53 0.90 The salt effect parameters are:  $k_{sC} = (1/C) \log(S^{O}/S)$  $k_{sm} = (1/m) \log(S^{O}/S)$  $k_{eX} = (1/m) \log (X^{O}/X)$ where c is the NaI concentration in mol  $dm^{-3}$  of solution, m is the NaI concentration in mol  $kg^{-1}$  of methanol, S<sup>O</sup>/S is the Ostwald coefficient of solubility ratio, and X<sup>O</sup>/X is the mol fraction solubility ratio assuming 100 per cent dissociation of the NaI. The density of the methanol + NaI solution as a function of NaI molarity is:  $\rho/g \text{ cm}^{-3} = 0.781 + 0.129 \text{ C}$ AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: Helium. Matheson Co., Inc. Reg-ular grade, stated to be 99.99 per cent pure. 2. Methanol. Merck Anhydrous. 3. Sodium Iodide. Baker, Analyzed Reagent Grade. ESTIMATED ERROR: APPARATUS/PROCEDURE: The apparatus was modeled after that of Markham and Kobe (1). A length of TRUEBORE tub-ing of 0.4643 cm<sup>2</sup> crossection was used as the gas buret. The volume of **REFERENCES:** helium, presaturated with solvent vapor, taken up by 103.1 cm<sup>3</sup> of 1. Markham, A.E.; Kobe, K.A. J. Am. Chem. Soc. 1941, 63, 449. solution was measured.

| COMPONENTS :   | ORIGINAL MEASUREMENTS:  |
|--|---|
| 1. Helium; He; 7440-59-7   | Cargill, R.W.   |
| 2. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O;<br>64-17-5                              | <u>J. Chem. Soc., Faraday</u> <u>Trans. 1</u> .<br>1978, <u>74</u> , 1444 - 1456. |
| 3. Water; H <sub>2</sub> O; 7732-18-5  |   |
| VARIABLES: T/K: 277.35 - 335.15<br>He P/kPa: 101.325 (1 atm)<br>Ethanol/X <sub>2</sub> : 0.0 - 0.982 | PREPARED BY:<br>P.L.Long  |
| EXPERIMENTAL VALUES:   |   |
| Mol Fraction   | $(cm^3 kg^{-1})$ S/cm <sup>3</sup> kg <sup>-1</sup>                               |
|  | .970 9.33<br>.961 9.14  |
|  | .961 9.14<br>.930 8.51  |
|  | .953 8.97   |
|  | .976 9.46   |
|  | .968 9.29<br>.954 8.99  |
|  | .945 8.81   |
|  | .936 8.63   |
| 314.25 31.83 0   | .937 8.65   |
|  | .959 9.10   |
|  | 9.964<br>9.978<br>9.51  |
|  | .954 8.99   |
| 294.25 33.99 0   | .950 8.91   |
|  | .941 8.73   |
|  | .961 9.14<br>.979 9.53  |
|  | .967 9.27   |
|  | .958 9.08   |
|  | .947 8.85   |
|  | .953 8.97   |
|  | .952 8.95<br>.971 9.35  |
| 334.45 29.90 0   | .980 9.55   |
| *Values in water. For other helium + w<br>laboratory see reference 3 data sheet                      | vater solubility values from the same   |
| AUXILIARY  | INFORMATION   |
| METHOD: Absorption of gas by a thin  | SOURCE AND PURITY OF MATERIALS:   |
| film of liquid. Modification of the  | l. Helium.  |
| Morrison and Billett method. Modifi-   |   |
| cations include replacing Valve A<br>with a constant-flow pump (Watson-                              | 2. Ethanol.   |
| Marlow MHRE/22, with Neoprene tub-   |   |
| ing), and measuring the mass of the  | 3. Water.   |
| solvent leaving the absorption tube  |   |
| (instead of the volume) on a top-  |   |
| pan balance (1). The solubility,S,<br>is reported as cm <sup>3</sup> He,at 273.15 K                  |   |
| and 101.325 kPa, absorbed in 1.000 kg  |   |
| solvent.   |   |
|  | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE: Modification of the   |   |
| Morrison and Billet apparatus. The   |   |
| solvent is degassed using the vapor-<br>pump principle (1). Each determina-                          |   |
| tion contains about 20 cm <sup>3</sup> of gas  |   |
| in up to 500 cm <sup>3</sup> of solvent, which   | REFERENCES:   |
| is then recycled. The density of   | 1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;                      |
| the solution is checked after each   | Ibid.1952, 3819.  |
| run, so that the exact composition<br>of the solution can be determined                              | 2. International Critical Tables  |
| (2).   | 1928, III, 116-119.   |
|  | 3. Morrison, T. J.; Johnstone, N. B.  |
|  | J. Chem. Soc. 1954, 3441.   |

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|--|------------|
| 2. Ethanol; (Ethyl Alcohol); $C_{2}H_{6}O$<br>3. Water; $H_{2}O$ ; 7732-18-5<br>The set of the set of |            |
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| 332.65         30.07         1.605         40.3           0.885         278.55         35.90         1.432         27.0           294.85         33.92         1.513         32.6           314.25         31.83         1.602         40.0  |            |
| 294.85       33.92       1.513       32.6         314.25       31.83       1.602       40.0  |            |
| 314.25 31.83 1.602 40.0  |            |
|  |            |
| 328.75 30.42 1.652 44.9  |            |
| 0.982 278.85 35.87 1.484 30.5  |            |
| 289.15 34.59 1.541 34.8  |            |
| 299.15 33.43 1.584 38.4<br>309.15 32.35 1.642 43.9   |            |
| 320.15 31.24 1.702 50.4  |            |
| 333.15 30.02 1.789 61.5  |            |

| 00000000000   |   |
|---|---|
| COMPONENTS :  | ORIGINAL MEASUREMENTS:  |
| 1. Helium; He; 7440-59-7  | R. W. Cargill   |
| 2. 2-Methyl-2-propanol ( <u>t</u> -Butanol);<br>C <sub>4</sub> H <sub>10</sub> O; 75-65-0 | <u>J. Chem. Soc., Faraday</u> <u>Trans. 1</u> .<br>1978, <u>74</u> , 1444 - 1456. |
| 3. Water; H <sub>2</sub> O; 7732-18-5   |   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 277.45 - 334.25<br>Mole Fractions (x): 0.00 - 0.85                                   | 4 P. L. Long  |
| EXPERIMENTAL VALUES:  |   |
| t-Butanol<br>Mol Fraction <u>T/K</u> 10 <sup>4</sup> T <sup>-1</sup> log                  | $(S/cm^3 kg^{-1}) = S/cm^3 kg^{-1}$   |
| 0.00* 278.35 35.93  | 0.970 9.33  |
| 284.05 35.21  | 0.961 9.14  |
| 294.45 33.97  | 0.930 8.51<br>0.953 8.97  |
| <u>332.35</u> 30.09<br>0.006 277.75 36.01   | 0.953 8.97<br>0.984 9.64  |
| 286.05 34.97  | 0.962 9.16  |
| 293.75 34.05  | 0.946 8.83  |
| 304.75 32.82  | 0.944 8.79  |
| 314.35 31.82<br>323.55 30.91  | 0.952 8.95<br>0.952 8.95  |
| 323.55 30.91<br>333.45 29.99  | 0.952 8.95<br>0.963 9.18  |
| 0.011 277.85 36.00  | 0.979 9.53  |
| 285.15 35.08  | 0.960 9.12  |
| 294.75 33.93  | 0.942 8.75  |
| 304.65 32.83<br>313.15 31.94  | 0.942 8.75<br>0.941 8.73  |
| 313.15 31.94<br>324.05 30.86  | 0.954 8.99  |
| 333.85 29.97  | 0.967 9.27  |
| 0.029 278.25 35.94  | 0.944 8.79  |
| 285.75 35.01  | 0.930 8.51  |
| 294.85 33.92<br>303.15 32.99  | 0.933 8.57<br>0.946 8.83  |
| 318.95 31.36  | 0.970 9.33  |
| 0.046 277.45 36.05  | 0.907 8.07  |
| 279.15 35.83  | 0.907 8.07  |
| *Values in water. For other helium<br>laboratory see reference 3 data she                 | + water solubility values from the same et.                                       |
| AUXILIAR  | Y INFORMATION   |
| METHOD: Absorption of gas by a thin   | SOURCE AND PURITY OF MATERIALS:   |
| film of liquid. Modification of the   |   |
| Morrison and Billett method. Modifi-  | l. Helium.  |
| Cations include replacing Valve A<br>with a constant-flow pump (Watson-                   | 2. t-Butanol.   |
| Marlow MHRE/22, with Neoprene tub-  |   |
| ing), and measuring the mass of the   | 3. Water.   |
| solvent leaving the absorption tube   |   |
| (instead of the volume) on a top-pan<br>balance (1). The solubility, S,                   |   |
| is reported as cm <sup>3</sup> He at 273.15 K an  | a   |
| 101.325 kPa absorbed in 1.000 kg  |   |
| solvent.  |   |
|   | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE: Modified Morrison  |   |
| and Billet apparatus. The solvent   |   |
| was degassed using the vapor-pump<br>principle (1). Each determination                    |   |
| contained about 20 cm <sup>3</sup> of gas in up   |   |
| to 500 cm <sup>3</sup> of solvent, which was the  | n REFERENCES:<br>1. Morrison, T. J.; Billett, F. J.                               |
| recycled. The density of the solu-  | Chem. Soc. 1948, 2033.  |
| tion was checked after each run, so that the exact composition of the                     | ibid. 1952, 3819.   |
| solution could be determined (2).   | 2. International Critical Tables  |
|   | 1928, <u>III</u> , 113.<br>3. Morrison, T. J.; Johnstone, N. B.                   |
| L   | J. Chem. Soc. 1954, 3441.   |

| COMP                     | ONENTS:  |                  |                    |        |  | <u> </u>                               |                   |
|--------------------------|--|------------------|--------------------|--------|--|--|-------------------|
| L. Helium; He; 7440-59-7 |  |                  | R. W. Carg         | ill    |  |  |                   |
| 2.                       | 2-Methyl-2-<br>C <sub>4</sub> H <sub>10</sub> O; 75- |                  | ( <u>t</u> -Butano | ol);   | <u>J. Chem. S</u><br>1978, <u>74</u> , | <u>oc., Faraday</u><br>1444 - 1456.    | <u>Trans. 1</u> . |
| 3.                       | Water; H <sub>2</sub> O;                             | 7732-18-         | -5                 |        |  |  |                   |
|                          | Deterral   |                  |                    |        | L                                      | ······································ |                   |
| Mo                       | -Butanol<br>ol Fraction                              | _T/K             | $10^{4} T^{-1}$    | 10g (S | /cm <sup>3</sup> kg <sup>-1</sup> )    | <u>S/cm<sup>3</sup> kg-1</u>           |                   |
|                          | 0.046  | 285.15           | 35.08              |        | .906                                   | 8.05                                   |                   |
|                          |  | 294.85           | 33.92              | 0      | .921                                   | 8.34                                   |                   |
|                          |  | 304.15           | 32.88              | 0      | .931                                   | 8.53                                   |                   |
|                          |  | 313.85           | 31.87              |        | .981                                   | 9.57                                   |                   |
|                          |  | 324.05           | 30.86              |        | .009                                   | 10.2                                   |                   |
|                          |  | 333.35           | 30.00              |        | .047                                   | 11.1                                   |                   |
|                          | 0.072  | 278.15           | 35.96              |        | .928                                   | 8.47                                   |                   |
|                          |  | 286.65           | 34.90              |        | .933                                   | 8.57                                   |                   |
|                          |  | 296.75           | 33.70              |        | .960                                   | 9.12                                   |                   |
|                          |  | 306.05           | 32.68              |        | .984                                   | 9.64                                   |                   |
|                          |  | 320.65           | 31.19              |        | .045                                   | 11.1                                   |                   |
|                          |  | 331.65           | 30.16              |        | .106                                   | 12.8                                   |                   |
|                          | 0.102  | 282.15           | 35.45              |        | .980                                   | 9.55                                   |                   |
|                          |  | 299.55           | 33.38              |        | .017                                   | 10.4                                   |                   |
|                          |  | 308.15           | 32.46              |        | .035                                   | 10.8                                   |                   |
|                          |  | 318.35           | 31.42              |        | .095                                   | 12.4                                   |                   |
|                          | 0.144  | 332.75           | 30.06              |        | .170                                   | <u>14.8</u><br>9.71                    |                   |
|                          | 0.144  | 277.95<br>286.85 | 35.98              |        | .987<br>.039                           |  |                   |
|                          |  | 299.45           | 34.87<br>33.40     |        |  | 10.9<br>12.4                           |                   |
|                          |  | 307.45           | 32.53              |        | .094<br>.142                           | 13.9                                   |                   |
|                          |  | 322.05           | 31.06              |        | .201                                   | 15.9                                   |                   |
|                          |  | 333.85           | 29.96              |        | .245                                   | 17.6                                   |                   |
|                          | 0.314  | 278.05           | 35.97              |        | .215                                   | 16.4                                   |                   |
|                          | 0.014  | 287.25           | 34.82              |        | .261                                   | 18.2                                   |                   |
|                          |  | 296.55           | 33.72              |        | .300                                   | 20.0                                   |                   |
|                          |  | 308.35           | 32.44              |        | .359                                   | 22.9                                   |                   |
|                          |  | 321.75           | 31.08              |        | .413                                   | 25.9                                   |                   |
|                          |  | 333.85           | 29.96              |        | .485                                   | 30.5                                   |                   |
|                          | 0.530  | 277.45           | 36.05              |        | .351                                   | 22.4                                   |                   |
|                          |  | 287.25           | 34.82              |        | .399                                   | 25.1                                   |                   |
|                          |  | 297.15           | 33.66              |        | .449                                   | 28.1                                   |                   |
|                          |  | 308.65           | 32.41              |        | .497                                   | 31.4                                   |                   |
|                          |  | 320.65           | 31.19              |        | .559                                   | 36.2                                   |                   |
|                          |  | 334.55           | 29.90              |        | .623                                   | 42.0                                   |                   |
|                          | 0.714  | 279.15           | 35.83              |        | .432                                   | 27.0                                   |                   |
|                          |  | 279.55           | 35.77              |        | .436                                   | 27.3                                   |                   |
|                          |  | 289.15           | 34.59              |        | .494                                   | 31.2                                   |                   |
|                          |  | 289.75           | 34.52              |        | .479                                   | 30.1                                   |                   |
|                          |  | 303.15           | 33.01              |        | .546                                   | 35.2                                   |                   |
|                          |  | 319.45           | 31.30              |        | .653                                   | 45.0                                   |                   |
|                          | 0.854  | 281.35           | 35.55              |        | .487                                   | 30.7                                   |                   |
|                          |  | 289.15           | 34.59              |        | .532                                   | 34.0                                   |                   |
|                          |  | 298.55           | 33.50              |        | .585                                   | 38.5                                   |                   |
|                          |  | 320.25           | 31.23              | 1      | .703                                   | 50.5                                   |                   |

| COMPONENTS:   |   |  | ORIGINAL MEASUR   |   |
|---|---|--|---|---|
| l. Helium; He;  | 7440-59-7   | ,  | Friedman, H.  | ц.  |
| 2. Water; H <sub>2</sub> O;   |   |  |   |   |
| E.  |   |  |   |   |
| 3. Nitromethane   | ; CH <sub>3</sub> NO <sub>2</sub> ;   | 75-52-5  | <u>J. Am. Chem</u> .  | <u>Soc</u> . 1954, <u>76</u> , 3294-3297.   |
| VARIABLES:  |   | PREPARED BY:   | ······  |   |
| T/K:<br>P/kPa: 9  |   | 0 mmHg)  | P   | . L. Long   |
| EXPERIMENTAL VALUES   | :   |  |   | · · · · · · · · · · · · · · · · · · ·   |
|   | Т/К   | Mol Fraction   | Bunsen  | Ostwald   |
|   |   | $x_{1} \times 10^{4}$  | $\begin{array}{c} \text{Coefficient} \\ \alpha \times 10^2 \end{array}$                                       | Coefficient<br>L x 10 <sup>2</sup>  |
|   | Water   |  |   |   |
|   | 298.00  |  |   | 0.91<br>0.93  |
|   |   | 0.0687   | 0.85  | 0.96<br>0.93 av.  |
|   | 1.7 c 1 .   |  |   | -   |
|   | Water s   | aturated with  | nitromethane  | (about 4 mol percent)(2)<br>0.89  |
|   | 298.00  |  |   | 0.84  |
|   |   |  | 0.81  | 0.92<br>0.88 av.  |
|   | Nitron-   | thang gatures  |   |   |
|   | 298.00  | chane saturate   | a with water  | (about 12 mol percent)(2)<br>1.70   |
|   |   |  |   | 1.63  |
|   |   |  | 1.53  | 1.67 av.  |
| Bunsen coeffici   | ent and t<br>by the c<br>s law is   | he mole fracti<br>compiler with t<br>obeyed.   | on solubility<br>he assumption  | t about 700 mmHg. The<br>at 101.325 kPa (l atm)<br>s that the gas is ideal,<br>$\times 10^{-2}$ . |
|   |   | AUXILIARY  | INFORMATION   |   |
| METHOD: Gas abso<br>essentially tha<br>and Herzberg (1<br>included a magn<br>instead of shak<br>vessel, and bal<br>against a colum<br>electrical cont.<br>balancing the ga<br>atmosphere. | t employe<br>). Modifi<br>etic stir<br>ing the s<br>ancing th<br>n of merc<br>acts inst | d by Eucken<br>cations<br>ring device<br>aturation<br>e gas pressure<br>ury with<br>ead of | <ol> <li>Helium. A<br/>grade, 99<br/>spectrosc</li> <li>Water. Co</li> <li>Nitrometh<br/>Distilled</li> </ol> | nductivity water.<br>ane. Source not given.   |
|   |   | vent was de-<br>ocedure, re-   | ESTIMATED ERROF   | t:<br>δT/K = 0.05<br>δP/mmHg = 0.3  |

| COMPONENTS:                               |                      |                   | ORIGINAL MEASUREMENTS:  |  |   |
|---|----------------------|-------------------|---|--|---|
| 1. Helium; He; 7440-59-7                  |                      |                   | J.; Megyery-Ba<br>; Patyi, L.   | log, K.;   |   |
| 2. Pentane; C <sub>5</sub> I              | H <sub>12</sub> ; 10 | 9-66-0            | Rusz, D.  | ; ratyr, m.  |   |
|   |                      |                   | Hung. J. I  | nd. Chem. 1976,  | <u>4</u> , 269-280.                         |
| VARIABLES:                                |                      | PREPARED BY:      |   |  |   |
| T/K: 298.15<br>P/kPa: 101.325 (l atm)     |                      |                   |   | S. A. Johnson  | ı   |
| EXPERIMENTAL VALUES                       | :                    |                   |   |  |   |
|   | т/к                  | Mol Fraction      |   | Ostwald  |   |
|   |                      | $x_1 \times 10^4$ | Coefficient   | Coefficient<br>L x 10 <sup>2</sup>   |   |
| :   | 298.15               | 2.6               | 5.0   | 5.5  |   |
|   |                      |                   |   |  |   |
|   |                      |                   |   |  |   |
|   |                      | AUXILIARY         | Y INFORMATION   |  |   |
| METHOD:                                   |                      | AUXILIAR          |   | URITY OF MATERIALS   |   |
| Volumetric met                            | hod. Th<br>hai, an   |                   | SOURCE AND P<br>Both the g<br>grade reag  | URITY OF MATERIALS<br>gas and liquid v<br>gents of Hungari<br>rigin. No furthe   | vere analyti-<br>lan or                     |
| Volumetric met<br>Bodor, Bor, Mo<br>used. | hai, an              | e apparatus of    | SOURCE AND P<br>Both the g<br>grade reag<br>foreign or  | gas and liquid v<br>gents of Hungari<br>rigin. No furthe   | vere analyti-<br>lan or                     |
| Volumetric met<br>Bodor, Bor, Mol         | hai, an              | e apparatus of    | SOURCE AND P<br>Both the g<br>grade reag<br>foreign or<br>mation.   | gas and liquid v<br>gents of Hungari<br>rigin. No furthe   | vere analyti-<br>Lan or<br>er infor-        |
| Volumetric met<br>Bodor, Bor, Mo<br>used. | hai, an              | e apparatus of    | SOURCE AND P<br>Both the g<br>grade reag<br>foreign or<br>mation.   | gas and liquid v<br>gents of Hungari<br>rigin. No furthe<br>ROR:   | vere analyti-<br>an or<br>er infor-         |
| Volumetric met<br>Bodor, Bor, Mo<br>used. | hai, an              | e apparatus of    | SOURCE AND PI<br>Both the g<br>grade reag<br>foreign or<br>mation.<br>ESTIMATED ER<br>REFERENCES:<br>1. Bodor,<br>Sipos | yas and liquid v<br>yents of Hungari<br>rigin. No furthe<br>ROR:<br>δX <sub>1</sub> /X <sub>1</sub> = 0<br>E.; Bor, Gy.; M | vere analyti-<br>an or<br>er infor-<br>).03 |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| 1. Helium; He; 7440-59-7  | Clever, H.L.; Battino, R.; Saylor,J.H.<br>Gross, P.M.   |
| 2. Hexane; C <sub>6</sub> H <sub>14</sub> ; 110-54-3  |   |
|   | <u>J.Phys.Chem</u> . 1957, <u>61</u> , 1078-1083.   |
| VARIABLES:  | PREPARED BY:  |
| T/K 288.15 - 314.95<br>P/kPa: 101.325 (1 atm)   | P.L.Long  |
| EXPERIMENTAL VALUES:  |   |
|   | Ostwald   |
| $\begin{array}{c} \text{Coefficient C} \\ \text{X}_1 \times 10^4 \qquad \textbf{X} \times 10^2 \\ \hline \end{array}$ | coefficient<br>L x 10 <sup>2</sup>  |
| 288.15 2.35 4.06  |   |
| 298.45 2.57 4.38  |   |
| 314.95 3.11 5.18  | 5.97  |
| Smoothed Data. $\Delta G^{\circ}/J \mod^{-1} = -RTln X$   |   |
| Smoothed Data. $\Delta G^{\circ}/J \mod f = -RTIN X$<br>Std. Dev. $\Delta G^{\circ} = 34.3$ ,                         | ±   |
|   | $\Delta S^{O}/J K^{-1} mol^{-1} = -41.756$  |
|   |   |
| T/K Mol Fractior<br>$X_1 \times 10^4$   | $\Delta G^{O}/J \text{ mol}^{-1}$   |
| 288.15 2.33   | 20,043  |
| 293.15 2.46<br>298.15 2.60  | 20,252<br>20,461  |
| 303.15 2.74   | 20,669  |
| 308.15 2.89<br>313.15 3.04  | 20,878<br>21,087  |
| There is a report of the partial molal<br>dilatometry at 298.15 K of 42.3 ± 1 cm                                      | volume of helium in hexane by $n^3 \text{ mol}^{-1}$ (3).   |
| The Bunsen coefficients were calculate  | ed by the compiler.   |
|   | INFORMATION   |
| METHOD:<br>Volumeteric. The solvent is  | SOURCE AND PURITY OF MATERIALS:   |
| saturated with gas as it flows  | 1. Helium, Matheson Co., Both standard<br>and research grade used.                                |
| through an 8 mm x 180 cm glass<br>spiral attached to a gas buret. The   |   |
| pressure is maintained at 1 atm as<br>the gas is absorbed.  | 2. Hexane. Humphrey-Wilkinson, Inc.,<br>N.Haven, CN. Shaken with H <sub>2</sub> SO <sub>4</sub> , |
|   | washed, dried over sodium, dis-   |
| ADDED NOTE.Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J.                                   | tilled.   |
| Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.044 at 298.15   |   |
| K for this system. The value was not  |   |
| used in the smoothed data fit above.  |   |
| APPARATUS/PROCEDURE: The apparatus is a   | ESTIMATED ERROR:  |
| modification of that of Morrison and  | $\delta$ T/K = 0.05   |
| Billett (1). The modifications in-<br>clude the addition of a spiral stor-  | SP/torr = 3<br>$SX_1/X_1 = 0.03$  |
| age for the solvent, a manometer for  | REFERENCES: 1. Morrison, T.J.; Billett, F.  |
| constant reference pressure, and an extra buret for highly soluble gases.   |   |
| The solvent is degassed by a modi-<br>fication of the method of Baldwin   | 2. Baldwin, R.R.; Daniel, S.G.  |
| and Daniel (2).   | J. <u>Appl. Chem</u> . 1952, <u>2</u> , 161.  |
|   | 3. Ng, W.Y.;Walkley, J.<br>J. Phys. <u>Chem</u> . 1969, <u>73</u> , 2274.                         |
|   |   |

| COMPONENTS:   |  |   | ORIGINAL MEASUREMEN  | TS:   |
|---|--|---|--|---|
|   |  | Clever, H.L.; B   |  |   |
| 1. Helium; He;  | 1. Helium; He; 7440-59-7                               |   | Saylor, J.H.;  | Gross, P.M.   |
| 2. Heptane; C <sub>7</sub> H <sub>16</sub> ; 142-82-5   |  |   |  |   |
|   |  | J. Phys. Chem.  | 1957, <u>61</u> , 1078 -1083.  |   |
|   |  |   |  |   |
| VARIABLES:  |  | _   | PREPARED BY:   |   |
|   | .15 - 314.9  |   | P.L.L  | ong   |
| P/kPa: 101.325 (1 atm)  |  |   |  |   |
| EXPERIMENTAL VALUES   | 5: т/к   | Mol Fractic   | on Bunsen  | Ostwald   |
|   |  | $x_{-} = 10^{4}$  | $\frac{\text{Densen}}{\text{Coefficient}}$   | Coefficient   |
|   | 288.15   | 2.24  | 3.46   | 3.65  |
|   | 298.15<br>314.95                                       | 2.49<br>2.95  | 3.78<br>4.40   | 4.13<br>5.07  |
|   |  |   |  |   |
| Smoothed Data.  |  |   | $x_1 = 7766.6 + 42.$   |   |
|   |  | •   | Coef. Corr. 0.9<br>$\Delta S^{O}/J K^{-1} mol^{-1}$  |   |
|   | •  |   | •  | = -42.929   |
|   | т/к м  | ol Fraction $X_1 \times 10^4$                               | ▲G <sup>O</sup> /J mol <sup>-1</sup>   |   |
|   | 288.15   | 2.24  | 20,136   |   |
|   | 293.15<br>298.15                                       |   | 20,351   |   |
|   | 298.15   | 2.49<br>2.63  | 20,566<br>20,780   |   |
|   | 308.15<br>313.15                                       | 2.63 2.76   | 20,995<br>21,210   |   |
|   |  |   | •  | -   |
| There are two reports of the partial methods heptane. The partial molal volume by $c cm^3 mol^{-1}$ . An apparent molal volume by urated solution at pressures of 90 to is 37.5 $\pm$ 0.3 cm <sup>3</sup> mol <sup>-1</sup> (4). The value tentative recommended value. The Bunsen coefficients were calculated |  | a density deter<br>100 atm and a te<br>by dilatometry a     | mination of the sat-<br>mperature of 298.15 K<br>t l atm (3) is the  |   |
|   |  | AUXILIARY   | INFORMATION  |   |
| METHOD: Volumete  | ric. The so  | lvent is  | SOURCEAND PURITY C   | OF MATERIALS:   |
| saturated with<br>through an 8 mm<br>spiral attached  | x 180 cm g<br>to a gas b                               | lass<br>uret. The   |  | eson Co. Both standard<br>grades were used.               |
| pressure is mai<br>pressure of 1 a<br>absorbed.   | tm as the g  | as is   | 2. Heptane. Phi<br>Bartlesville<br>as received.  | llips Petroleum Co.,<br>, OK, pure grade, used            |
| ADDED NOTE.Makr<br>Balog, K.;Rusz,<br>Ind. Chem. 1976<br>Ostwald coeffic<br>K for this syst<br>used in the smooth   | L.;Patyi,<br>, 4, 269 re<br>ient of 0.0<br>em. The val | L. <u>Hung. J.</u><br>port an<br>44 at 298.15<br>ue was not |  |   |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-   |  | <b>8</b> P  | P/K = 0.05<br>P/torr = 3<br>$R_1/X_1 = 0.03$   |   |
| age for the sol<br>constant reference<br>extra buret for<br>The solvent is of<br>fication of the<br>and Daniel (2).   | nce pressur<br>highly sol<br>degassed by               | e, and an<br>uble gases.<br>a modi-                         | J. <u>Chem.Soc</u> . 1948<br>2. Baldwin, R.R.<br>J. <u>Appl. Chem</u><br>3. Ng, W.Y.;Walk<br>J. Phys. Chem | 1. 1952, <u>2</u> , 161.<br>ley, J.<br>1. 1969, 73, 2274. |
|   |  |   | 4. Popov, G.A.;D<br>Zh. Fiz. Khim  | $\frac{1}{1}$   |

| CON      | 1PONENTS:  | EVALUATOR:  |
|----------|--|---|
| 1.<br>2. | Helium; He; 7440-59-7<br>Octane; C <sub>8</sub> H <sub>18</sub> ; 111-65-9 | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322 U.S.A. |
|          |  | USA<br>April 1978   |

CRITICAL EVALUATION:

The solubility of helium in octane was measured by Clever, Battino, Saylor, and Gross (1), by Makranczy, Megyery-Balog, Rusz, and Patyi (2), and by Wilcock, Battino, and Danforth (3).

The value of Makranczy, et al. (Ostwald coefficient 0.037, mole fraction 2.5 x  $10^{-4}$  at 298.15 K) is not recommended. It was reported to only two significant figures and it is 3-5 percent higher than the smoothed data value at 298.15 K from the other two laboratories.

The smoothed data of Clever et al. ranges from 4.7 percent higher at 288.15 to 2.1 percent higher at  $3\overline{13.15}$  K than the smoothed data of Wilcock Although the two data sets agree within experimental error, the more et al. recent data of Wilcock <u>et al</u>. were determined with a better degassing proce-dure and with better control of temperature and pressure than used in the earlier work. Thus the two data sets were combined by the method of least squares to a Gibbs energy equation linear in temperature with a weight of 2 for the Wilcock <u>et al</u>. data and a weight of 1 for the Clever et al. data.

The recommended values for the transfer of one mole of helium from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 8486.3 + 40.965 T$ 

Std. Dev.  $\Delta G^\circ = 49$ , Coef. Corr. = 0.9954

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 8486.3, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -40.965$ 

The recommended solubility values and Gibbs energy as a function of temperature are in Table 1.

TABLE 1. The solubility of helium in octane. The mole fraction solubility at 101.325 kPa and the Gibbs energy as a function of temperature.

| т/к    | Mol Fraction $X_1 \times 10^4$ | $\Delta G^{o}/J \text{ mol}^{-1}$ |
|--------|--------------------------------|-----------------------------------|
| 283,15 | 1.971                          | 20,085                            |
| 288.15 | 2.098                          | 20,290                            |
| 293.15 | 2.229                          | 20,495                            |
| 298.15 | 2.363                          | 20,700                            |
| 303.15 | 2.500                          | 20,905                            |
| 308.15 | 2.641                          | 21,110                            |
| 313.15 | 2.784                          | 21,314                            |
| 318.15 | 2.930                          | 21,519                            |

Ng and Walkley (4) report a partial molal volume of helium in octane by dilatometry of 47.8  $\pm$  1 cm<sup>3</sup> mol<sup>-1</sup> at 298.15 K.

- 1. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, <u>61</u>, 1078.
- Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. 2. Chem. 1976, 4, 269. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. Chem.
- з. Thermodyn. 1978, <u>10</u>, 817. Ng, W. Y.; Walkley, J. <u>J. Phys. Chem</u>. 1969, <u>73</u>, 2274.

4.

| COMPONENTS:  |   |  | ORIGINAL MEASUREME   | NTS:  |             |
|--|---|--|--|---|-------------|
| l. Helium; He; 7440-59-7                             |   | Clever, H.L.;B<br>Saylor, J.H.   |  |   |             |
| 2. Octane; C <sub>8</sub> H <sub>18</sub> ; 111-65-9 |   |  |  |   |             |
|  |   |  | J. Phys. Chem.   | 1957, <u>61</u> , 1078-1                      | 083.        |
| VARIABLES:   |   |  | PREPARED BY:   |   |             |
| T/K: 288.15 - 314.75<br>P/kPa: 101.325 (1 atm)       |   | P.:  | L.Long   |   |             |
| P/kPa: 1   | .01.325 (1 8  | atm)   |  |   |             |
| EXPERIMENTAL VALUES                                  | S:- <u>T/K</u>  | Mol Fractio  | on Bunsen  | Ostwald<br>Coefficient                        |             |
|  |   | $x_1 \times 10^4$  | $\propto \times 10^2$  |   |             |
|  | 288.15  | 2.17   | 3.00   | 3.17  |             |
|  | 298.15  | 2.42   | 3.22   | 3.52  |             |
|  | 314.75  | 2.87   | 3.85   | 4.44  |             |
| Smoothed Data.                                       | $\Delta G^{O}/J \text{ mol}^{-1}$   | <sup>1</sup> = 7936.1 +  | + 42.601 T = - R   | T ln X <sub>l</sub>                           |             |
|  | Std. Dev. 4   | $\Delta G^{O} = 2.7,$  | Coef. Corr. 0.9  | 999   |             |
| See the evaluat                                      | ion of the  | helium + oct   | tane system for  | the recommended G                             | ibbs        |
| energy equation                                      |   |  |  |   |             |
|  |   |  |  |   |             |
| The Bunsen coef                                      | ficients we<br>values were  | re calculate<br>adjusted to  | ed by the compil   | um dissolved in o<br>er.<br>sure of helium of |             |
| The Bunsen coef                                      | ficients we<br>values were  | re calculate<br>adjusted to<br>ry's law.   | ed by the compil<br>o a partial pres   | er.   |             |
| The Bunsen coef<br>The solubility<br>101.325 kPa (1  | ficients we<br>values were<br>atm) by Hen   | re calculato<br>adjusted to<br>ry's law.<br>AUXILIARY  | ed by the compil<br>o a partial pres<br>INFORMATION  | er.<br>sure of helium of                      |             |
| The Bunsen coef                                      | ticients we<br>values were<br>atm) by Hen<br>c. The solve<br>as it flows<br>m glass spi:<br>The total p | re calculato<br>adjusted to<br>ry's law.<br>AUXILIARY<br>ent is sat-<br>s through<br>ral attached<br>pressure is | ed by the compil<br>o a partial pres<br>INFORMATION<br>SOURCE AND PURITY<br>1. Helium. Mat<br>and researc<br>2. Octane. Hum<br>N. Haven, C | er.<br>sure of helium of                      | andar<br>d. |

| COMPONENTS :  |  |  | ORIGINAL MEAS   | UREMENTS :  |
|---|--|--|---|---|
| l. Helium; He; 7440-59-7  |  |  | .J.; Battino, R.;<br>th, W.F; Wilhelm, E.   |   |
| 2. Octane; C <sub>8</sub> H   | H <sub>18</sub> ; 111-6  | 5-9  |   | . ,   |
| 8 18.   |  | <u>J.Chem.Thermodyn</u> . 1978, <u>10</u> , 817-822.   |   |   |
| VARIABLES:  |  |  | PREPARED BY:  | ······································  |
| T/K: 288.23 - 312.92  |  |  |   |   |
| P/kPa: 101.325 (1 atm)  |  |  | A.L. Cramer   |   |
| EXPERIMENTAL VALUE  | S:   |  |   |   |
|   | T/K M  | Aol Fraction   | Bunsen  | Ostwald   |
|   |  | $x_{1} \times 10^{4}$  | $\alpha \times 10^2$  | Coefficient   |
|   |  | $\frac{x_1 \times 10}{1}$ .  | α χ 10  | X 10  |
|   | 283.23   | 1.933  | 2.697   | 2.797   |
|   | 298.33<br>312.92   | 2.370  | 3.250   | 3.550   |
|   | 312.92   | 2.733  | 3.685   | 4.221   |
| Smoothed Data:  | ∆G <sup>O</sup> /J mo  | $pl^{-1} = -RT \ln 2$  | $x_1 = 8585.2$  | + 40.731 T  |
|   | Std. Dev   | $AG^{O} = 27, CO$  | Def. Corr. =  | 0.9990  |
| 101.325 kPa (1<br>The Bunsen coef   | atm) by H<br>fficients   | Henry's law.<br>were calculate   | ed by the co  |   |
| 101.325 kPa (1<br>The Bunsen coef   | atm) by I<br>fficients<br>report of  | Henry's law.<br>were calculate<br>this work app  | ed by the co<br>eared in Con  | mpiler.<br>f. Int. Thermodyn. Chim.,  |
| 101.325 kPa (1<br>The Bunsen coef<br>A preliminary r  | atm) by I<br>fficients<br>report of  | <pre>Aenry's law. were calculate this work app 2 - 128; Chem.</pre>  | ed by the co<br>eared in Con  | mpiler.<br>f. Int. Thermodyn. Chim.,  |
| 101.325 kPa (1<br>The Bunsen coef<br>A preliminary r<br>{C.R.}, 4th 197   | atm) by H<br>fficients<br>report of<br>75, <u>6</u> , 12:  | <pre>Henry's law. were calculate this work app 2 - 128; Chem. AUXILIARY</pre>  | ed by the co<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION   | mpiler.<br>f. Int. Thermodyn. Chim.,  |
| 101.325 kPa (1<br>The Bunsen coef<br>A preliminary r<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu   | atm) by H<br>fficients<br>report of<br>75, <u>6</u> , 12:<br>NS/PROCEDU  | Henry's law.<br>were calculate<br>this work app<br>2 - 128; <u>Chem</u> .<br>AUXILIARY<br>WRE:<br>ed on the de-  | ed by the co<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium   | mpiler.<br><u>f. Int. Thermodyn. Chim.</u> ,<br><u>7, 86</u> , 22375d.<br>URITY OF MATERIALS:<br>Matheson Co. Inc.  |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morrisc   | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:<br>DS/PROCEDU<br>IS is base<br>on and Bil  | Henry's law.<br>were calculate<br>this work app<br>2 - 128; <u>Chem</u> .<br>AUXILIARY<br>RE:<br>ed on the de-<br>llett (1), and   | ed by the co<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest   | mpiler.<br><u>f. Int. Thermodyn. Chim.</u> ,<br><u>7, 86</u> , 22375d.<br>URITY OF MATERIALS:<br><u>1. Matheson Co. Inc.</u><br><u>1. commercially available</u>  |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morriso<br>the version use<br>Battino, Evans,   | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:<br>/S/PROCEDU<br>is is base<br>on and Bil<br>ed is desc<br>, and Danf  | Auxiliary's law.<br>were calculato<br>this work apport<br>2 - 128; <u>Chem</u> .<br>AUXILIARY<br>RE:<br>ed on the de-<br>liett (1), and<br>cribed by<br>forth (2). The   | ed by the con<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.  | mpiler.<br><u>f. Int. Thermodyn</u> . <u>Chim</u> .,<br><u>86</u> , 22375d.<br>URITY OF MATERIALS:<br>Matheson Co. Inc.<br>commercially available   |
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| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary 1<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morriso<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)  | atm) by H<br>fficients<br>report of<br>75, <u>6</u> , 123<br>DS/PROCEDU<br>IS iS base<br>on and Bill<br>ed is deso<br>, and Danf<br>ratus and<br>attino, Ba  | AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>RE:<br>ed on the de-<br>lett (1), and<br>cribed by<br>forth (2). The<br>procedure are<br>anzhof, Bogan,   | ed by the con-<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.<br>2. Octane  | mpiler.<br><u>f. Int. Thermodyn</u> . <u>Chim</u> .,<br><u>86</u> , 22375d.<br>URITY OF MATERIALS:<br>Matheson Co. Inc.<br>commercially available   |
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| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morrisc<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)<br>Degassing.<br>solvent is place<br>size that the 1<br>deep. The liqui<br>and vacuum is a<br>through a liqui  | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:<br>OS/PROCEDU<br>is is base<br>on and Bill<br>ed is desc<br>, and Danf<br>ratus and<br>attino, Ba<br>Up to 500<br>ced in a fi<br>liquid is<br>rat<br>uid is rap<br>applied in<br>id N <sub>2</sub> trap  | AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>RE:<br>ed on the de-<br>llett (1), and<br>cribed by<br>forth (2). The<br>procedure are<br>anzhof, Bogan,<br>cm <sup>3</sup> of<br>flask of such<br>about 4 cm<br>oidly stirred,<br>htermittently<br>o until the  | ed by the con<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.<br>2. Octane<br>99 mol   | <pre>mpiler.<br/>f. Int. Thermodyn. Chim.,<br/>, 86, 22375d.<br/>URITY OF MATERIALS:<br/> Matheson Co. Inc.<br/>commercially available<br/> Phillips Petroleum Co.<br/>per cent minimum.</pre>  |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morrisc<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)<br>Degassing.<br>solvent is plac<br>size that the J<br>deep. The liqu<br>and vacuum is a<br>through a liqui<br>permanent gas n<br>to 5 microns.<br>Solubility E  | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:<br>DS/PROCEDU<br>is is base<br>on and Billed<br>is desc<br>, and Danf<br>ratus and<br>attino, Ba<br>, and | Auxiliary's law.<br>were calculate<br>this work apper<br>2 - 128; Chem.<br>AUXILIARY<br>RE:<br>ed on the de-<br>lett (1), and<br>cribed by<br>Forth (2). The<br>procedure are<br>anzhof, Bogan,<br>) cm <sup>3</sup> of<br>Elask of such<br>about 4 cm<br>oidly stirred,<br>htermittently<br>o until the<br>pressure drops<br>tion. The de-  | ed by the con<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.<br>2. Octane<br>99 mol   | <pre>mpiler.<br/>f. Int. Thermodyn. Chim.,<br/>, 86, 22375d.<br/>URITY OF MATERIALS:<br/>. Matheson Co. Inc.<br/>commercially available<br/>. Phillips Petroleum Co.<br/>per cent minimum.</pre>  |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>(C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>Sign of Morrisc<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)<br>Degassing.<br>solvent is plac<br>size that the J<br>deep. The liqu<br>and vacuum is a<br>through a liqui<br>permanent gas n<br>to 5 microns.<br>Solubility I<br>gassed solvent   | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:<br>DS/PROCEDU<br>as is base<br>on and Bail<br>at is desc<br>, and Danf<br>ratus and<br>attino, Bail<br>attino, Bail  | Auxiliary's law.<br>were calculate<br>this work apper<br>2 - 128; Chem.<br>AUXILIARY<br>TRE:<br>ed on the de-<br>lett (1), and<br>cribed by<br>forth (2). The<br>procedure are<br>anzhof, Bogan,<br>) cm <sup>3</sup> of<br>Elask of such<br>about 4 cm<br>oidly stirred,<br>htermittently<br>o until the<br>pressure drops<br>tion. The de-<br>d in a thin  | ed by the con<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.<br>2. Octane<br>99 mol   | <pre>mpiler.<br/>f. Int. Thermodyn. Chim.,<br/>, 86, 22375d.<br/>URITY OF MATERIALS:<br/> Matheson Co. Inc.<br/>commercially available<br/> Phillips Petroleum Co.<br/>per cent minimum.</pre>  |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morrisc<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)<br>Degassing.<br>solvent is place<br>size that the J<br>deep. The liqui<br>and vacuum is a<br>through a liqui<br>permanent gas n<br>to 5 microns.<br>Solubility D<br>gassed solvent<br>film down a glatining the sol   | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:<br>DS/PROCEDU<br>IS iS base<br>on and Bill<br>ed is desc<br>, and Danf<br>ratus and<br>attino, Ba<br>).<br>Up to 500<br>ced in a fi<br>liquid is<br>ratus and<br>attino, Ba<br>).<br>Up to 500<br>ced in a fi<br>liquid is<br>ratus and<br>attino, Ba<br>).<br>Up to 500<br>ced in a fi<br>liquid is<br>ratus and<br>attino, Ba<br>).  | AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>RE:<br>ed on the de-<br>llett (1), and<br>cribed by<br>forth (2). The<br>procedure are<br>anzhof, Bogan,<br>cm <sup>3</sup> of<br>flask of such<br>about 4 cm<br>oidly stirred,<br>ntermittently<br>o until the<br>pressure drops<br>cion. The de-<br>l in a thin<br>tube con-<br>olus the sol-  | ed by the con-<br>eared in Con-<br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.<br>2. Octane<br>99 mol<br>ESTIMATED ER<br>REFERENCES:   | mpiler.<br>$\frac{1}{4}$ . Int. Thermodyn. Chim.,<br>$\frac{1}{86}$ , 22375d.<br>URITY OF MATERIALS:<br>$\frac{1}{2}$ Matheson Co. Inc.<br>commercially available<br>$\frac{1}{2}$ Phillips Petroleum Co.<br>per cent minimum.<br>ROR:<br>$\frac{\delta T/K = 0.03}{\delta P/mmHg} = 0.5$<br>$\frac{\delta X_1/X_1}{\delta I} = 0.02$   |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morrisc<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)<br>Degassing.<br>solvent is place<br>size that the J<br>deep. The liqui<br>and vacuum is a<br>through a liqui<br>permanent gas n<br>to 5 microns.<br>Solubility I<br>gassed solvent<br>film down a glat<br>taining the solvent   | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:<br>DS/PROCEDU<br>is is base<br>on and Bill<br>ed is desc<br>, and Danf<br>ratus and<br>attino, Ba<br>o<br>Up to 500<br>ced in a fi<br>liquid is<br>ratus and<br>attino, Ba<br>o<br>to 200<br>ced in a fi<br>liquid is<br>ratus and<br>attino, Ba<br>o<br>ceterminat<br>is passed<br>ass spiral<br>lute gas p<br>a total pr  | AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>RE:<br>ed on the de-<br>llett (1), and<br>cribed by<br>forth (2). The<br>procedure are<br>anzhof, Bogan,<br>cm <sup>3</sup> of<br>flask of such<br>about 4 cm<br>oidly stirred,<br>ntermittently<br>o until the<br>pressure drops<br>cion. The de-<br>lin a thin<br>tube con-<br>olus the sol-<br>cessure of one   | ed by the co<br>eared in Con<br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.<br>2. Octane<br>99 mol<br>ESTIMATED ER<br>REFERENCES:<br>1.Morrison  | mpiler.<br><u>f. Int. Thermodyn. Chim.</u> ,<br><u>86</u> , 22375d.<br>URITY OF MATERIALS:<br>Matheson Co. Inc.<br>commercially available<br>Phillips Petroleum Co.<br>per cent minimum.<br>ROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta x_1/x_1 = 0.02$<br>   |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morrisc<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)<br>Degassing.<br>solvent is place<br>size that the J<br>deep. The liqui<br>and vacuum is a<br>through a liqui<br>permanent gas n<br>to 5 microns.<br>Solubility I<br>gassed solvent<br>film down a gla<br>taining the solvent<br>atm. The volum<br>found by differ   | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:  | AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>RE:<br>ed on the de-<br>lett (1), and<br>cribed by<br>forth (2). The<br>procedure are<br>anzhof, Bogan,<br>cm <sup>3</sup> of<br>flask of such<br>about 4 cm<br>oidly stirred,<br>netermittently<br>o until the<br>pressure drops<br>tion. The de-<br>lin a thin<br>tube con-<br>cessure of one<br>absorbed is<br>yeen the ini-  | ed by the con-<br>eared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.<br>2. Octane<br>99 mol<br>ESTIMATED ER<br>REFERENCES:<br>1.Morrison<br>J. Chem.<br>2.Battino,                                     | mpiler.<br><u>af. Int. Thermodyn. Chim.</u> ,<br><u>af. 1nt. Thermodyn. Chim.</u> ,<br><u>af. 22375d.</u><br><u>JRITY OF MATERIALS:</u><br><u>Matheson Co. Inc.</u><br><u>commercially available</u><br><u>commercially avail</u> |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>(C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morrisc<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)<br>Degassing.<br>solvent is place<br>size that the J<br>deep. The liquing<br>permanent gas n<br>to 5 microns.<br>Solubility I<br>gassed solvent<br>film down a glat<br>taining the solvent<br>film down a glat<br>taining the volum<br>found by differtial and final  | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:  | Auxiliary's law.<br>were calculate<br>this work apper<br>2 - 128; Chem.<br>AUXILIARY<br>RE:<br>ed on the de-<br>lett (1), and<br>cribed by<br>forth (2). The<br>procedure are<br>anzhof, Bogan,<br>) cm <sup>3</sup> of<br>flask of such<br>about 4 cm<br>oidly stirred,<br>htermittently<br>o until the<br>pressure drops<br>tion. The de-<br>l in a thin<br>tube con-<br>blus the sol-<br>ressure of one<br>absorbed is<br>yeen the ini-<br>In the buret                     | Abstr. 1977<br>INFORMATION<br>SOURCE AND PT<br>1. Helium<br>Purest<br>grade.<br>2. Octane<br>99 mol<br>ESTIMATED ER<br>REFERENCES:<br>1.Morrison<br>J. Chem.<br>2.Battino,<br>J.Am.Oil  | mpiler.<br><u>f. Int. Thermodyn. Chim.</u> ,<br><u>86</u> , 22375d.<br><u>URITY OF MATERIALS:</u><br><u>Matheson Co. Inc.</u><br><u>commercially available</u><br><u>Commercially available</u>  |
| 101.325 kPa (1)<br>The Bunsen coef<br>A preliminary n<br>{C.R.}, 4th 197<br>(C.R.}, 4th 197<br>METHOD /APPARATU<br>The apparatu<br>sign of Morrisc<br>the version use<br>Battino, Evans,<br>degassing appar<br>described by Ba<br>and Wilhelm (3)<br>Degassing.<br>solvent is place<br>size that the J<br>deep. The liquing<br>permanent gas n<br>to 5 microns.<br>Solubility I<br>gassed solvent<br>film down a glat<br>taining the solvent<br>film down a glat<br>taining the volum<br>found by differtial and final  | atm) by I<br>fficients<br>report of<br>75, <u>6</u> , 12:  | AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>RE:<br>ed on the de-<br>lett (1), and<br>procedure are<br>anzhof, Bogan,<br>cm <sup>3</sup> of<br>cmth (2). The<br>procedure are<br>anzhof, Bogan,<br>cm <sup>3</sup> of<br>clask of such<br>about 4 cm<br>pidly stirred,<br>ntermittently<br>o until the<br>pressure drops<br>cion. The de-<br>lin a thin<br>tube con-<br>plus the sol-<br>cessure of one<br>absorbed is<br>yeen the ini-<br>in the buret<br>collected in | ed by the co<br>pared in <u>Con</u><br><u>Abstr</u> . 1977<br>INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Purest<br>grade.<br>2. Octane<br>99 mol<br>ESTIMATED ER<br>REFERENCES:<br>1.Morrison<br>J. Chem.<br>2.Battino,<br>J.Am.Oil<br>3.Battino,<br>Wilhelm, | mpiler.<br><u>f. Int. Thermodyn. Chim.</u> ,<br><u>86</u> , 22375d.<br>URITY OF MATERIALS:<br>Matheson Co. Inc.<br>commercially available<br>Phillips Petroleum Co.<br>per cent minimum.<br>ROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br><br><br><br><br><br><br>   |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| 1   |  |
| 1. Helium; He; 7440-59-7  | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.                                   |
| 2. 3-Methylheptane; C <sub>8</sub> H <sub>18</sub> ; 589-81-1                 |  |
|   | J. Phys. Chem. 1957, 61, 1078-1083.  |
| VARIABLES:  | PREPARED BY:   |
| т/к: 288.15 - 314.75  | P. L. Long   |
| P/kPa: 101.325 (1 atm)  |  |
| EXPERIMENTAL VALUES:<br>T/K Mol Fraction                                      | Bunsen Ostwald   |
|   | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$                                   |
| 288.15 2.24<br>298.15 2.49  | 3.12 3.29<br>3.44 3.75   |
| 314.75 2.95   | 3.98 4.59  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$                       | Х <sub>1</sub> = 7823.7 + 42.733 т   |
| Std. Dev. $\Delta G^\circ = 4.9$ ,  | -  |
|   | $\Delta s^{0} J K^{-1} mol^{-1} = -42.733$   |
| $\Delta n^{-}/5$ MOL - = $7823.7$ ,   | 20 / 0 K MOT42,133   |
| T/K Mol Fract   | cion ΔG°/J mol <sup>-1</sup>   |
| x <sub>1</sub> x 10   | ) <sup>4</sup>   |
| 288.15 2.24   | 20,137   |
| 293.15 2.36   | 20,351   |
| 298.15 2.50<br>303.15 2.63  |  |
| 308.15 2.76   | 20,992   |
| 313.15 2.90<br>318.15 3.04  | 21,206<br>21,419   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law. | a partial pressure of helium of  |
| The Bunsen coefficients were calculate  | ed by the compiler.  |
| AUXILIARY   | INFORMATION  |
| METHOD: Volumetric. The solvent is sat-                                       | SOURCE AND PURITY OF MATERIALS:  |
| urated with gas as it flows through   | 1. Helium. Matheson Co., Inc. Both   |
| an 8 mm x 180 cm glass spiral attached<br>to a gas buret. The total pressure  | standard and research grades were used.  |
| of solute gas plus solvent vapor is   | 2. 3-Methylheptane. Humphrey-  |
| maintained at 1 atm as the gas is absorbed.                                   | Wilkinson, Inc. Shaken with  |
|   | H <sub>2</sub> SO <sub>4</sub> , washed, dried over Na,<br>distilled through a vacuum column |
|   |  |
| 1   |  |
|   | ESTIMATED ERROR:   |
| APPARATUS/PROCEDURE: The apparatus is a                                       | $\delta T/K = 0.05$  |
| modification of that of Morrison and<br>Billett (1). The modifications in-    | $\delta P/torr = 3$  |
| clude the addition of a spiral stor-<br>age for the solvent, a manometer for  | $\delta X_1 / X_1 = 0.03$  |
| a constant reference pressure, and an   | REFERENCES:  |
| extra buret for highly soluble gases.<br>The solvent is degassed by a modi-   | 1. Morrison, T. J.; Billett, F.<br>J. <u>Chem. Soc. 1948</u> , 2033;                         |
| fication of the method of Baldwin and   |  |
| Daniel (2).   | <ol> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. Appl. Chem. 1952, 2, 161.</li> </ol>           |
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| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
|  | Clever, H. L.; Battino, R.;  |
| 1. Helium; He; 7440-59-7   | Saylor, J. H.; Gross, P. M.  |
| 2. 2,3-Dimethylhexane; C <sub>8</sub> H <sub>18</sub> ; 584-   |  |
| 94-1   | J. Phys. Chem. 1957, <u>61</u> , 1078-1083.  |
|  |  |
| VARIABLES:   | PREPARED BY:   |
| т/к: 288.15 - 314.05   | P. L. Long   |
| P/kPa: 101.325 (1 atm)   |  |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol Fraction   | Bunsen Ostwald   |
| $x_1 \times 10^4$  | Coefficient Coefficient<br>$\alpha \ge 10^2$ L $\ge 10^2$  |
| 288.15 2.26  | 3.19 3.37  |
| 298.15 2.47<br>314.05 2.89   | 3.44 3.76<br>3.95 4.54   |
|  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = RT \ln J$   | $x_1 = 7200.1 + 44.850 T$  |
| Std. Dev. $\Delta G^\circ = 15.8$  | , Coef. Corr. = 0.9996   |
| $AH^{\circ}/T mol^{-1} = 7200 l$   | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -44.850$   |
|  |  |
| $\begin{array}{ccc} T/K & Mol Fractor \\ X_1 \times 10 \\ \hline \end{array}$  | tion ΔG°/J mol <sup>-1</sup><br>04   |
| 288.15 2.25  | 20,124   |
| 293.15 2.37  |  |
| 298.15 2.49<br>303.15 2.61   |  |
| 308.15 2.73  | 21,021   |
| 313.15 2.86<br>318.15 2.99   |  |
| The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calcula   |  |
|  |  |
| AUXILIARY  | INFORMATION  |
| METHOD: Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as<br>the gas is absorbed.  | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. Matheson Co., Inc. Both standard and research grades were used.</li> <li>2. 2,3-Dimethylhexane. Humphrey-Wilkinson, Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, dried over Na, distilled through a vacuum column</li> </ul> |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1).The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modi-<br>fication of the method of Baldwin and<br>Daniel (2). | 1. Morrison, T. J.; Billett, F.<br>J. <u>Chem. Soc</u> . 1948, 2033;   |

| COMPONENTS:   | OPT CINAL MEANINESSING  |  |  |
|---|---|--|--|
| CONTONENTS:   | ORIGINAL MEASUREMENTS:  |  |  |
| 1. Helium; He; 7440-59-7  | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.  |  |  |
| 2. 2,4-Dimethylhexane; C <sub>8</sub> H <sub>18</sub> ; 589-  |   |  |  |
| 43-5  | J. Phys. Chem. 1957, 61, 1078-1083.   |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |
| T/K: 288.15 - 314.15  | P. L. Long  |  |  |
| P/kPa: 101.325 (1 atm)  |   |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |
| T/K Mol Fraction<br>$x_1 \times 10^4$   | BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L $\times 10^2$  |  |  |
| 288.15 2.42   | 3.35 3.53   |  |  |
| 298.15 2.72<br>314.15 3.33  | 3.71 4.05<br>4.46 5.13  |  |  |
|   |   |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = RT \ln X_{J}$  | = 9304.5 + 36.983 T   |  |  |
| Std. Dev. $\Delta G^\circ = 17.7$ ,   | Coef. Corr. = 0.9993  |  |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 9304.5,$   | $\Delta s^{-1} = -36.983$   |  |  |
| T/K Mol Fract   | ion $\Delta G^{\circ}/J \mod^{-1}$  |  |  |
| $x_1 \times 10^{-17}$   | )4  |  |  |
| 288.15 2.41   | 19,961  |  |  |
| 293.15 2.57   | 20,146  |  |  |
| 298.15 2.74<br>303.15 2.92  | 20,331<br>20,516  |  |  |
| 308.15 3.10   | 20,701  |  |  |
| 313.15 3.28<br>318.15 3.47  | 20,886<br>21,070  |  |  |
| The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler.                                |   |  |  |
| AUXILIARY   | INFORMATION   |  |  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:   |  |  |
| METHOD: Volumetric. The solvent is<br>saturated with gas as it flows<br>through an 8 mm x 180 cm glass spiral<br>attached to a gas buret. The total   | <ol> <li>Helium. Matheson Co., Inc. Both<br/>standard and research grades were<br/>used.</li> </ol>   |  |  |
| pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.  | 2. 2,4-Dimethylhexane. Humphrey-<br>Wilkinson, Inc. Shaken with<br>H <sub>2</sub> SO <sub>4</sub> , washed, dried over Na,<br>distilled through a vacuum column |  |  |
|   | ESTIMATED ERROR:  |  |  |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for | $\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$   |  |  |
| a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modi-<br>fication of the method of Baldwin and<br>Daniel (2).                          | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br><u>J. Chem. Soc</u> . 1948, 2033;<br><u>ibid</u> .1952, 3819.   |  |  |
| 2011202 (2),  | <ol> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. <u>Appl. Chem</u>. 1952, <u>2</u>, 161.</li> </ol>  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
|   |   |
| <ol> <li>Helium; He; 7440-59-7</li> <li>2,2,4-Trimethylpentane (Iso-<br/>catapos C Hesi 540-84-1</li> </ol>   | Clever, H. L.; Battino, R;<br>Saylor, J. H.; Gross, P. M.   |
| octane; C <sub>8</sub> H <sub>18</sub> ; 540-84-1   | J. Phys. Chem. 1957, 61, 1078-1083.   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 288.15 - 314.95<br>P/kPa: 101.325 (1 atm)  | P. L. Long  |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Fraction<br>$X_1 \times 10^4$   | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$  |
| 288.15 2.76<br>298.15 3.10<br>314.95 3.63   | 3.76     3.97       4.20     4.58       4.80     5.53   |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$   | X <sub>1</sub> = 7670.1 + 41.489 т  |
| Std. Dev. ΔG° = 11.6,   | -   |
|   | $\Delta s^{-1} \ k^{-1} \ mol^{-1} = 41.489$  |
|   | tion $\Delta G^{\circ}/J \text{ mol}^{-1}$  |
| 288.15<br>293.15<br>293.15<br>298.15<br>3.08<br>303.15<br>3.24<br>308.15<br>3.41<br>313.15<br>3.58  | 19,833<br>20,040  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate   |   |
| AUXILIARY   | INFORMATION   |
| METHOD: Volumetric. The solvent is<br>saturated with gas as it flows<br>through an 8 mm x 180 cm glass spiral<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed. | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. Matheson Co., Inc. Both standard and research grades were used.</li> <li>2. 2,2,4-Trimethylpentane. Enjay Co. Used as received.</li> </ul> |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for   | ESTIMATED ERROR:<br>$\begin{array}{l} \delta T/K = 0.05 \\ \delta P/torr = 3 \\ \delta X_1/X_1 = 0.03 \end{array}$  |
| a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modi-<br>fication of the method of Baldwin and<br>Daniel (2).  | 1. Morrison, T. J.; Billett, F.<br>J. <u>Chem. Soc</u> . 1948, 2033;  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
|   | Clever, H. L.; Battino, R.;  |
| 1. Helium; He; 7440-59-7  | Saylor, J. H.; Gross, P. M.  |
| 2. Nonane; C <sub>9</sub> H <sub>20</sub> ; 111-84-2  |  |
|   | <u>J. Phys</u> . <u>Chem</u> . 1957, <u>61</u> , 1078-1083.  |
| VARIABLES:  | PREPARED BY:   |
| T/K: 288.15 - 314.95  | P. L. Long   |
| P/kPa: 101.325 (1 atm)  |  |
| EXPERIMENTAL VALUES:  | Pumpon Option 12   |
| T/K Mol Fraction<br>$X_1 \times 10^4$   | Bunsen Ostwald<br>Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>   |
| 288.15 2.03   | 2.56 2.70  |
| 298.15 2.41<br>314.95 2.87  | 3.00 3.28<br>3.53 4.07   |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$  | $X_1 = 9558.8 + 37.394 T$  |
| Std. Dev. ∆G° = 49.7,   | Coef. Corr. = 0.9952   |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 9558.8,$   | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -37.394$   |
| T/K Mol Fract<br>X <sub>1</sub> x 10  | cion ΔG°/J mol <sup>-1</sup><br>)4   |
| 288.15 2.06   |  |
| 293.15 2.21<br>298.15 2.36  | 20,521<br>20,708   |
| 303.15 2.51   | 20,895   |
| 308.15 2.67<br>313.15 2.83  | 21,082<br>21,269   |
| 318.15 3.00   | 21,456   |
| The solubility values were adjusted to<br>101.325 kPa (l atm) by Henry's law.   |  |
| The Bunsen coefficients were calculate  | ed by the compiler.  |
|   | INFORMATION  |
| METHOD: Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed. | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Helium. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used.</li> <li>2. Nonane. Phillips Petroleum Co.<br/>Used as received.</li> </ul> |
| ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> , J.<br>Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.028 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.       |  |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for   | ESTIMATED ERROR:<br>$\begin{array}{rcl} & \delta T/K &= & 0.05 \\ & \delta P/torr &= & 3 \\ & \delta X_1/X_1 &= & 0.03 \end{array}$  |
| a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modi-<br>fication of the method of Baldwin and<br>Daniel (2).  | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br><u>J. Chem. Soc</u> . 1948, 2033;<br><u>ibid</u> .1952, 3819.  |
|   | <ol> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. <u>Appl</u>. <u>Chem</u>. 1952, <u>2</u>, 161.</li> </ol>  |

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| COMPONENTS:   | EVALUATOR:   |
|---|--|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Decane; C<sub>10</sub>H<sub>22</sub>; 124-18-5</li> </ol> | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322<br>U.S.A. |
|   | April 1978   |

CRITICAL EVALUATION:

The solubility of helium in decane was measured by Clever, Battino, Saylor, and Gross (1), by Makranczy, Megyery-Balog, Rusz, and Patyi (2), and by Wilcock, Battino, and Danforth (3).

The value of Makranczy et al. (Ostwald coefficient 0.025, mole fraction 2.0 x  $10^{-4}$  at 298.15 K) is not recommended. It was reported to only two significant figures and it is 15 - 20 percent lower than the smoothed data value at 298.15 K from the other two laboratories.

The smoothed data values of Wilcock et al. range from 4.4 percent higher at 288.15 K to 1.7 percent higher at 313.15 K. The two data sets agree within experimental error but the more recent data were determined with a better degassing procedure and with better control of temperature and pressure than used in the earlier work. Thus the data sets were combined with a weight of 2 to the Wilcock et al. values and a weight of 1 to the Clever et al. values by the method of least squares to a Gibbs energy equation linear in temperature. The solubility value at 288.35 K (1) was more than two standard deviations from the fit. It was omitted and the remaining solubility values were fitted again.

The recommended values for the thermodynamic changes in transfer of one mole of helium from a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 6,619.1 + 47.144 T$ 

Std. Dev. AG° = 31, Coef. Corr. = 0.9987

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,619.1, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -47.144$ 

The recommended mole fraction solubility and Gibbs energy values are in Table 1.

TABLE 1. The solubility of helium in decane. The mole fraction solubility and the Gibbs energy at 101.325 kPa as a function of temperature.

| т/к    | Mol Fraction $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|--------------------------------|-------------------------|
| 283.15 | 2.072                          | 19,968                  |
| 288.15 | 2.176                          | 20,203                  |
| 293.15 | 2.281                          | 20,439                  |
| 298.15 | 2.387                          | 20,675                  |
| 303.15 | 2.494                          | 20,911                  |
| 308.15 | 2.603                          | 21,146                  |
| 313.15 | 2.713                          | 21,382                  |
| 318.15 | 2.823                          | 21,618                  |

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1. 1957, <u>61</u>, 1078.

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. 2.

<sup>&</sup>lt;u>Chem</u>. 1976, <u>4</u>, 269. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. <u>Chem</u>. <u>Thermodyn</u>. 1978, <u>10</u>, 817. з.

COMPONENTS: **ORIGINAL MEASUREMENTS:** Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. 1. Helium; He; 7440-59-7 2. Decane; C<sub>10</sub>H<sub>22</sub>; 124-18-5 J. Phys. Chem. 1957, 61, 1078-1083 VARIABLES: PREPARED BY: P. L. Long T/K: 288.35 - 314.55 P/kPa: 101.325 (1 atm) EXPERIMENTAL VALUES: T/K Mol Fraction Ostwald Bunsen Coefficient Coefficient  $x_1 \times 10^4$  $\alpha \times 10^2$ L x 10' 288.35 2.04 2.35 2.48 2.39 2.73 2,98 298.15 3.48 3.02 314.55 2.69 Smoothed Data:  $\Delta G^{\circ}/J \mod^{-1} = - RT \ln X_1 = 7690.5 + 43.806 T$ Std. Dev.  $\Delta G^{\circ} = 69.7$ , Coef. Corr. = 0.9929 See the evaluation of helium + decane for the recommended Gibbs energy equation and the recommended solubility values. The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: Volumetric. The solvent is sat-SOURCE AND PURITY OF MATERIALS: urated with gas as it flows through an 8 mm x 180 cm glass spiral at- Helium. Matheson Co., Inc. Both standard and research grades were tached to a gas buret. The total pressure of solute gas plus solvent used. vapor is maintained at 1 atm as the Decane. Humphrey-Wilkinson, Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, dried gas is absorbed. over Na. ESTIMATED ERROR: APPARATUS/PROCEDURE: The apparatus is a  $\delta T/K = 0.05$ modification of that of Morrison and Billett (1). The modifications in-clude the addition of a spiral stor- $\delta P/torr = 3$  $\delta x_1 / x_1 = 0.03$ age for the solvent, a manometer for **REFERENCES:** a constant reference pressure, and an extra buret for highly soluble gases. The solvent is degassed by a modifi-1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid.1952, 3819. cation of the method of Baldwin and Daniel (2). Baldwin, R. R.; Daniel, S. G. J. <u>Appl</u>. <u>Chem</u>. 1952, <u>2</u>, 161. 2.

| COMPONENTS:  | OPTCINAL MEACUPENEMME   |  |  |
|--|---|--|--|
| L. Helium; He; 7440-59-7   | ORIGINAL MEASUREMENTS:<br>Wilcock, R.J.; Battino, R.;   |  |  |
|  | Danforth, W.F; Wilhelm, E.  |  |  |
| 2. Decane; C <sub>10</sub> H <sub>22</sub> ; 124-18-5  | J. <u>Chem</u> . <u>Thermodyn</u> . 1978, <u>10</u> , 817-822.  |  |  |
| VARIABLES:   | PREPARED BY:  |  |  |
| т/к: 283.18 - 313.35   |   |  |  |
| P/kPa: 101.325 (1 atm)   | A.L. Cramer   |  |  |
| EXPERIMENTAL VALUES:   |   |  |  |
| T/K Mol Fraction   | Bunsen Ostwald<br>Coefficient Coefficient   |  |  |
| $x_1 \times 10^4$  | $\alpha \times 10^2$ L × 10 <sup>2</sup>  |  |  |
|  | 2 420 2 500   |  |  |
| 283.18 2.081<br>298.23 2.367   | 2.420 2.509<br>2.710 2.959  |  |  |
| 313.35 2.756   | 3.105 3.562   |  |  |
| Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = -RT \ln$   | $X_1 = 6885.8 + 46.223 T$   |  |  |
| Std. Dev. $\Delta G^{\circ} = 26$ , C  | oef. Corr. = 0.9993   |  |  |
| See the evaluation of helium + decane<br>equation and recommended solubility v   |   |  |  |
| The solubility values were adjusted t<br>101.325 kPa (1 atm) by Henry's law.   | o a partial pressure of helium of   |  |  |
| The Bunsen coefficients were calculat  | ed by the compiler.   |  |  |
| A preliminary report of this work app<br>{C.R.}, 4th 1975, <u>6</u> , 122-128; <u>Chem</u> Al  | peared in <u>Conf. Int. Thermodyn</u> . <u>Chim</u> .,<br><u>ostr</u> . 1977, <u>86</u> , 22375d.   |  |  |
| AUXILIARY  | INFORMATION   |  |  |
| METHOD /APPARATUS/PROCEDURE:   | SOURCE AND PURITY OF MATERIALS:   |  |  |
| The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See the helium + octane data sheet<br>for more details. | <ol> <li>Helium. Matheson Co. Inc.<br/>Purest commercially available<br/>grade.</li> <li>Decane. Phillips Petroleum Co.<br/>99 mol per cent minimum.</li> </ol>   |  |  |
|  | ESTIMATED ERROR:  |  |  |
|  |   |  |  |
|  | <pre>REFERENCES:<br/>1.Morrison,T.J.;Billett,F.<br/>J.Chem.Soc. 1948, 2033.<br/>2.Battino,R.;Evans,F.D.;Danforth,W.F.<br/>J.Am.Oil Chem. Soc. 1968, 45, 830.<br/>3.Battino, R.; Banzhof,M.; Bogan, M.;<br/>Wilhelm, E.<br/>Anal. Chem. 1971, 43, 806.</pre> |  |  |

| ORIGINAL MEASUREMENTS:   |
|--|
| Makranczy, J.; Megyery-Balog, K.;  |
| Rusz, L.; Patyi, L.  |
|  |
| Hung. J. Ind. Chem. 1976, 4, 269-280.  |
| PREPARED BY:   |
| S. A. Johnson  |
|  |
|  |
| Bunsen Ostwald   |
| $\begin{array}{cc} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \end{array}$ |
| 2.0 2.2  |
| , , , , , , , , , , , , , , , , ,  |
| ent were calculated by the compiler.   |
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| INFORMATION  |
| SOURCE AND PURITY OF MATERIALS:  |
| Both the gas and liquid were analyti-  |
| cal grade reagents of Hungarian or foreign origin. No further informa-   |
| tion.  |
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| - ESTIMATED ERROR:   |
| ESTIMATED ERROR:<br>$\delta X_1 / X_1 = 0.03$  |
|  |
|  |
| $\delta X_1 / X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;                                       |
| δX <sub>1</sub> /X <sub>1</sub> = 0.03<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;<br>Sipos, G.             |
| $\delta X_1 / X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;                                       |
|  |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
|  | Clever, H. L.; Battino, R.;  |
| 1. Helium; He; 7440-59-7   | Saylor, J. H.; Gross, P. M.  |
| 2. Dodecane; C <sub>12</sub> H <sub>26</sub> ; 112-40-3  |  |
|  | <u>J. Phys. Chem</u> . 1957, <u>61</u> , 1078-1083.  |
|  |  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 288.15 - 314.55<br>P/kPa: 101.325 (1 atm)   | P. L. Long   |
|  |  |
| EXPERIMENTAL VALUES:<br>T/K Mol Fraction   | Bunsen Ostwald   |
| , c  | Coefficient Coefficient  |
| $x_1 \times 10^4$  | $\begin{array}{c} \alpha \times 10^2 \qquad \text{L} \times 10^2 \\ \hline \end{array}$  |
| 288.15 2.00  | 1.98 2.09  |
| 298.15 2.24<br>314.55 2.58   | 2.20 2.40<br>2.49 2.87   |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$  |  |
|  | -  |
| Std. Dev. $\Delta G^\circ = 16.4$ ,  |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 7207.5,$  | $\Delta s^{-1} \text{ mol}^{-1} = -45.761$   |
| T/K Mol Fract  | $\Delta G^{\circ}/J \text{ mol}^{-1}$  |
| $x_1 \times 10$  | )4   |
| 288.15 2.01  | •  |
| 293.15 2.12<br>298.15 2.22   | 20,622<br>20,851   |
| 303.15 2.33  | 21,080   |
| 308.15 2.44  | 21,309   |
| 313.15 2.56<br>318.15 2.67   | 21,538   |
| JT0.TJ 2.07  | 21,766   |
| ······································   |  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.  |  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.  | o a partial pressure of helium of  |
| The solubility values were adjusted to   | o a partial pressure of helium of  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate  | o a partial pressure of helium of  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY   | o a partial pressure of helium of<br>ed by the compiler.   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through  | o a partial pressure of helium of<br>ed by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Matheson Co., Inc. Both   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-   | o a partial pressure of helium of<br>ed by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS:   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent  | o a partial pressure of helium of<br>ed by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Matheson Co., Inc. Both<br>standard and research grades<br>were used.   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total   | <pre>&gt; a partial pressure of helium of<br/>ed by the compiler.<br/>INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Helium. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used.<br/>2. Dodecane. Humphrey-Wilkinson,</pre>  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.   | <ul> <li>a partial pressure of helium of</li> <li>by the compiler.</li> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS: <ol> <li>Helium. Matheson Co., Inc. Both standard and research grades were used.</li> <li>Dodecane. Humphrey-Wilkinson,</li> </ol> </li> </ul>  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. Hung. J.   | <ul> <li>a partial pressure of helium of</li> <li>by the compiler.</li> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. Matheson Co., Inc. Both standard and research grades were used.</li> <li>2. Dodecane. Humphrey-Wilkinson, Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed,</li> </ul>                        |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung. J.</u><br>Ind. Chem. 1976, 4, 269 report an   | <ul> <li>a partial pressure of helium of</li> <li>by the compiler.</li> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS: <ol> <li>Helium. Matheson Co., Inc. Both standard and research grades were used.</li> </ol> </li> <li>Dodecane. Humphrey-Wilkinson, Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, dried over Na.</li> </ul>   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J.<br>Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.022 at 298.15  | <ul> <li>a partial pressure of helium of</li> <li>by the compiler.</li> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS: <ol> <li>Helium. Matheson Co., Inc. Both standard and research grades were used.</li> </ol> </li> <li>Dodecane. Humphrey-Wilkinson, Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, dried over Na.</li> </ul>   |
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| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J.<br>Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.022 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.<br>APPARATUS/PROCEDURE: The apparatus is a   | <ul> <li>a partial pressure of helium of</li> <li>by the compiler.</li> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS: <ol> <li>Helium. Matheson Co., Inc. Both standard and research grades were used.</li> </ol> </li> <li>Dodecane. Humphrey-Wilkinson, Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, dried over Na.</li> </ul>   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J.<br><u>Ind. Chem</u> . 1976, <u>4</u> , 269 report an<br>Ostwald coefficient of 0.022 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and   | <pre>b a partial pressure of helium of<br/>ed by the compiler.<br/>INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Helium. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used.<br/>2. Dodecane. Humphrey-Wilkinson,<br/>Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed,<br/>dried over Na.<br/>ESTIMATED ERROR:</pre> |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung. J.</u><br>Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.022 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-  | <pre>o a partial pressure of helium of<br/>ed by the compiler.<br/>INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Helium. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used.<br/>2. Dodecane. Humphrey-Wilkinson,<br/>Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed,<br/>dried over Na.<br/>ESTIMATED ERROR:</pre> |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J.<br><u>Ind. Chem</u> . 1976, <u>4</u> , 269 report an<br>Ostwald coefficient of 0.022 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for   | <pre>b a partial pressure of helium of<br/>ed by the compiler.<br/>INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Helium. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used.<br/>2. Dodecane. Humphrey-Wilkinson,<br/>Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed,<br/>dried over Na.<br/>ESTIMATED ERROR:</pre> |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J.<br>Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.022 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.                               | <pre>b a partial pressure of helium of<br/>ed by the compiler.<br/>INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Helium. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used.<br/>2. Dodecane. Humphrey-Wilkinson,<br/>Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed,<br/>dried over Na.<br/>ESTIMATED ERROR:</pre> |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung</u> . J.<br><u>Ind. Chem. 1976, 4</u> , 269 report an<br>Ostwald coefficient of 0.022 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an  | <pre>b a partial pressure of helium of<br/>ed by the compiler.<br/>INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Helium. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used.<br/>2. Dodecane. Humphrey-Wilkinson,<br/>Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed,<br/>dried over Na.<br/>ESTIMATED ERROR:</pre> |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor is maintained at 1 atm as the<br>gas is absorbed.<br>ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. Hung. J.<br>Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.022 at 298.15<br>K for this system. The value was not<br>used in the smoothed data fit above.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modi- | <pre>b a partial pressure of helium of<br/>ed by the compiler.<br/>INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Helium. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used.<br/>2. Dodecane. Humphrey-Wilkinson,<br/>Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed,<br/>dried over Na.<br/>ESTIMATED ERROR:</pre> |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| 1. Helium; He; 7440-59-7  | Makranczy, J.; Megyery-Balog, K.;  |
| 2. Tridecane; C <sub>13</sub> H <sub>28</sub> ; 629-50-5  | Rusz, L.; Patyi, L.  |
| 13 20   |  |
|   | Hung. J. Ind. Chem. 1976, 4, 269-280.  |
| VARIABLES:  | PREPARED BY:   |
| T/K: 298.15   | FREFARED DI:   |
| P/kPa: 101.325 (1 atm)  | S. A. Johnson  |
| EXPERIMENTAL VALUES:  |  |
|   |  |
| T/K Mol Fraction  | Bunsen Ostwald   |
| $x_{1} \times 10^{4}$   | Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>   |
| 298.15 1.9  | 1.7 1.9  |
|   |  |
| The mole fraction and Bunsen coefficie  | ent were calculated by the compiler.   |
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| AUXILIARY   | INFORMATION  |
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| METHOD:   | SOURCE AND PURITY OF MATERIALS;  |
| METHOD:<br>Volumetric method. The apparatus of  | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-   |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or   |
| METHOD:<br>Volumetric method. The apparatus of  | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-   |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.   |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.   |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.   |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta x_1/x_1 = 0.03$   |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:   |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G.  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta x_1/x_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;<br>Sipos, G.<br>Veszpremi Vegyip. Egy. Kozl.<br>1957, 1, 55; |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;  |

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| COMPONENTS:   |   |                 | ORIGINAL MEAS                         | UREMENTS:   |
|---|---|-----------------|---------------------------------------|---|
|   |   |                 | Clever, H.                            | L.; Battino, R.;  |
| l. Helium; He;  | 7440-59-7   | 1               | Saylor,                               | J. H.; Gross, P. M.   |
| 2. Tetradecane  | ; C <sub>14</sub> <sup>H</sup> <sub>30</sub> ; 629-59 | -4              |                                       |   |
|   | 14 50   |                 | J. Phys. C                            | hem. 1957, 61, 1078-1083.   |
|   |   |                 | <u> </u>                              |   |
| VARIABLES:  |   |                 | PREPARED BY:                          |   |
|   | 88.35 - 314.10  |                 |                                       | P. L. Long  |
| P/kPa: 1  | 01.325 (1 atm)  |                 |                                       |   |
|   | -   |                 |                                       |   |
| EXPERIMENTAL VALUES   | T/K Mol Frac  | tion            | Bunsen                                | Ostwald   |
|   | •   | ~               | Coefficient                           | Coefficient   |
|   | x <sub>1</sub> x 1                                    | .0*             | α x 10 <sup>2</sup>                   | $L \times 10^{2}$   |
|   | 288.35 2.10   | )               | 1.76                                  | 1.86  |
|   | 298.15 2.26   |                 | 1.99                                  | 2.17  |
| -   | 314.10 2.60   | )               | 2.12                                  | 2.44  |
| Smoothed Data:  | $\Delta G^{\circ}/J \text{ mol}^{-1} = -$             | - RT ln         | $x_1 = 6310.9$                        | ) + 48.565 T  |
|   | Std. Dev. AG° =                                       |                 | -                                     |   |
|   |   |                 |                                       |   |
|   | •   |                 |                                       | $mol^{-1} = -48.565$  |
|   | T/K Mo  | ol Fract        | tion $\Delta G^{\circ}/J$             | mol <sup>-1</sup>   |
|   |   | $x_1 \times 10$ | )4                                    |   |
|   | 288.15  | 2.09            | 20,                                   | 305   |
|   | 293.15  | 2.18            | 20,                                   | 548   |
|   | 298.15<br>303.15                                      | 2.28<br>2.38    |                                       | .791<br>.033  |
|   | 308.15  | 2.47            |                                       | 276   |
|   | 313.15<br>318.15                                      | 2.57<br>2.67    |                                       | 519<br>,762   |
|   |   | 2.07            |                                       |   |
| The solubility  | values were adju                                      | isted to        | o a partial                           | pressure of helium of   |
| 101.325 kPa (1  | atm) by Henry's                                       | law.            |                                       |   |
| The Bunsen coef   | ficients were ca                                      | alculate        | ed by the co                          | ompiler.  |
|   | At  | IXILIARY        | INFORMATION                           |   |
|   |   |                 | · · · · · · · · · · · · · · · · · · · |   |
|   | c. The solvent is as it flows the                     |                 | SOURCE AND PU                         | JRITY OF MATERIALS:<br>n. Matheson Co., Inc. Both                   |
|   | m glass spiral a                                      |                 | standa                                | ard and research grades were  |
|   | buret. The tot<br>ute gas plus sol                    |                 | used.                                 |   |
|   | ined at 1 atm as                                      |                 |                                       | lecane. Humphrey-Wilkinson,   |
| gas is absorbed   |   |                 |                                       | Shaken with H <sub>2</sub> SO <sub>4</sub> , washed, over Na.       |
|   | ranczy, J.; Megy                                      |                 | urreu                                 | over na.  |
|   | L.;Patyi, L. <u>Hu</u><br>5, 4, 269 report            |                 |                                       |   |
|   | ient of 0.017 at                                      |                 | \$                                    |   |
|   | em. The value wat the data fit a                      |                 |                                       |   |
|   |   |                 | ESTIMATED ER                          | ROR:  |
|   | E: The apparatus<br>that of Morriso                   |                 |                                       | $\delta T/K = 0.05$   |
|   | e modifications                                       |                 |                                       | $\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$                      |
| clude the addit   | ion of a spiral                                       | stor-           |                                       |   |
| aye for the sol   | vent, a manomete<br>rence pressure,                   | and an          | REFERENCES:                           |   |
| extra buret for   | highly soluble  | gases.          | 1. Morris                             | son, T. J.; Billett, F.   |
|   | degassed by a mo<br>method of Baldy                   |                 |                                       | em. <u>Soc</u> . 1948, 2033;<br>1952, 3819.                         |
| Daniel (2).   |   |                 |                                       |   |
|   |   |                 | 2. Baldwi<br>J. Apr                   | in, R. R.; Daniel, S. G.<br>51. <u>Chem</u> . 1952, <u>2</u> , 161. |
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| Non-second second se |   | `               | l                                     |   |

|  | ORIGINAL MEASUREMENTS:  |
|--|---|
| l. Helium; He; 7440-59-7   | Makranczy, J.; Megyery-Balog, K.;   |
| 2. Pentadecane; C <sub>15</sub> H <sub>32</sub> ; 629-62-9                             | Rusz, L.; Patyi, L.   |
| or   |   |
| Hexadecane; C <sub>16</sub> H <sub>34</sub> ; 544-76-3                                 | Hung. J. Ind. Chem. 1976, <u>4</u> , 269-280.   |
| VARIABLES:   | PREPARED BY:  |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)  | S. A. Johnson   |
| EXPERIMENTAL VALUES:   |   |
| T/K Mol Fraction   | Bunsen Ostwald  |
| $x_1 \times 10^4$  | $\begin{array}{ccc} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \end{array}$                                 |
| Pentadecan   | e; C <sub>15<sup>H</sup>32</sub> ; 629-62-9   |
| 298.15 1.8   | 1.5 1.6   |
| Hexadecane   | ; C <sub>16</sub> H <sub>34</sub> ; 544-76-3  |
| 298.15 1.8   | 1.4 1.5   |
|  |   |
|  |   |
| AUXILIARY  | INFORMATION   |
| AUXILIARY<br>METHOD:   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:  |
|  |   |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was | SOURCE AND PURITY OF MATERIALS;<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa- |

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| COMPONENTS:   | EVALUATOR:   |
|---|--|
| 1. Helium; He; 7440-59-7<br>2. Cyclohexane; C <sub>6</sub> H <sub>12</sub> ; 110-82-7 | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, GA 30322<br>USA |
|   | January 1978   |
| CRITICAL EVALUATION:  |  |
|   | clohexane was measured by Lannung (1),<br>Sross (2). The two data sets agree to      |

within better than one percent over 288 - 303 K, the temperature range of common measurement. The agreement is well within the estimated experi-mental error of the methods used. Dymond and Hildebrand (3) show a helium in cyclohexane solubility value at 298.15 K on a graph. Their value was not used in the evaluation.

The two data sets were combined on a one to one weight basis for the recommended values (Table 1). The recommended thermodynamic values for the transfer of one mole of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \mod^{-1} = 10,164 + 40.841 T$ 

Std. Dev.  $\Delta G^{\circ} = 23.2$ , Coef. Corr. = 0.9980

 $\Delta H^{\circ}/J \mod^{-1} = 10,164, \Delta S^{\circ}/J K^{-1} \mod^{-1} = -40.841$ 

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes are summarized at five degree intervals between 288.15 and 318.15 K in Table 2.

TABLE 1. Parameters for Gibbs energy equation.

| $\Delta G^{\circ}/J \text{ mol}^{-1} = A + BT$ | Std. Dev. AG° | No. Exp. Points | Weight | Reference |
|--|---------------|-----------------|--------|-----------|
| 10,297 + 40.398 T<br>10,009 + 41.341 T         | 28.3<br>6.0   | 6<br>3          | 1<br>1 | 1<br>2    |
| 10,164 + 40.841 T                              | 23.2          | 9               |        | 1 + 2     |

TABLE 2. Recommended mole fraction solubility and Gibbs energy of solution at 101.325 kPa (1 atm).

| T/K    | Mol Fraction $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|--------------------------------|-------------------------|
| 288.15 | 1.06                           | 21,933                  |
| 293.15 | 1.14                           | 22,137                  |
| 298.15 | 1.22                           | 22,341                  |
| 303.15 | 1.30                           | 22,545                  |
| 308.15 | 1.39                           | 22,749                  |
| 313.15 | 1.48                           | 22,954                  |
| 318,15 | 1.58                           | 23,158                  |
|        |                                |                         |

 Lannung, A. J. Am. Chem. Soc. 1930, 52, 68.
 Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, <u>61</u>, 1078. 3. Dymond, J.; Hildebrand, J. H. <u>Ind. Eng. Chem. Fundam.</u> 1967, <u>6</u>, 130.

| REPARED BY:   | <u>n. Soc</u> . 1930, <u>52</u> , 68 - 80.  |
|---|---|
| REPARED BY:   | <u>n. Soc</u> . 1930, <u>52</u> , 68 - 80.  |
| REPARED BY:   | n. <u>Soc</u> . 1930, <u>52</u> , 68 - 80.  |
|   |   |
| P   |   |
|   | P. L. Long  |
|   |   |
|   |   |
| Bunsen  | Ostwald   |
| efficient<br>α x 10 <sup>2</sup>  | Coefficient<br>L x 10 <sup>2</sup>  |
| 2.21  | 2.33  |
| 2.20<br>2.39  | 2.32<br>2.56  |
| 2,32  | 2.49  |
|   | 3.00<br>2.94  |
|   | ·····   |
| = 10,297 +  |   |
| Coef. Corr.   | . = 0.9948  |
| ane.  | e the critical evaluation   |
| a partial p   |   |
| a partial p   | pressure of helium of   |
| a partial p<br>twald coeff  | pressure of helium of   |
| a partial p<br>twald coeff<br>NFORMATION<br>OURCE AND PUR<br>1. Helium.   | Dressure of helium of<br>Ficient were calculated by<br>ITY OF MATERIALS:<br>Linde's Liquid Air.   |
| a partial p<br>twald coeff<br>NFORMATION<br>OURCE AND PUR<br>1. Helium.   | pressure of helium of<br>Ficient were calculated by<br>ITY OF MATERIALS:  |
| a partial p<br>twald coeff<br>FORMATION<br>OURCE AND PUR<br>1. Helium.<br>Contain<br>neon.<br>2. Cyclohe<br>shaken<br>separat<br>until n<br>distill<br>jected,                              | Dressure of helium of<br>Ficient were calculated by<br>ITY OF MATERIALS:<br>Linde's Liquid Air.   |
| a partial p<br>twald coeff<br>FORMATION<br>OURCE AND PUR<br>1. Helium.<br>Contain<br>neon.<br>2. Cyclohe<br>shaken<br>separat<br>until n<br>distill<br>jected,                              | Diversible of the pressure of helium of<br>Ficient were calculated by<br>ITY OF MATERIALS:<br>Linde's Liquid Air.<br>Hed 0.5 per cent by volume<br>exane. Poulenc Frères,<br>with fuming sulfuric acid<br>ted and shaken with water<br>Heutral. Kept over $P_2O_5$ , and<br>ted over $P_2O_5$ . First $\frac{1}{2}$ re-<br>m.p. = 6.0°C. Distilled<br>a, used m.p. 6.3°.  |
| a partial p<br>twald coeff<br>twald coeff<br>FORMATION<br>OURCE AND PUR<br>1. Helium.<br>Contain<br>neon.<br>2. Cyclohe<br>shaken<br>separat<br>until n<br>distill<br>jected,<br>over Na    | Diversible of the pressure of helium of<br>Ficient were calculated by<br>ITY OF MATERIALS:<br>Linde's Liquid Air.<br>Hed 0.5 per cent by volume<br>exane. Poulenc Frères,<br>with fuming sulfuric acid<br>ted and shaken with water<br>Heutral. Kept over $P_2O_5$ , and<br>ted over $P_2O_5$ . First $\frac{1}{2}$ re-<br>m.p. = 6.0°C. Distilled<br>a, used m.p. 6.3°.  |
| a partial p<br>twald coeff<br>FORMATION<br>OURCE AND PUR<br>I. Helium.<br>Contain<br>neon.<br>2. Cyclohe<br>shaken<br>separat<br>until n<br>distill<br>jected,<br>over Na<br>STIMATED ERROM | The pressure of helium of<br>Example the pressure of helium of<br>Example the pressure of the pressure of the pressure of the press<br>and the pressure of the press of the pressure of the press  The press of the prese of the press of |
|   | efficient<br>α x 10 <sup>2</sup><br>2.21<br>2.20<br>2.39<br>2.32<br>2.70<br>2.65<br>= 10,297 +<br>Coef. Corr.   |

|   | OPTOTIVAL MELO  |  |
|---|---|--|
| COMPONENTS:   | ORIGINAL MEAS   |  |
| 1. Helium; He; 7440-59-7  |   | L.; Battino, R.;<br>J. H.; Gross, P. M.  |
| 2. Cyclohexane; C <sub>6</sub> H <sub>12</sub> ; 110-82-7   | 1 .   |  |
|   |   |  |
|   | J. Phys. C  | chem. 1957, 61, 1078 - 1083.   |
| VARIABLES:  | PREPARED BY:  |  |
| T/K: 288.15 - 314.75  |   | P. L. Long   |
|   |   | -  |
| EXPERIMENTAL VALUES:  |   |  |
| T/K Mol Fraction  | Bunsen  | Ostwald  |
|   | Coefficient   | Coefficient  |
| $x_1 \times 10^4$   | α x 10 <sup>2</sup>   | $L \times 10^2$  |
| 288.15 1.06   | 2.20  | 2.32   |
| 298.45 1.23<br>314.75 1.51  | 2.53<br>3.05  | 2.76<br>3.51   |
|   | 5.05  |  |
|   |   |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$   | $x_1 = 10,009$  | + 41.341 T   |
| Std. Dev. ∆G° = 6.0,  | Coef. Corr  | . = 0.9999   |
|   |   |  |
| The Bunsen coefficients were calculat   |   | mniler   |
|   |   | mpiler.  |
| AUXILIARY   |   | mpiler.  |
|   | INFORMATION   |  |
| METHOD: Volumetric. The solvent is sat-   | INFORMATION<br>SOURCE AND PUT   | RITY OF MATERIALS;   |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache  | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search  | RITY OF MATERIALS;<br>Matheson Co. Both re-<br>and standard grades were  |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure  | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w  | RITY OF MATERIALS;<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-  |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache  | INFORMATION<br>SOURCE AND PU<br>1. Helium<br>search<br>used w<br>sults.   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-  |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is  | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum   |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is  | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as   |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is  | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as   |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is  | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as   |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed.   | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B<br>receiv   | RITY OF MATERIALS;<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.  |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed.<br>APPARATUS/PROCEDURE: The apparatus is a  | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.<br>OR:   |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed. APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-   | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B<br>receiv   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.<br>OR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$   |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed. APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-   | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B<br>receiv   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.<br>OR:<br>δT/K = 0.05  |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an   | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B<br>receiv<br>ESTIMATED ERR<br>REFERENCES:   | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.<br>OR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$  |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.  | INFORMATION<br>SOURCE AND PU<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B<br>receiv<br>ESTIMATED ERR<br>REFERENCES:<br>1. Morriso                                      | RITY OF MATERIALS:<br>A. Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.<br>OR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$<br>n, T. J.; Billett, F.                                |
| METHOD:<br>Volumetric. The solvent is saturated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed. APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and         | INFORMATION<br>SOURCE AND PU<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B<br>receiv<br>ESTIMATED ERR<br>REFERENCES:<br>1. Morriso<br>J. Chem                           | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.<br>OR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$  |
| METHOD:<br>Volumetric. The solvent is saturated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed. APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-  | INFORMATION<br>SOURCE AND PU<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B<br>receiv<br>ESTIMATED ERR<br>REFERENCES:<br>1. Morriso<br>J. Chem<br>ibid. 1                | RITY OF MATERIALS:<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.<br>OR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$<br>n, T. J.; Billett, F.<br>Soc. 1948, 2033;<br>952, 3819. |
| METHOD:<br>Volumetric. The solvent is sat-<br>urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral attache<br>to a gas buret. The total pressure<br>is maintained at 1 atm as the gas is<br>absorbed.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and | INFORMATION<br>SOURCE AND PUT<br>1. Helium<br>d search<br>used w<br>sults.<br>2. Cycloh<br>Co., B<br>receiv<br>ESTIMATED ERR<br>REFERENCES:<br>1. Morriso<br>J. Chem<br>ibid. 1<br>2. Baldwin | RITY OF MATERIALS;<br>Matheson Co. Both re-<br>and standard grades were<br>ith no difference in re-<br>exane. Phillips Petroleum<br>artlesville, OK. Used as<br>ed.<br>OR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$<br>n, T. J.; Billett, F.<br>Soc. 1948, 2033;               |

| COMPONENTS:   | ODICINAL MERCURPLEMENT  |
|---|---|
| COM UNENTS :  | ORIGINAL MEASUREMENTS:<br>Clever, H. L.; Saylor, J. H.;   |
| 1. Helium; He; 7440-59-7  | Gross, P. M.  |
| <ol> <li>Methylcyclohexane; C<sub>7</sub>H<sub>14</sub>;</li> </ol>   |   |
| 108-87-2  | J. Phys. Chem. 1958, 62, 89 - 91.   |
|   |   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 289.15 - 316.25  |   |
| P/kPa: 101.325 (1 atm)  | P. L. Long  |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Fraction  | Bunsen Ostwald  |
| $x_1 \times 10^4$   | Coefficient Coefficient<br>$\alpha \ge 10^2$ L $\ge 10^2$   |
| 289.15 1.46   | 2.57 2.72   |
| 303.15 1.68<br>316.25 2.07  | 2.93 3.25<br>3.54 4.10  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$   |   |
|   | -   |
| Std. Dev. $\Delta G^\circ = 69.5$ ,   | Coef. Corr. = 0.9917  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 9804.7,$   | $\Delta s^{\circ}/J K^{-1} mol^{-1} = -39.657$  |
| T/K Mol Fract   | tion $\Delta G^{\circ}/J \mod^{-1}$   |
| X <sub>1</sub> × 10   |   |
| 288.15 1.42   | 21,232  |
| 293.15 1.52<br>208.15 1.62  | 21,430  |
| 298.15 1.62<br>303.15 1.73  | 21,628<br>21,827  |
| 308.15 1.85   | 22,025  |
| 313.15 1.96<br>318.15 2.08  | 22,223<br>22,421  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate |   |
| AUXILIARY   | INFORMATION   |
| METHOD: Volumetric (1). The apparatus   | SOURCE AND PURITY OF MATERIALS:   |
| is a modification of that used by<br>Morrison and Billett (2). Modifica-<br>tions include the addition of a             | <ol> <li>Helium. Matheson Co., Inc. Both<br/>standard and research grades were<br/>used.</li> </ol> |
| spiral solvent storage tubing, a manometer for constant reference   | 2. Methylcyclohexane. Eastman   |
| pressure, and an extra gas buret for<br>highly soluble gases.   | Kodak Co., white label. Dried<br>over Na and distilled; corrected<br>b.p. 100.95 to 100.97°, lit.   |
|   | b.p. 100.93°.   |
|   |   |
| APPARATUS/PROCEDURE: (a.) Degassing.  | ESTIMATED ERROR:<br>$\delta T/K = 0.05$   |
| 700 ml of solvent is shaken and<br>evacuated while attached to a cold   | $\begin{array}{rcl} \delta P / mm & Hg = 3 \\ \delta X_1 / X_1 = 0.03 \end{array}$                  |
| trap, until no bubbles are seen; sol-   |   |
| vent is then transferred through a 1 mm. capillary tubing, released as a  | REFERENCES:   |
| fine mist into a continuously evacu-  | 1. Clever, H. L.; Battino, R.;  |
| ated flask. (b.) Solvent is satura-<br>ted with gas as it flows through   | Saylor, J. H.; Gross, P. M.<br><u>J. Phys</u> . <u>Chem</u> . <u>1957, 61</u> , 1078.               |
| 8 mm x 180 cm of tubing attached to a   |   |
| gas buret. Pressure is maintained at<br>l atm. as the gas is absorbed.  | 2. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br><u>ibid.1952</u> , 3819.            |
|   |   |

| COMPONENTS:   | OPTOTNAL MEACUPENTING  |
|---|--|
|   | ORIGINAL MEASUREMENTS:<br>Wilcock, R. J.; Battino, R;  |
| 1. Helium; He; 7440-59-7  | Wilhelm, E.  |
| 2. Cyclooctane; C <sub>8</sub> H <sub>16</sub> ; 292-64-8   |  |
|   | J. <u>Chem</u> . <u>Thermodyn</u> . 1977, <u>9</u> , 111-115.  |
|   |  |
| VARIABLES:  | PREPARED BY:   |
| T/K: 289.23 - 313.51  | H. L. Clever   |
| P/kPa: 101.325  |  |
| EXPERIMENTAL VALUES:  |  |
| T/K Mol Fraction  | Bunsen Ostwald   |
| $x_1 \times 10^4$   | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$   |
| 289.23 0.805  | 1.35 1.429   |
| 289.23 0.805<br>298.15 0.822<br>313.51 1.015  | 1.37 1.491<br>1.66 1.907   |
|   |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$   | <i>±</i>   |
|   | Coef. Corr. = 0.9888   |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 7618.0,$   | $\Delta s^{\prime} J \kappa^{-1} mol^{-1} = -52.284$   |
| T/K Mol Fract<br>X <sub>1</sub> x 10  | tion $\Delta G^{\circ}/J \text{ mol}^{-1}$   |
|   |  |
| 293.15 0.81   | 6 22,945   |
| 298.15 0.860<br>303.15 0.904  |  |
| 308.15 0.95<br>313.15 0.99  | 0 23,729   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law. 5<br>calculated by the compiler.  |  |
|   |  |
| AUXILIARY   | INFORMATION  |
| METHOD: The apparatus is based on the   | SOURCE AND PURITY OF MATERIALS:  |
|   |  |
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| COMPONENTS:   |  |   | ORIGINAL MEAS  |  |               |
|---|--|---|--|--|---------------|
| l. Helium   | m; He; 7440-   | 59-7  | Geller, E.<br>Wilhelm,   | B.; Battino, R.;<br>E.   |               |
| 2. <u>cis</u> -1,<br>C <sub>8</sub> H <sub>16</sub> ;   | ,2-Dimethylc;<br>2207-01-4   | yclohexane;   |  |  |               |
|   |  |   | <u>J</u> . <u>Chem</u> . <u>1</u>  | <u>hermodyn</u> . 1976, <u>8</u> , 197 <sup>.</sup>  | -202          |
| VARIABLES:  |  |   | PREPARED BY:   |  |               |
| T/F   | K: 297.96 -  | 298.28  |  | H. L. Clever   |               |
| P/kPa   | a: 101.325   | (1 atm)   |  |  |               |
| EXPERIMENTAL V  |  | Mal Tree all an   |  | Ostwald  |               |
|   | т/к  | Mol Fraction $X_1 \times 10^4$  | Bunsen<br>Coefficient<br>$\alpha \times 10^2$  |  |               |
|   | 297.96<br>298.28   | 1.48<br>1.40  | 2.34<br>2.22   | 2.55<br>2.42   |               |
| 101.325 kPa   | a (l atm) by   | were adjusted t<br>Henry's law.<br>s were calculat  |  | pressure of helium of  |               |
|   |  |   |  |  |               |
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|   |  |   |  |  |               |
|   |  | AUXILIARY   | INFORMATION  |  |               |
| METHOD: The a   | apparatus is   | based on the  | SOURCE AND PL  | JRITY OF MATERIALS;  |               |
| design by<br>and the ve   | Morrison and   | based on the<br>d Billett (1)<br>is described by  | SOURCE AND PU<br>1. Helium<br>Chemic   | URITY OF MATERIALS:<br>h. Either Air Products (<br>sals, Inc. or Matheson (<br>99 mol % or better.   |               |
| design by<br>and the ve   | Morrison and<br>ersion used :  | based on the<br>d Billett (1)<br>is described by  | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. <u>cis-</u> 1,<br><u>Chemic</u>  | <ul> <li>a. Either Air Products a</li> <li>als, Inc. or Matheson (</li> <li>99 mol % or better.</li> <li>2-Dimethylcyclohexane.</li> <li>al Samples Co., fractic</li> </ul>  | Co.,<br>onal  |
| design by<br>and the ve<br>Battino, E   | Morrison and<br>ersion used f<br>Evans and Dar   | based on the<br>d Billett (1)<br>is described by<br>nforth (2).   | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. cis-1,<br>Chemic<br>ly dis   | <ul> <li>a. Either Air Products a</li> <li>als, Inc. or Matheson (</li> <li>99 mol % or better.</li> <li>2-Dimethylcyclohexane.</li> </ul>   | Co.,<br>onal  |
| design by<br>and the ve<br>Battino, F<br>APPARATUS/P<br>500 cm <sup>3</sup> of s<br>flask of su   | Morrison and<br>ersion used :<br>Evans and Dar<br>ROCEDURE: De<br>solvent is p<br>ch size that   | based on the<br>d Billett (1)<br>is described by<br>nforth (2).<br>egassing. Up to<br>blaced in a<br>the liquid is  | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. cis-1,<br>Chemic<br>ly dis   | <ul> <li>a. Either Air Products and als, Inc. or Matheson (99 mol % or better.</li> <li>2-Dimethylcyclohexane.</li> <li>cal Samples Co., fraction the stored in data and stored in data</li></ul>  | Co.,<br>onal  |
| design by<br>and the ve<br>Battino, E<br>APPARATUS/P<br>500 cm <sup>3</sup> of<br>flask of su<br>about 4 cm o<br>ly stirred,  | Morrison and<br>ersion used :<br>Evans and Dar<br>ROCEDURE: De<br>solvent is p<br>ch size that<br>deep. The li<br>and vacuum   | based on the<br>d Billett (1)<br>is described by<br>nforth (2).<br>egassing. Up to<br>blaced in a<br>the liquid is<br>quid is rapid-<br>is applied in-  | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. cis-1,<br>Chemic<br>ly dis<br>n <sub>D</sub> (298  | <ul> <li>a. Either Air Products a<br/>cals, Inc. or Matheson (<br/>99 mol % or better.</li> <li>2-Dimethylcyclohexane.</li> <li>aal Samples Co., fraction<br/>tilled and stored in data (<br/>1.15 K) 1.4337.</li> </ul>   | Co.,<br>onal  |
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| design by<br>and the ve<br>Battino, E<br>APPARATUS/P<br>500 cm <sup>3</sup> of a<br>flask of su<br>about 4 cm<br>ly stirred,<br>termittentl<br>until the poperssure dro   | Morrison and<br>ersion used for<br>Evans and Dar<br>ROCEDURE: De<br>solvent is p<br>ch size that<br>deep. The li<br>and vacuum<br>y through a<br>ermanent gas<br>ops to 5 mic  | based on the<br>d Billett (1)<br>is described by<br>nforth (2).<br>egassing. Up to<br>blaced in a<br>the liquid is<br>quid is rapid-<br>is applied in-<br>liquid N <sub>2</sub> trap<br>s residual<br>erons.  | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. cis-1,<br>Chemic<br>ly dis<br>n <sub>D</sub> (298  | <pre>A. Either Air Products a<br/>cals, Inc. or Matheson (<br/>99 mol % or better.<br/>2-Dimethylcyclohexane.<br/>cal Samples Co., fractic<br/>tilled and stored in da<br/>tilled and stored in da<br/>til</pre> | Co.,<br>onal  |
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| design by<br>and the ve<br>Battino, F<br>Battino, F<br>APPARATUS/P<br>500 cm <sup>3</sup> of s<br>flask of suc<br>about 4 cm of<br>ly stirred,<br>termittentl<br>until the po<br>pressure dro<br>Solubility I<br>gassed solve<br>film down a<br>taining the<br>solvent vapo   | Morrison and<br>ersion used is<br>Evans and Dar<br>Evans and Dar<br>ROCEDURE: De<br>solvent is p<br>ch size that<br>deep. The li<br>and vacuum<br>y through a<br>ermanent gas<br>ops to 5 mic<br>Determinatio<br>Determinatio<br>ent is passe<br>glass spira<br>solute gas<br>or at a tota                                 | based on the<br>d Billett (1)<br>is described by<br>nforth (2).<br>egassing. Up to<br>blaced in a<br>the liquid is<br>quid is rapid-<br>is applied in-<br>liquid N <sub>2</sub> trap<br>s residual<br>erons.<br>on. The de-<br>id in a thin<br>il tube con-<br>plus the<br>l pressure of  | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. cis-1,<br>Chemic<br>ly dis<br>n <sub>D</sub> (298<br>- ESTIMATED<br>REFERENCES:<br>1. Morris                                       | <pre>A. Either Air Products a<br/>cals, Inc. or Matheson (<br/>99 mol % or better.<br/>2-Dimethylcyclohexane.<br/>cal Samples Co., fractic<br/>tilled and stored in da<br/>tilled and stored in da<br/>til</pre> | Co.,<br>onal  |
| design by<br>and the ve<br>Battino, F<br>Battino, F<br>APPARATUS/P<br>500 cm <sup>3</sup> of a<br>flask of suc<br>about 4 cm of<br>ly stirred,<br>termittently<br>until the popressure dr<br>Solubility J<br>gassed solve<br>film down a<br>taining the<br>solvent vapone atm. The  | Morrison and<br>ersion used a<br>Evans and Dar<br>Evans and Dar<br>Solvent is p<br>ch size that<br>deep. The li<br>and vacuum<br>y through a<br>ermanent gas<br>ops to 5 mic<br>Determinatio<br>ent is passe<br>glass spira<br>solute gas<br>or at a tota<br>e volume of   | based on the<br>d Billett (1)<br>is described by<br>nforth (2).<br>egassing. Up to<br>blaced in a<br>the liquid is<br>quid is rapid-<br>is applied in-<br>liquid N <sub>2</sub> trap<br>s residual<br>erons.<br>m. The de-<br>id in a thin<br>the tube con-<br>plus the<br>l pressure of<br>gas absorbed                                    | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. <u>cis</u> -1,<br>Chemic<br>ly dis<br>n <sub>D</sub> (298<br>- ESTIMATED<br>REFERENCES:<br>1. Morris<br><u>J. Che</u>              | a. Either Air Products a<br>sals, Inc. or Matheson (<br>99 mol % or better.<br>2-Dimethylcyclohexane.<br>sal Samples Co., fraction<br>tilled and stored in da<br>1.15 K) 1.4337.<br>ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$<br>son, T. J.; Billett, F.<br>Em. Soc. 1948, 2033.   | Co.,<br>onal  |
| design by<br>and the ve<br>Battino, E<br>Battino, E<br>APPARATUS/P:<br>500 cm <sup>3</sup> of a<br>flask of su<br>about 4 cm<br>ly stirred,<br>termittent!<br>until the po-<br>pressure dro<br>Solubility I<br>gassed solve<br>film down a<br>taining the<br>solvent vapo<br>one atm. The<br>is found by                          | Morrison and<br>ersion used for<br>Evans and Dar<br>Evans and Dar<br>Constant of the<br>solvent is p<br>ch size that<br>deep. The li<br>and vacuum<br>y through a<br>ermanent gas<br>ops to 5 mic<br>Determinatio<br>ent is passe<br>glass spira<br>solute gas<br>or at a tota<br>e volume of<br>difference<br>final volum | based on the<br>d Billett (1)<br>is described by<br>nforth (2).<br>egassing. Up to<br>blaced in a<br>the liquid is<br>quid is rapid-<br>is applied in-<br>liquid N <sub>2</sub> trap<br>s residual<br>erons.<br>on. The de-<br>d in a thin<br>the tube con-<br>plus the<br>l pressure of<br>gas absorbed<br>between the<br>mes in the       | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. cis-1,<br>Chemic<br>ly dis<br>n <sub>D</sub> (298<br>- ESTIMATED<br>REFERENCES:<br>1. Morris<br><u>J. Che</u><br>2. Battir<br>Danf | h. Either Air Products of<br>eals, Inc. or Matheson (<br>99 mol % or better.<br>2-Dimethylcyclohexane.<br>al Samples Co., fraction<br>tilled and stored in da<br>15 K) 1.4337.<br>ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta x_1/x_1 = 0.03$<br>tion, T. J.; Billett, F.<br>m. Soc. 1948, 2033.<br>to, R.; Evans, F. D.;<br>forth, W. F.  | Donal<br>ark. |
| design by<br>and the ve<br>Battino, E<br>Battino, E<br>Battino, E<br>APPARATUS/P<br>500 cm <sup>3</sup> of a<br>flask of su<br>about 4 cm<br>ly stirred,<br>termittentl<br>until the p<br>pressure dro<br>Solubility I<br>gassed solve<br>film down a<br>taining the<br>solvent vap<br>one atm. The<br>is found by<br>initial and | Morrison and<br>ersion used i<br>Evans and Dar<br>Evans and Dar<br>Constant is p<br>ch size that<br>deep. The li<br>and vacuum<br>y through a<br>ermanent gas<br>ops to 5 mic<br>Determinatio<br>ent is passe<br>glass spira<br>solute gas<br>or at a tota<br>e volume of<br>difference                                    | based on the<br>d Billett (1)<br>is described by<br>nforth (2).<br>egassing. Up to<br>blaced in a<br>the liquid is<br>quid is rapid-<br>is applied in-<br>liquid N <sub>2</sub> trap<br>s residual<br>erons.<br>on. The de-<br>d in a thin<br>a thin<br>tube con-<br>plus the<br>l pressure of<br>gas absorbed<br>between the<br>mes in the | SOURCE AND PU<br>1. Helium<br>Chemic<br>Inc.,<br>2. cis-1,<br>Chemic<br>ly dis<br>n <sub>D</sub> (298<br>- ESTIMATED<br>REFERENCES:<br>1. Morris<br><u>J. Che</u><br>2. Battir<br>Danf | a. Either Air Products a<br>sals, Inc. or Matheson (<br>99 mol % or better.<br>2-Dimethylcyclohexane.<br>al Samples Co., fraction<br>tilled and stored in da<br>15 K) 1.4337.<br>ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$<br>fon, T. J.; Billett, F.<br>m. Soc. 1948, 2033.<br>No, R.; Evans, F. D.;  | co.,          |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |
|--|---|--|--|
| 1. Helium; He; 7440-59-7   | Geller, E. B.; Battino, R.;   |  |  |
| <ol> <li><u>trans</u>-1,2-Dimethylcyclohexane;<br/>C<sub>8</sub>H<sub>16</sub>; 6876-23-9</li> </ol>   | Wilhelm, E.   |  |  |
| -8.19,   | <u>J. Chem. Thermodyn</u> . 1976, <u>8</u> , 197-202.   |  |  |
| VARIABLES:   | PREPARED BY:  |  |  |
| T/K: 298.03<br>P/kPa: 101.325 (1 atm)  | H. L. Clever  |  |  |
| EXPERIMENTAL VALUES:   | <b>I</b>  |  |  |
| T/K Mol Fraction<br>$x_1 \times 10^4$  | BunsenOstwaldCoefficientCoefficient $\alpha \ge 10^2$ L $\ge 10^2$  |  |  |
| 298.03 1.80  | 2.78 3.03   |  |  |
| The solubility value was adjusted to<br>101.325 kPa (1 atm) by Henry's law.  |   |  |  |
| The Bunsen coefficient was calculate   | ed by the compiler.   |  |  |
|  |   |  |  |
| AUXILIARY  | INFORMATION   |  |  |
| METHOD: The apparatus is based on the  | SOURCE AND PURITY OF MATERIALS:   |  |  |
| design by Morrison and Billett (1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2).  | <ol> <li>Helium. Either Air Products &amp;<br/>Chemicals, Inc. or Matheson Co.,<br/>Inc., 99 mol % or better.</li> </ol>                      |  |  |
| APPARATUS/PROCEDURE: Degassing. Up to<br>500 cm <sup>3</sup> of solvent is placed in a   | 2. trans-1,2-Dimethylcyclohexane.<br>Chemical Samples Co., fractional-<br>ly distilled and stored in dark.<br>n <sub>D</sub> (298.15) 1.4248. |  |  |
| flask of such size that the liquid is<br>about 4 cm deep. The liquid is rapid-<br>ly stirred and vacuum is applied in-   |   |  |  |
| termittently through a liquid N <sub>2</sub> trap<br>until the permanent gas residual<br>pressure drops to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent passes in a thin film | ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$   |  |  |
| down a glass spiral containing the<br>solute gas plus the solvent vapor at<br>a total pressure of one atm. The vol-<br>ume of gas absorbed is measured in a<br>buret system, and the solvent is    | <pre>REFERENCES: 1. Morrison, T. J.; Billett, F. <u>J. Chem. Soc</u>. 1948, 2033. 2. Battino, R.; Evans, F. D.;</pre>                         |  |  |
| collected in a tared flask and weighed.  | Danforth, W. F.<br>J. <u>Am. Oil Chem. Soc</u> . 1968, <u>45</u> ,<br>830.  |  |  |

| COMPONENTS:  |   |
|--|---|
|  | ORIGINAL MEASUREMENTS:  |
| <ol> <li>Helium; He; 7440-59-7</li> <li>cis-1,3-Dimethylcyclohexane; 59</li> </ol>   | Geller, E. B.; Battino, R.;<br>Wilhelm. E.  |
| $\frac{213}{\text{mol } \text{%;}C_8\text{H}_{16}\text{; 638-04-0}}$   |   |
| 3. <u>trans</u> -1,3-Dimethylcyclohexane; 41<br>mol %;C <sub>8</sub> H <sub>16</sub> ; 2207-03-6   | <u>J. Chem. Thermodyn</u> . 1976, <u>8</u> , 197-202.   |
| VARIABLES: T/K: 298.09   | PREPARED BY:  |
| P/kPa: 101.325 (1 atm)   | H. L. Clever  |
| EXPERIMENTAL VALUES:   |   |
| T/K Mol Fraction   | Bunsen Ostwald  |
| $x_1 \times 10^4$  | $\begin{array}{c} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \end{array}$   |
| 298.09 1.68  | 2.59 2.83   |
| The solubility value was adjusted to<br>101.325 kPa (1 atm) by Henry's law.  |   |
| The Bunsen coefficient was calculate   | ed by the compiler.   |
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| AUXILIARY  | INFORMATION   |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett (1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2). | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.                        |
|  | <ol> <li>cis-1,3-Dimethylcyclohexane.<br/>Chemical Samples Co., binary mix-<br/>ture, analysed by R. I. by auth-<br/>ors, used as received.     </li> </ol> |
| APPARATUS/PROCEDURE: Degassing. Up to 500 cm <sup>3</sup> of solvent is placed in a flask of such size that the liquid is                                | <ol> <li>trans-1,3-Dimethylcyclohexane.<br/>Chemical Samples Co., binary mix-<br/>ture, analysed by R. I. by auth-</li> </ol>                               |
| about 4 cm deep. The liquid is rapid-<br>ly stirred, and vacuum is applied in-   | ors. used as received.  |
| termittently through a liquid N <sub>2</sub> trap<br>until the permanent gas residual  | ESTIMATED ERROR:<br>$\delta T/K = 0.03$   |
| pressure drops to 5 microns.<br>Solubility Determination. The de-  | $\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$  |
| gassed solvent passes in a thin film   |   |
| down a glass spiral tube conatining<br>the solute gas plus the solvent vapor<br>at a total pressure of one atm. The                                      | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.   |
| absorbed gas volume is measured in a<br>buret system, and the solvent is   | 2. Battino, R.; Evans, F. D.;   |
| collected in a tared flask and<br>weighed.   | 2. Battino, R.; Evans, F. D.;<br>Danforth, W. F.<br>J. Am. Oil Chem. Soc. 1968, 45,   |
|  | 830.  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| 1. Helium; He; 7440-59-7  | Geller, E. B.; Battino, R.;<br>Wilhelm, E.  |
| 2. <u>cis</u> -1,4-Dimethylcyclohexane; 70<br>mol %; C <sub>8</sub> H <sub>16</sub> ; 624-29-3  |   |
| 3. <u>trans</u> -1,4-Dimethylcyclohexane; 30 mol %; $C_{8H_{16}}$ ; 2207-04-7   | J. Chem. Thermodyn. 1976, 8, 197-202.   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 298.15 - 298.24  | H. L. Clever  |
| P/kPa: 101.325 (1 atm)  |   |
| EXPERIMENTAL VALUES:  | L   |
| T/K Mol Fraction  | Bunsen Ostwald  |
| $x_1 \times 10^4$   | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$  |
| 298.15 1.64<br>298.24 1.64  | 2.53 2.76<br>2.53 2.76  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.   | o a partial pressure of helium of   |
| The Bunsen coefficients were calculate  | ed by the compiler.   |
|   |   |
| AUXILIARY   | INFORMATION   |
| METHOD: The apparatus is based on the   | SOURCE AND PURITY OF MATERIALS:   |
| design by Morrison and Billett (1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2).   | 1. Helium. Either Air Products &<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.   |
| APPARATUS/PROCEDURE: Degassing. Up to<br>500 cm <sup>3</sup> of solvent is placed in a  | <ol> <li>cis-1,4-Dimethylcyclohexane.<br/>Chemical Samples Co., binary mix-<br/>ture, analysed by R. I. by auth-<br/>ors, used as received.</li> </ol>          |
| flask of such size that the liquid is about 4 cm deep. The liquid is rapid-   | <ol> <li>trans-1,4-Dimethylcyclohexane.<br/><u>Chemical Samples Co., binary mix-</u><br/>ture, analysed by R. I. by auth-<br/>ors, used as received.</li> </ol> |
| ly stirred, and vacuum is applied in-   | VIN: ubcu ub recetted   |
| termittently through a liquid N <sub>2</sub> trap   | ESTIMATED ERROR:  |
| termittently through a liquid $N_2$ trap<br>until the permanent gas residual<br>pressure drops to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin |   |
| termittently through a liquid $N_2$ trap<br>until the permanent gas residual<br>pressure drops to 5 microns.<br>Solubility Determination. The de-                                       | ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$  |

| COMPONENTS:   | EVALUATOR:  |
|---|---|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Benzene; C<sub>6</sub>H<sub>6</sub>; 71-43-2</li> </ol> | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322<br>USA |
|   | January 1978  |

CRITICAL EVALUATION:

Since the early qualitative observation of Ramsay, Collie, and Travers (1) that helium is insoluble in benzene, the solubility of helium in benzene at 101,325 kPa (1 atm) was measured by Lannung (2), Clever, Battino, Saylor, and Gross (3), and de Wet (4). The three data sets and an equal weight calculation of the three were each fitted by the method of least squares to a free energy equation linear in temperature,

$$\Delta G^{\circ} = - RT \ln X_1 = A + BT.$$

In the combined data least squares fit only the 298.15 K solubility value from reference 3 fell more than 2 standard deviations from the least square line. That value was omitted and a second least square linear fit found which is the recommended equation. The information on the linear free energy equations is summarized in Table 1. Table 2 contains the recommended mole fraction solubilities of helium in benzene at five degree intervals from 288.15 to 318.15 K.

The recommended thermodynamic values for the transfer of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 10,321 + 44,256 T$ 

Std. Dev.  $\Delta G^{\circ} = 22.6$ , Coef. Corr. = 0.9977

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 10,321, \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -44.256$ 

TABLE 1. Parameters for  $\Delta G^{\circ} = A + BT$  Equation.

| $\Delta G^{\circ}/J \text{ mol}^{-1}$                       | Std. Dev. $\Delta G^{\circ}$ | No. Exp. Points | Weight      | Reference   |
|---|------------------------------|-----------------|-------------|-------------|
| 10,318 + 44.260 T<br>10,242 + 44.422 T<br>10,057 + 45.153 T | 25.0<br>51.2<br>25.6         | 10<br>3<br>3    | 1<br>1<br>1 | 2<br>3<br>4 |
| I. 10,349 + 44.140 T<br>II. 10,321 + 44.256 T               | 30.8<br>22.6                 | 16<br>15        |             |             |

TABLE 2. Solubility of Helium in Benzene. Recommended Mole Fraction Solubility and Gibbs Energy of Solution as a Function of Temperature.

| Т/К    | Mol Fraction $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|--------------------------------|-------------------------|
| 288.15 | 0.657                          | 23,073                  |
| 293.15 | 0.707                          | 23,294                  |
| 298.15 | 0.759                          | 23,515                  |
| 303.15 | 0.813                          | 23,737                  |
| 308.15 | 0.869                          | 23,958                  |
| 313.15 | 0.926                          | 24,179                  |
| 318.15 | 0.986                          | 24,401                  |

Popov and Drakin (5) calculated apparent molal volumes of helium dissolved in benzene at 298.15 K from their density measurements of the saturated solutions over the pressure interval of 10 - 100 atm. Their results are:

| P/atm               | 9.98   | 29.36  | 58.60  | 78.30    | 97.66      |
|---------------------|--------|--------|--------|----------|------------|
| $V_1/cm^3 mol^{-1}$ | 33 ± 6 | 32 ± 2 | 30 ± 2 | 29 ± 0.7 | 24.4 ± 0.6 |

| COMPONENTS:   | EVALUATOR:   |  |  |
|---|--|--|--|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Benzene; C<sub>6</sub>H<sub>6</sub>; 71-43-2</li> </ol>                       | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322 |  |  |
|   |  |  |  |
| CRITICAL EVALUATION:  |  |  |  |
| No report of calorimetric measur<br>helium in benzene was found.  | rement of the enthalpy of solution of  |  |  |
| <ol> <li>Ramsay, W.; Collie, J. N.; Traver<br/>J. <u>Chem</u>. <u>Soc</u>. 1895, <u>67</u>, 684.</li> </ol>           | cs, M.   |  |  |
| 2. Lannung, A. J. Am. Chem. Soc. 19   | 930, <u>52</u> , 68.   |  |  |
| <ol> <li>Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem.<br/>1957, <u>61</u>, 1078.</li> </ol> |  |  |  |
| 4. de Wet, W. J. <u>J. S. Afr. Chem. Inst</u> . 1964, <u>17</u> , 9.  |  |  |  |
| 5. Popov, G. A.; Drakin, S. I. Zh.  | <u>Fiz</u> . <u>Khim</u> . 1974, <u>48</u> , 631.                                  |  |  |
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| 1. Helium; He; 7440-59-7       Lannung, A.         2. Benzene; $C_{6}H_{6}$ ; 71-43-2       J. Am. Chem. Soc. 1930, 52, 68 -         VARIABLES:         T/K: 288.15 - 303.15         PREPARED BY:         DEXTERIMENTAL VALUES:         T/K MOI Fraction         Summer Coefficient         Ostwald         Ostwald         288.15       0.650         288.15       0.650         288.15       0.650         288.15       0.714       1.80       1.93         298.15       0.770       1.93       2.11         298.15       0.766       1.92       2.10         298.15       0.766       1.92       2.10         298.15       0.766       1.92       2.10         298.15       0.766       1.92       2.00         303.15       0.807       2.00       2.02         303.15       0.807       2.00       2.22         Smoothed Data: $\Delta G^O/J$ mol <sup>-1</sup> = -RT ln X <sub>1</sub> = 10,318 + 44.260 T         Std. Dev.AG <sup>O</sup> = 25.0, Coef. Corr. = 0.9946 <tr< th=""><th colspan="3">COMPONENTS:</th><th>ORIGINAL MEASU</th><th>REMENTS:</th><th></th></tr<>   | COMPONENTS:   |   |  | ORIGINAL MEASU                                  | REMENTS:                                      |                            |
|---|---|---|--|---|---|----------------------------|
| 2. Benzene; $C_{6}H_{6}$ ; 71-43-2<br>J. Am. Chem. Soc. 1930, 52, 68 -<br>VARIABLES:<br>T/K: 288.15 - 303.15<br><b>EXPERIMENTAL VALUES:</b><br>T/K Mol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup><br>288.15<br>288.15<br>0.650<br>1.65<br>1.74<br>293.15<br>0.714<br>293.15<br>0.714<br>293.15<br>0.714<br>293.15<br>0.714<br>293.15<br>0.714<br>293.15<br>0.714<br>1.80<br>1.93<br>293.15<br>0.714<br>1.80<br>1.93<br>293.15<br>0.716<br>1.93<br>2.10<br>298.15<br>0.758<br>1.90<br>2.00<br>2.01<br>2.23<br>303.15<br>0.803<br>2.00<br>2.22<br>Smoothed Data: $\Delta G^{0}/J$ mol <sup>-1</sup> = -RT ln X <sub>1</sub> = 10,318 + 44.260 T<br>Std. Dev.AG <sup>o</sup> = 25.0, Coef. Corr. = 0.9946<br>For the recommended Gibbs free energy equation see<br>the critical evaluation of the solubility of helium<br>in benzene.<br>The solubility values were adjusted to a partial pressure of helium of<br>101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the<br>Ostwald coefficient were calculated by the compiler.<br>AUXILIARY INFORMATION<br>KETHOD:<br>Gas absorption. The gas is presat-<br>urated with solvent vapor. The gas<br>volume absorbed is the difference<br>between initial and final gas vol-<br>umes. The amount of solvent is detra-<br>the weight of mercury<br>displaced.<br>APPARATUS/FROCEDURE: The apparatus is a<br><b>J. Am. Chem. Soc.</b> 1930, 52, 68 -<br><b>J. Meltim. Linde's Liquid Air.</b><br>Contained 0.5 per cent by volu<br>argewichtsbestimmung'. Melting<br>point 5.48 °C.<br><b>ESTIMATED ERBOR:</b>   | 1. Helium; He;  | 7440-59-                                  | 7  | Lannung, A.                                     |   |                            |
| J. Am. Chem. Soc. 1930, 52, 68 -         VARIABLES:         T/K: 288.15 - 303.15         T/K: 288.15 - 303.15         PREPARED BY:         T/K: 001 Fraction $x_1 \times 10^4$ 288.15         0.650         1.65         288.15         0.650         1.65         288.15         0.650         1.65         293.15         0.714         1.80         298.15         0.714         298.15         0.714         298.15         0.758         1.90         298.15         0.758         1.90         298.15         0.758         1.90         298.15         0.758         1.90         201         210         298.15         0.803         2.00         298.15         0.758         1.90         291         292.10         293.11         293.15         1.80         1.90 <td colspan="2"></td> <td></td> <td></td> <td></td>   |   |   |  |   |   |                            |
| T/K: 288.15 - 303.15       P.L.Long         P.L.Long         T/K: 288.15 - 303.15         T/K Mol Fraction         Summer P.L.Long         T/K Mol Fraction         Summer P.L.Long         T/K         288.15 0.650         288.15 0.650         288.15 0.714         293.15 0.714         298.15 0.770         298.15 0.770         298.15 0.776         298.15 0.776         298.15 0.766         298.15 0.776         1.90         200         2.01         2.23         Smoothed Data: $\Delta G^0/J \mod^{-1} = -RT \ln X_1 = 10,318 + 44.260 T         Std. Dev.AG0 = 25.0, Coef. Corr. = 0.9946         For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in benzene.         AUXILIARY INFORMATION         WETROD:         Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volume. The amount of solvent is determined by the weight of mercury displaced.     $  | U   |   |  | J. Am. Chem                                     | . <u>Soc</u> . 1930,                          | <u>52</u> , 68 - 80.       |
| EXPERIMENTAL VALUES:<br>$T/K  Mol \; Fraction \\ X_1 \times 10^4 \qquad Coefficient \\ Contained \\ Coefficient \\ Contained \\ Coofficient \\ Cont$  | VARIABLES:  | <u> </u>                                  |  | PREPARED BY:                                    |   |                            |
| $\frac{T/K}{X_1 \times 10^4}$ $\frac{X_1 \times 10^4}{(288.15 \ 0.650 \ 1.65 \ 1.74}$ $\frac{288.15 \ 0.650 \ 1.65 \ 1.74}{288.15 \ 0.650 \ 1.65 \ 1.74}$ $\frac{288.15 \ 0.650 \ 1.65 \ 1.74}{293.15 \ 0.714 \ 1.80 \ 1.93}$ $\frac{293.15 \ 0.714 \ 1.80 \ 1.93}{293.15 \ 0.710 \ 1.79 \ 1.92}$ $\frac{296.15 \ 0.776 \ 1.92 \ 2.10}{298.15 \ 0.756 \ 1.92 \ 2.10}$ $\frac{298.15 \ 0.756 \ 1.92 \ 2.10}{298.15 \ 0.756 \ 1.92 \ 2.10}$ $\frac{298.15 \ 0.756 \ 1.92 \ 2.10}{298.15 \ 0.756 \ 1.92 \ 2.10}$ $\frac{200 \ 2.22}{200 \ 2.22}$ Smoothed Data: $\Delta G^O/J \ mol^{-1} = -RT \ ln \ X_1 = 10,318 + 44.260 \ T$ Std. Dev. $AG^O = 25.0$ , Coef. Corr. = 0.9946<br>For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in benzene. The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the Ostwald coefficient were calculated by the compiler. $\frac{AUXILLARY INFORMATION}{KETROD:}$ Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced. $SURCE AND FURITY OF MATERIALS:$ $\frac{SURCE AND FURITY OF MATERIALS:}{SURCE AND FURITY OF MATERIALS:}$ $\frac{SURCE AND FURITY OF MATERIALS:}{SURCE AND FURITY OF MATERIALS:}$   | Т/К: 2  | 88.15 - 3                                 | 03.15  | P   | .L.Long                                       |                            |
| $\frac{X_1 \times 10^4}{(288.15 \ 0.650 \ 1.65 \ 1.74}$ $\frac{X_1 \times 10^4}{(288.15 \ 0.650 \ 1.65 \ 1.74}$ $\frac{288.15 \ 0.650 \ 1.65 \ 1.74}{(293.15 \ 0.714 \ 1.80 \ 1.93}$ $\frac{293.15 \ 0.714 \ 1.80 \ 1.93}{(293.15 \ 0.714 \ 1.80 \ 1.93}$ $\frac{293.15 \ 0.770 \ 1.93 \ 2.11}{(298.15 \ 0.766 \ 1.92 \ 2.10 \ 2.22}$ $298.15 \ 0.758 \ 1.90 \ 2.07$ $\frac{298.15 \ 0.766 \ 1.92 \ 2.10}{(298.15 \ 0.766 \ 1.92 \ 2.10 \ 2.22}$ Smoothed Data: $\Delta G^O/J \mod^{-1} = -RT \ln X_1 = 10,318 + 44.260 \ T$ Std. Dev. $\Delta G^O = 25.0$ , Coef. Corr. = 0.9946<br>For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in benzene. The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the Ostwald coefficient were calculated by the compiler. $\frac{AUXILLARY INFORMATION}{KETHOD:}$ Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference between initial and final gas volume absorbed is the difference in the there the there there there there there there ther  | XPERIMENTAL VALUE   | ES:                                       | ······   |   |   |                            |
| $\frac{x_1 \times 10^4}{288.15 \\ 288.15 \\ 288.15 \\ 288.15 \\ 0.650 \\ 1.65 \\ 1.74 \\ 293.15 \\ 0.714 \\ 1.80 \\ 1.93 \\ 293.15 \\ 0.714 \\ 1.80 \\ 1.93 \\ 293.15 \\ 0.710 \\ 1.79 \\ 1.92 \\ 298.15 \\ 0.766 \\ 1.92 \\ 2.10 \\ 298.15 \\ 0.766 \\ 1.92 \\ 2.10 \\ 298.15 \\ 0.766 \\ 1.92 \\ 2.10 \\ 2.01 \\ 2.23 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 0.07 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 0.07 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 0.07 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 0.07 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ 0.07 $ |   | т/к                                       | Mol Fraction   |   |   |                            |
| $\frac{288.15}{293.15} = 0.714 + 1.80 + 1.93}{293.15} = 0.714 + 1.80 + 1.93}{293.15} = 0.710 + 1.79 + 1.92}$ $\frac{298.15}{293.15} = 0.770 + 1.93 + 2.11}{298.15} = 0.766 + 1.92 + 2.10}$ $\frac{298.15}{298.15} = 0.766 + 1.92 + 2.10}{298.15} = 0.766 + 1.92 + 2.10}$ $\frac{303.15}{303.15} = 0.807 + 2.01 + 2.23}{303.15} = 0.803 + 2.00 + 2.22}$ Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = -RT \ln X_1 = 10,318 + 44.260 \text{ T}}$ Std. Dev. $\Delta G^{O} = 25.0$ , Coef. Corr. = 0.9946<br>For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in benzene.<br>The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the Ostwald coefficient were calculated by the compiler.<br>AUXILIARY INFORMATION<br>WETHOD:<br>Gas absorption. The gas is presaturated with solvent vapor. The gas volumes. The amount of solvent is determined by the weight of mercury displaced.<br>APPARATUS/PROCEDURE: The apparatus is a  |   |   | X <sub>1</sub> x 10 <sup>4</sup>                           |   |   |                            |
| 293.15       0.714       1.80       1.93         293.15       0.710       1.79       1.92         298.15       0.766       1.92       2.10         298.15       0.766       1.90       2.07         303.15       0.803       2.00       2.22         Smoothed Data: $\Delta G^{0}/J \mod^{-1} = -RT \ln X_1 = 10,318 + 44.260 T$ Std. Dev. $\Delta G^{0} = 25.0$ , Coef. Corr. = 0.9946         For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in benzene.         The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the Ostwald coefficient were calculated by the compiler.         AUXILIARY INFORMATION   |   |   |  |   |   |                            |
| $\frac{298.15}{298.15}  0.766 \\ 1.92 \\ 2.10 \\ 2.07 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22 \\ \hline \\$  |   | 293.15                                    | 0.714  | 1.80  | 1.93  |                            |
| $\frac{303.15 \\ 303.15 \\ 303.15 \\ 0.803 \\ 2.00 \\ 2.22}$ Smoothed Data: $\Delta G^{0}/J \text{ mol}^{-1} = -RT \ln X_1 = 10,318 + 44.260 \text{ T}$ Std. Dev. $\Delta G^{0} = 25.0$ , Coef. Corr. = 0.9946<br>For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in benzene.<br>The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the Ostwald coefficient were calculated by the compiler.<br>AUXILIARY INFORMATION<br>METHOD:<br>Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.<br>APPARATUS/PROCEDURE: The apparatus is a   |   | 298.15                                    | 0.766  | 1.92  | 2.10  |                            |
| Std. Dev. $\Delta G^O$ = 25.0, Coef. Corr. = 0.9946         For the recommended Gibbs free energy equation see the critical evaluation of the solubility of helium in benzene.         The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the Ostwald coefficient were calculated by the compiler.         AUXILIARY INFORMATION         METHOD:       SOURCE AND PURITY OF MATERIALS:         Gas absorption. The gas is presaturated with solvent vapor. The gas volume absorbed is the difference between initial and final gas volumes. The amount of solvent is determined by the weight of mercury displaced.       SOURCE AND PURITY OF MATERIALS:         2. Benzene. Kahlbaum, "zur Moleku argewichtsbestimmung". Melting point 5.48 °C.         APPARATUS/PROCEDURE: The apparatus is a       ESTIMATED ERROR:   |   | 303.15                                    | 0.807  | 2.01  | 2.23  |                            |
| For the recommended Gibbs free energy equation see<br>the critical evaluation of the solubility of helium<br>in benzene.<br>The solubility values were adjusted to a partial pressure of helium of<br>101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the<br>Ostwald coefficient were calculated by the compiler.<br>AUXILIARY INFORMATION<br>METHOD:<br>Gas absorption. The gas is presat-<br>urated with solvent vapor. The gas<br>volume absorbed is the difference<br>between initial and final gas vol-<br>umes. The amount of solvent is deter-<br>mined by the weight of mercury<br>displaced.<br>APPARATUS/PROCEDURE: The apparatus is a<br>For the recommended Gibbs free energy equation see<br>the solubility of helium of<br>solution of the solubility of helium of<br>solution of the solubility and the<br>SOURCE AND FURITY OF MATERIALS:<br>1. Helium. Linde's Liquid Air.<br>Contained 0.5 per cent by volu<br>neon.<br>2. Benzene. Kahlbaum, "zur Moleku<br>argewichtsbestimmung". Melting<br>point 5.48 °C.<br>ESTIMATED ERROR:  | Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = -RT \ln S$  |   |  | $x_1 = 10,318 +$                                | 44.260 T                                      |                            |
| the critical evaluation of the solubility of helium<br>in benzene.<br>The solubility values were adjusted to a partial pressure of helium of<br>101.325 kPa (1 atm) by Henry's law. The mole fraction solubility and the<br>Ostwald coefficient were calculated by the compiler.<br>AUXILIARY INFORMATION<br>METHOD:<br>Gas absorption. The gas is presat-<br>urated with solvent vapor. The gas<br>volume absorbed is the difference<br>between initial and final gas vol-<br>umes. The amount of solvent is deter-<br>mined by the weight of mercury<br>displaced.<br>APPARATUS/PROCEDURE: The apparatus is a<br>the critical evaluation of the solubility of helium of<br>approximate to a partial pressure of helium of<br>SOURCE AND PURITY OF MATERIALS;<br>1. Helium. Linde's Liquid Air.<br>Contained 0.5 per cent by volu<br>neon.<br>2. Benzene. Kahlbaum, "zur Moleku<br>argewichtsbestimmung". Melting<br>point 5.48 °C.<br>ESTIMATED ERROR:  |   | Std. De                                   | $v.\Delta G^{O} = 25.0,$                                   | Coef. Corr.                                     | = 0.9946                                      |                            |
| METHOD:<br>Gas absorption. The gas is presat-<br>urated with solvent vapor. The gas<br>volume absorbed is the difference<br>between initial and final gas vol-<br>umes. The amount of solvent is deter-<br>mined by the weight of mercury<br>displaced.<br>APPARATUS/PROCEDURE: The apparatus is a<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Linde's Liquid Air.<br>Contained 0.5 per cent by volu<br>neon.<br>2. Benzene. Kahlbaum, "zur Moleku<br>argewichtsbestimmung". Melting<br>point 5.48 °C.<br>ESTIMATED ERROR:   | 101.325 kPa (1  | the cri<br>in benz<br>values w<br>atm) by | tical evaluati<br>ene.<br>ere adjusted t<br>Henry's law. T | on of the sol<br>o a partial p<br>he mole fract | ubility of h<br>pressure of h<br>ion solubili | elium<br>elium of          |
| Gas absorption. The gas is presat-<br>urated with solvent vapor. The gas<br>volume absorbed is the difference<br>between initial and final gas vol-<br>umes. The amount of solvent is deter-<br>mined by the weight of mercury<br>displaced.<br>APPARATUS/PROCEDURE: The apparatus is a   |   |   | AUXILIARY  | INFORMATION                                     |   |                            |
| urated with solvent vapor. The gas<br>volume absorbed is the difference<br>between initial and final gas vol-<br>umes. The amount of solvent is deter-<br>mined by the weight of mercury<br>displaced.<br>APPARATUS/PROCEDURE: The apparatus is a   | METHOD:   |   |  | SOURCE AND PUR                                  | ITY OF MATERIAL                               | S;                         |
| argewichtsbestimmung". Melting<br>point 5.48 °C.<br>APPARATUS/PROCEDURE: The apparatus is a   | urated with solvent vapor. The gas<br>volume absorbed is the difference   |   | Containe   |   |   |                            |
| APPARATUS/PROCEDURE: The apparatus is a   | mined by the w  |   |  | argewich  | tsbestimmung                                  | zur Molekul-<br>". Melting |
| modification of that of von Antropoff $\delta T/K = 0.03$   | modification of that of von Antropoff   |   |  |   |   |                            |
| (1). A calibrated, combined all glass<br>manometer and bulb is enclosed in an   | (1). A calibra manometer and  | ted, comb<br>bulb is e                    | ined all glass<br>nclosed in an                            |   |   |                            |
| <pre>air thermostat. Mercury is used as<br/>the calibration and confining liquid.<br/>The solvent is degassed in the appa-<br/>ratus. The solvent and the gas are<br/>shaken together until equilibrium is<br/>established.</pre> REFERENCES: 1. v. Antropoff, A.<br>Z. Electrochem. 1919, 25, 269.   | manometer and bulb is enclosed in an<br>air thermostat. Mercury is used as<br>the calibration and confining liquid.<br>The solvent is degassed in the appa-<br>ratus. The solvent and the gas are<br>shaken together until equilibrium is |   | 1. v. Antro  |   | , <u>25</u> , 269.                            |                            |
|   |   | r until e                                 | quilibrium is  |   |   |                            |

| COMPONENTS :   |                             |   | ORIGINAL MEASUR                             | REMENTS:   |
|--|-----------------------------|---|---|--|
|  |                             | Clever, H.L.                            | ; Battino, R.;                              |  |
| l. Helium; He; 7440-59-7   |                             | Saylor, J.                              | H.; Gross, P.M.                             |  |
| 2. Benzene; C <sub>6</sub> H   | 1 <sub>6</sub> ; 71-43-     | -2                                      |   |  |
|  |                             |   | J. Phys. Che                                | <u>m</u> . 1957, <u>61</u> , 1078 - 1083.  |
| VARIABLES:<br>T/K: 28  | 88.15 - 31                  | 14.95                                   | PREPARED BY:<br>P                           | .L.Long  |
|  |                             |   |   |  |
| EXPERIMENTAL VALUE   | s <u>:</u>                  | ······································  |   |  |
|  | т/к                         | Mol Fraction<br>$X_1 \times 10^4$       | Bunsen<br>Coefficient<br>∝x 10 <sup>2</sup> | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>  |
|  | 288.15                      |   | 1.68  | 1.77   |
|  | 298.15                      |   | 1.97  | 2.15   |
|  | 314.95                      | 0.949                                   | 2.33  | 2.69   |
| Smoothed Data:   | <b>▲</b> G <sup>O</sup> = - | RT ln $X_1 = 10$                        | ,242 + 44.422                               | T (J mol <sup>-1</sup> )   |
|  | Std. Dev                    | $\Delta G^{O} = 51.2,$                  | Coef. Corr.                                 | = 0.9964   |
|  |                             | recommended fra<br>evaluation of<br>ne. |   |  |
| The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law. |                             |   |   | ressure of helium of   |
|  |                             |   |   |  |
| h <del>an</del>  | <u></u>                     | AUXILIARY                               | INFORMATION                                 |  |
| METHOD: Volumetr:  | ic. The so                  | olvent is sat-                          | SOURCE AND PURI                             | ITY OF MATERIALS;  |
| urated with gas<br>an 8 mm x 180<br>to a gas buret<br>maintained at 1<br>absorbed.                         | cm glass :<br>.The total    | spiral attached<br>l pressure is        | and stand<br>no differ<br>2. Benzene.       | atheson Co. Both research<br>rad grades were used with<br>ence in results.<br>Jones & Laughlin Steel Co. |
|  |                             |   | Pittsburg<br>water was<br>and disti         | h, PA. Shaken with H <sub>2</sub> SO <sub>4</sub> ,<br>hed, dried over sodium,<br>lled.                  |
| APPARATUS / PROCEDUR   |                             |   | ESTIMATED ERRO                              | R:   |
| APPARATUS/PROCEDUR<br>modification of<br>Billett (1). The<br>clude the addition                            | f that of<br>he modific     | Morrison and<br>cations in-             |   | $\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$                                    |
| age for the so<br>a constant refe  | lvent, a m                  | manometer for                           | REFERENCES:                                 |  |
| extra buret for<br>The solvent is  | r highly s<br>degassed      | soluble gases.<br>by a modi-            |   | T.J.; Billett, F.<br>Soc. 1948, 2033;<br>2 3819  |
| fication of the<br>Daniel (2).   | e method (                  | of Baldwin and                          | 2. Baldwin,                                 | 2, 3819.<br>R.R.; Daniel, S.G.<br><u>Chem</u> . 1952, <u>2</u> , 161.                                    |
| 1  |                             |   | I   |  |

| COMPONENTS :   |   |   | ORIGINAL MEASU   | REMENTS .   |
|--|---|---|--|---|
|  |   |   | de Wet, W.J  |   |
| 1. Helium; He;   | 7440-59-7   |   |  |   |
| 2. Benzene; C <sub>6</sub> H   | 6; 71-43-   | 2   |  |   |
|  |   |   | <u>J.S. Afr. (</u>   | <u>Chem. Inst</u> . 1964, <u>17</u> , 9-13.   |
| VARIABLES:   |   |   | PREPARED BY:   |   |
| _, _,  | 1.75 - 30   |   | I  | .L.Long   |
| P/kPa: 1<br>EXPERIMENTAL VALUES  |   | 1 atm)  |  |   |
| EXPERIMENTAL VALUES  | -   | Mol Fraction  | Bunsen   | Ostwald   |
|  |   | X <sub>1</sub> x 10 <sup>4</sup>  | Coefficient<br>× x 10 <sup>2</sup>   | Coefficient<br>L x 10 <sup>2</sup>  |
|  | 291.75  | 0.697   | 1.76   | 1.88  |
|  | 299.15  |   | 1.90   | 2.08  |
| :  | 305.15  | 0.837   | 2.08   | 2.32  |
| Smoothed Data:   | ∆G <sup>0</sup> /J mc   | $1^{-1} = - RT ln$  | $x_1 = 10,057$   | + 45.153 T  |
|  | Std. Dev  | $\Delta G^{O} = 25.6$ ,   | Coef. Corr.  | . = 0.9964  |
|  | For the<br>critical<br>in benze   | . evaluation o  | ree energy eq<br>f the solubil   | quation see the<br>Lity of helium   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.  |   |   | o a partial p  | pressure of helium of   |
| The mole fracti<br>by the compiler   |   | lity and the o  | Ostwald coef:  | ficients were calculated  |
|  |   | AUXILIARY   | INFORMATION  |   |
| METHOD: Molumoty   |   |   | ·····  | RITY OF MATERIALS:  |
| To degas, the so<br>large continous<br>until the solver<br>out further rele<br>To saturate, the<br>a thin film thro<br>containing the o<br>gas absorbed is<br>ed buret system. | olvent is<br>ly evacuat<br>nt boils d<br>ease of d<br>solvent<br>ough a gla<br>gas. The v<br>measured | ted bulb<br>freely with-<br>issolved gases<br>is flowed in<br>ass spiral<br>volume of   | <ol> <li>Helium.<br/>purified<br/>at liqui<br/>purities<br/>than 0.3</li> <li>Benzene.<br/>distille</li> </ol> | No source given. The gas<br>l over activated charcoal<br>d air temperature. Im-<br>s estimated to be less<br>3 percent.<br>No source given. Benzene<br>ed immediately before use. |
| APPARATUS/PROCEDURI  | 3:  |   | ESTIMATED ERRO   |   |
| The apparatus is<br>that used by Mon<br>and others (2).<br>is saturated wit<br>through a glass   | s a modificrison and<br>The degas<br>th gas as<br>spiral co<br>tof solve<br>cal was su                | Billett (1)<br>ssed solvent<br>it flows<br>ontaining the<br>ent passed<br>uch that 10 - | J. Chem.<br>ibid. 19   | δT/K = 0.05<br>h, T.J.; Billett, F.<br><u>Soc</u> . 1948, 2033;<br>952, 3819.   |
|  |   |   | Saylo  | H.L.; Battino, R.;<br>c, J.H.; Gross, P.M.<br>. <u>Chem</u> . 1957, <u>61</u> , 1078.   |

| СОМ      | PONENTS:  | EVALUATOR:   |
|----------|---|--|
| 1.<br>2. | Helium; He; 7440-59-7<br>Methylbenzene (Toluene); C <sub>7</sub> H <sub>8</sub> ;<br>108-88-3 | H. L. Clever<br>Emory University<br>Department of Chemistry<br>Atlanta, Georgia 30322<br>USA |
|          |   | January 1978   |

## CRITICAL EVALUATION:

The solubility of helium in toluene was measured by Saylor and Battino (1) and by de Wet (2). The two sets of data agree within 2.7 percent over 288 - 308 K, the temperature range of common measurement. The agreement is within the experimental uncertainty of the method used. The two sets of data have been combined on a one to one weight basis by the method of least squares in a Gibbs energy equation,  $\Delta G^{\circ} = A + BT$  (Table 1). The recommended thermodynamic values for the transfer of helium from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \mod^{-1} = -RT \ln X_1 = 10,157 + 42.599 T$ Std. Dev.  $\Delta G^{\circ} = 47$ , Coef. Corr. = 0.9967  $\Delta H^{\circ}/J \mod^{-1} = 10,157$ ,  $\Delta S^{\circ}/J K^{-1} \mod^{-1} = -42.599$ 

The recommended mole fraction solubilities at 101.325 kPa (1 atm) and the Gibbs energy changes at five degree intervals are given in Table 2.

## TABLE 1. Parameters for the Gibbs energy change as a function of temperature.

| $\Delta G^{\circ} = A + BT$                                 | Std. Dev. ∆G°        | No. Exp. Points | Weight | Reference |
|---|----------------------|-----------------|--------|-----------|
| 10,454 + 41.720 T<br>10,608 + 40.965 T<br>10,157 + 42.599 T | 36.1<br>24.7<br>47.0 | 4<br>3<br>7     | 1<br>1 | 1 2 1 + 2 |

## TABLE 2. Recommended mole fraction solubility of helium in toluene at 101.325 kPa (1 atm).

| т/к    | Mol Fraction $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|--------------------------------|-------------------------|
| 288.15 | 0.858                          | 22,432                  |
| 293.15 | 0.923                          | 22,645                  |
| 298.15 | 0.990                          | 22,858-                 |
| 303.15 | 1.059                          | 23,071                  |
| 308.15 | 1.13                           | 23,284                  |
| 313.15 | 1.20                           | 23,497                  |
| 318.15 | 1.28                           | 23,710                  |
| 323.15 | 1.36                           | 23,923                  |
| 328.15 | 1.44                           | 24,136                  |
|        |                                |                         |

Saylor, J. H.; Battino, R. J. Phys. Chem. 1958, 62, 1334.
 de Wet, W. H. J. S. Afr. Chem. Inst. 1964, 17, 9.

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |  |
|---|---|--|
| 1. Helium; He; 7440-59-7  | Saylor, J. H.; Battino, R.  |  |
| <ol> <li>Methylbenzene (Toluene); C<sub>7</sub>H<sub>8</sub>;<br/>108-88-3</li> </ol>   |   |  |
|   | J. Phys. Chem. 1958, <u>62</u> , 1334 - 1337.   |  |
| VARIABLES:  | PREPARED BY:  |  |
| T/K: 288.15 - 328.15<br>P/kPa: 101.325 (1 atm)  | H. L. Clever  |  |
| EXPERIMENTAL VALUES:  |   |  |
| T/K Mol Fraction<br>$X_1 \times 10^4$   | BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L $\times 10^2$  |  |
| 288.15 0.846<br>298.15 0.981<br>313.15 1.17   | 1.79     1.89       2.05     2.24       2.42     2.77       2.32     3.52   |  |
| 328.15 1.45   | 2.93 3.52   |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$  | *   |  |
| Std. Dev. $\Delta G^{\circ} = 36.1,$  | Coef. Corr. = 0.9988  |  |
| For the recommended free energy equation solubility of helium in toluene.   | ion see the critical evaluation of the  |  |
| The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.  |   |  |
| The Bunsen coefficients were calculate  | ed by the compiler  |  |
|   |   |  |
| AUXILIARY   | INFORMATION   |  |
| METHOD: Volumetric. The solvent is sat-   | SOURCE AND PURITY OF MATERIALS:   |  |
| urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total  | <ol> <li>Helium. Matheson Co., Inc.<br/>Research grade.</li> </ol>  |  |
| pressure is maintained at 1 atm as<br>the gas is absorbed.  | <ol> <li>Toluene. Mallinckrodt. Reagent<br/>grade. Shaken with conc. H<sub>2</sub>SO<sub>4</sub>,<br/>water washed, dried over<br/>Drierite, distilled b.p. 110.40 -<br/>110.60°C.</li> </ol> |  |
|   | ESTIMATED ERROR:  |  |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett (1). The modifications in-<br>clude the addition of a spiral stor-<br>age for the solvent, a manometer for | $\delta T/K = 0.03$<br>$\delta P/torr = 1$<br>$\delta X_1/X_1 = 0.04$   |  |
| age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br>ibid. 1952, 3819.  |  |
| Daniel (2).   | <ol> <li><u>1910</u>. 1952, 3819.</li> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. <u>Appl. Chem</u>. 1952, <u>2</u>, 161.</li> </ol>  |  |

| COMPONENTS :  | ORIGINAL MEASUREMENTS:   |  |  |
|---|--|--|--|
| 1. Helium; He; 7440-59-7  | de Wet, W. J.  |  |  |
| 2. Methylbenzene (Toluene); C <sub>7</sub> H <sub>8</sub> ;<br>108-88-3   |  |  |  |
|   | J. <u>S. Afr</u> . <u>Chem</u> . <u>Inst</u> . 1964, <u>17</u> ,<br>9 - 13.  |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |
| T/K: 292.15 - 304.15  | P.L. Long  |  |  |
| P/kPa: 101.325 (1 atm)  |  |  |  |
| EXPERIMENTAL VALUES:  | · · · · · · · · · · · · · · · · · · ·  |  |  |
| T/K Mol Fraction  | Bunsen Ostwald<br>Coefficient Coefficient  |  |  |
| $x_1 \times 10^4$   | $\alpha \times 10^2$ L × 10 <sup>2</sup>   |  |  |
| 292.15 0.924  | 1.95 2.09  |  |  |
| 299.35 1.01<br>304.15 1.10  | 2.12 2.32<br>2.29 2.55   |  |  |
| 304.15 1.10   | 2.23 2.35  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = -RT \ln X_1 = 10,608 + 40.965 T$  |  |  |  |
| Std. Dev. $\Delta G^{\circ} = 24.7$ ,   | Coef. Corr. = 0.9951   |  |  |
| For the recommended free energy equat solubility of helium in toluene.  | ion see the critical evaluation of the   |  |  |
| The solubility values were adjusted to 101.325 kPa (1 atm) by Henry's law.  | o a partial pressure of helium of  |  |  |
| The mole fraction solubility and the  | Ostwald coefficients were calculated   |  |  |
|   |  |  |  |
| AUXILIARY   | INFORMATION  |  |  |
| METHOD: Volumetric.   | SOURCE AND PURITY OF MATERIALS:  |  |  |
| To degas, the solvent was placed in   |  |  |  |
| a large continuously evacuated bulb<br>until the solvent boiled freely with-<br>out further release of dissolved<br>gases.  | <ol> <li>Helium. No source given. The gas<br/>purified over activated charcoal<br/>at liquid air temperature. Im-<br/>purities estimated to be less<br/>than 0.3 percent.</li> </ol> |  |  |
| To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of  |  |  |  |
| gas absorbed is measured on an at-<br>tached buret system.  |  |  |  |
| tached buret system.  | ESTIMATED ERROR:   |  |  |
| tached buret system. APPARATUS/PROCEDURE:   | ESTIMATED ERROR: $\delta T/K = 0.05$   |  |  |
| tached buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1  | $\delta T/K = 0.05$  |  |  |
| tached buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1<br>and others (2). The degassed solvent<br>is saturated with gas as it flows | $\delta T/K = 0.05$  |  |  |
| tached buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1<br>and others (2). The degassed solven                                       | $\delta T/K = 0.05$  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
|   | Byrne, J. E.; Battino, R.;  |
| 1. Helium; He; 7440-59-7  | Wilhelm, E.   |
| 2. 1,2-Dimethylbenzene (o-Xylene);  |   |
| $C_8H_{10}$ ; 95-47-6   | J. Chem. Thermodyn. 1975, 7, 515-522.   |
|   |   |
| VARIABLES:  | PREPARED BY:  |
| ,   |   |
| T/K: 283.16 - 313.19<br>P/kPa: 101.325 (1 atm)  | H. L. Clever  |
|   |   |
| EXPERIMENTAL VALUES:<br>T/K Mol Fraction  | Bunsen Ostwald  |
| l c   | oefficient Coefficient  |
| $x_1 \times 10^4$   | $\alpha \times 10^2$ L $\times 10^2$  |
| 283.16 0.758  | 1.42 1.474  |
| 283.42 0.757  | 1.42 1.472  |
| 298.12 0.929<br>298.17 0.936  | 1.72 1.874<br>1.73 1.890  |
| 313.05 1.112  | 2.03 2.324  |
| 313.09 1.111  | 2.01 2.300  |
| 313.19 1.118  | 2.04 2.336  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$   | $X_1 = 9508.0 + 45.305 \text{ T}$   |
| Std. Dev. $\Delta G^\circ = 10.4$ ,   | -   |
|   | $\Delta s^{/}J K^{-1} mol^{-1} = -45.305$                                       |
|   |   |
| T/K Mol Fract<br>X <sub>1</sub> × 10  | $\frac{1}{4}$ $\Delta G^{\circ}/J \text{ mol}^{-1}$                             |
|   | ······································  |
| 283.15 0.758<br>288.15 0.813  | 22,336<br>22,563  |
| 293.15 0.870  | 22,789  |
| 298.15 0.928<br>303.15 0.989  | 23,016<br>23,242  |
| 308.15 1.05   | 23,469  |
| 313.15 1.12   | 23,695  |
| <u>318.15</u> <u>1.18</u><br>The solubility values were adjusted to   | 23,922<br>a partial pressure of helium of                                       |
| 101.325 pKa (1 atm) by Henry's law.   | The Bunsen coefficients were calculated   |
| by the compiler. AUXILIARY  | INFORMATION   |
| METHOD: The apparatus is based on the   | SOURCE AND PURITY OF MATERIALS:   |
| design by Morrison and Billett (1)  | 1. Helium. Either Air Products &  |
| and the version used is described by  | Chemicals, Inc., or Matheson Co.,   |
| Battino, Evans, and Danforth (2).   | Inc. 99 mol % or better.  |
|   | <ol> <li>1,2-Dimethylbenzene. Phillips<br/>Petroleum Co. Pure grade.</li> </ol> |
| APPARATUS/PROCEDURE: Degassing. Up to   |   |
| 500 cm <sup>3</sup> of solvent is placed in a   |   |
| flask of such size that the liquid is<br>about 4 cm deep. The liquid is rapid-                                    |   |
| ly stirred, and vacuum is applied in-   |   |
| termittently through a liquid N <sub>2</sub> trap<br>until the permanent gas residual                             | ESTIMATED ERROR:  |
| pressure drops to 5 microns.  | $\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$                                    |
| Solubility Determination. The de-<br>gassed solvent is passed in a thin   | $\delta X_1 / X_1 = 0.03$   |
| film down a glass spiral tube con-  |   |
| taining the solute gas and the  | REFERENCES:   |
| solvent vapor at a total pressure of<br>one atm. The volume of gas absorbed<br>is found by difference between the | 1. Morrison, T. J.; Billett, F.<br>J. <u>Chem</u> . <u>Soc</u> . 1948, 2033.    |
| initial and final volumes in the  | 2. Battino, R.; Evans, F. D.;   |
| buret system. The solvent is collect-<br>ed in a tared flask and weighed.   | Danforth, W. F.   |
|   | J. Am. Oil Chem. Soc. 1968, 45,<br>830.   |
| L   | <u>.</u>  |

| COMPONENTS:   | EVALUATOR:   |
|---|--|
| <ol> <li>Helium; He; 7440-59-7</li> <li>1,3-Dimethylbenzene (<u>m</u>-Xylene);<br/>C<sub>8</sub>H<sub>10</sub>; 108-38-3</li> </ol> | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322<br>USA<br>February 1978 |

## CRITICAL EVALUATION:

The solubility of helium in 1,3-dimethyl benzene was measured by de Wet (1) and by Byrne, Battino, and Wilhelm (2). The two sets of values differ by about 9 per cent over the 288 - 308 K temperature range of common measurement, with de Wet's data being the higher valued. The experimental technique used by the two laboratories is similar, and the gas and solvent appear to be of equivalent purity. Low solubility values could arise from either incomplete degassing, nonattainment of equilibrium, or both. High values could come from contamination of the helium in a more soluble gas. For the helium + 1,3-dimethylbenzene, there is no reason to favor one data set over the other. No recommendation of solubility values can be made without either further experimental work or a factor analysis of the noble gases' solubility in all solvents.

Table 1 gives the fit of the Gibbs energy equation,  $\Delta G^{\circ} = - RT \ln X_1 =$ A + BT, for each of the two data sets and for the combined data set. Table 2 gives the smoothed values of the mole fraction solubility at five degree intervals for the two data sets and the combined data set.

TABLE 1. Parameters for the Gibbs energy as a function of temperature.

| $\Delta G^{\circ}/J \text{ mol}^{-1} = A + BT$                | Std. Dev. $\Delta G^{\circ}$ | No. Exp. Points | Reference |
|---|------------------------------|-----------------|-----------|
| 9,982.5 + 42.848 T<br>10,057 + 41.914 T<br>9,975.8 + 42.684 T | 31.5<br>36.3<br>100.         | 8<br>3<br>11    | 2<br>1 .  |

TABLE 2. Comparison of smoothed mole fraction solubility data at 101.325 kPa (l atm).

| т/к    | Mole F            | $raction/X_1 \times 10$ | 4        |
|--------|-------------------|-------------------------|----------|
|        | Byrne, et al. (1) | de Wet (2)              | Combined |
| 283.15 | 0.832             | -                       | 0.844    |
| 288.15 | 0.896             | 0.973                   | 0.916    |
| 293.15 | 0.962             | 1.04                    | 0.988    |
| 298.15 | 1.03              | 1.12                    | 1.06     |
| 303.15 | 1.10              | 1.20                    | 1.13     |
| 308.13 | 1.17              | 1.28                    | 1.20     |
| 313.15 | 1.25              | _                       | 1.27     |

1.

De Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9. Byrne, J. E.; Battino, R.; Wilhelm, E. J. Chem. Thermodyn. 1975, 7, 515. 2.

|  | ORIGINAL MEAS  | JREMENTS:  |  |
|--|--|--|--|
| 1. Helium; He;7440-59-7  | de Wet, W.   | J.   |  |
| <pre>2. 1,3-Dimethylbenzene (m-Xylene);     C<sub>8</sub>H<sub>10</sub>; 108-38-3</pre>  |  |  |  |
|  | J. S. Afr.   | <u>Chem</u> . <u>Inst</u> . 1964, <u>17</u> ,  |  |
| VARIABLES:   | PREPARED BY:   |  |  |
| T/K: 291.35 - 304.75<br>P/kPa: 101.325 (1 atm)   |  | P. L. Long   |  |
| EXPERIMENTAL VALUES:   | <b>1</b>   |  |  |
| T/K Mol Fraction   | Bunsen   | Ostwald  |  |
| $x_1 \times 10^4$  | $\begin{array}{c} \text{Coefficient} \\ \alpha \times 10^2 \end{array}$  | $\begin{array}{c} \text{Coefficient} \\ \text{L x } 10^2 \end{array}$  |  |
| 291.35 1.01  | 1.85   | 1.97   |  |
| 298.95 1.15<br>304.75 1.21   | 2.09<br>2.19   | 2.29<br>2.44   |  |
|  |  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$  | $x_1 = 10,057$   | + 41.914 T   |  |
| Std. Dev. $\Delta G^\circ$ = 36.3,   | Coef. Corr   | . = 0.9918   |  |
| For the recommended free energy equat solubility of helium in m-xylene.  | ion see the  | critical evaluation of the   |  |
| The solubility values were adjusted t<br>101.325 kPa (l atm) by Henry's law.   | o a partial  | pressure of helium of  |  |
|  |  |  |  |
| AUXILIARY  | AUXILIARY INFORMATION  |  |  |
|  | INFORMATION  |  |  |
| METHOD: Volumetric.  |  | RITY OF MATERIALS;   |  |
| To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved gase<br>To saturate, the solvent is flowed ir<br>a thin film through a glass spiral  | SOURCE AND PU<br>1. Helium.<br>purifie<br>at liqu<br>puritie<br>than 0.<br>2. m-Xylen  | No source given. The gas<br>d over activated charcoal<br>id air temperature. Im-<br>s estimated to be less<br>3 percent.<br>e. No source given. m-   |  |
| To saturate, the solvent is flowed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved gase  | SOURCE AND PU<br>1. Helium.<br>purifie<br>at liqu<br>than 0.<br>2. m-Xylen<br>Xylene<br>fore us  | No source given. The gas<br>d over activated charcoal<br>id air temperature. Im-<br>s estimated to be less<br>3 percent.<br>e. No source given. m-<br>distilled immediately be-<br>e.        |  |
| To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved gase<br>To saturate, the solvent is flowed ir<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an attack<br>ed buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett(1)<br>and others (2). The degassed solvent<br>is saturated with gas as it flows | SOURCE AND PU<br>1. Helium.<br>purifie<br>at liqu<br>than 0.<br>2. m-Xylene<br>fore us<br>ESTIMATED ERR  | No source given. The gas<br>d over activated charcoal<br>id air temperature. Im-<br>s estimated to be less<br>3 percent.<br>e. No source given. m-<br>distilled immediately be-<br>e.        |  |
| To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved gase<br>To saturate, the solvent is flowed ir<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an attack<br>ed buret system.<br>APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett(1)  | SOURCE AND PU<br>1. Helium.<br>purifie<br>at liqu<br>puritie<br>than 0.<br>2. m-Xylene<br>fore us<br>ESTIMATED ERR<br>REFERENCES:<br>1. Morrisc<br>J. Chem | No source given. The gas<br>d over activated charcoal<br>id air temperature. Im-<br>s estimated to be less<br>3 percent.<br>e. No source given. m-<br>distilled immediately be-<br>e.<br>OR: |  |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |  |
|--|--|--|
| 1. Helium; He; 7440-59-7   | Byrne, J. E.; Battino, R.;<br>Wilhelm, E.  |  |
| <pre>2. 1,3-Dimethylbenzene (m-Xylene);         C<sub>8</sub>H<sub>10</sub>; 108-38-3</pre>  | WIINEIM, E.  |  |
|  | T Cham Mharmadum 1075 7 515 533  |  |
|  | <u>J. Chem. Thermodyn</u> . 1975, <u>7</u> , 515-522.  |  |
| VARIABLES:   | PREPARED BY:   |  |
| T/K: 283.15 - 313.15<br>P/kPa: 101.325 (1 atm)   | H. L. Clever   |  |
| EXPERIMENTAL VALUES:   |  |  |
| T/K Mol Fraction   | Bunsen Ostwald   |  |
| $X_1 \times 10^4$  | Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>   |  |
| 283.15 0.840   | 1.55 1.604   |  |
| 283.21 0.841   | 1.55 1.606   |  |
| 298.09 1.009<br>298.20 1.040   | 1.83 1.998<br>1.89 2.060   |  |
| 298.20 1.040   | 1.84 2.009   |  |
| 298.24 1.024   | 1.86 2.029   |  |
| 313.15 1.258   | 2.25 2.579   |  |
| 313.15 1.262   | 2.26 2.586   |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$  | -  |  |
| <pre>Std. Dev. ∆G° = 31.5,</pre>   | Coef. Corr. = 0.9979   |  |
|  | $\Delta S^{\circ}/J K^{-1} mol^{-1} = 42.848$  |  |
| T/K Mol Fraction $\Delta G^{\circ}/J \mod 1$<br>X <sub>1</sub> x 10 <sup>4</sup>   |  |  |
| 283.15 0.832 22,115  |  |  |
| 288.15 0.89  |  |  |
| 293.15 0.962   | •  |  |
| 298.15 1.03  |  |  |
| 303.15 1.10<br>308.15 1.17   | 22,972<br>23,186   |  |
| 313.15 1.25  | 23,400   |  |
| AUXILIARY  | INFORMATION  |  |
|  |  |  |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett (1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2). | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Either Air Products and<br>Chemicals, Inc. or Matheson Co.,<br>Inc. 99 mole % or better. |  |
| The Bunsen and Ostwald coefficients were calculated by the compiler.   | <ol> <li>m-Xylene. Phillips Petroleum<br/>Co., pure grade.</li> </ol>  |  |
| were carculated by the compiler.   |  |  |
| APPARATUS/PROCEDURE: Degassing. Up to<br>500 cm <sup>3</sup> of solvent is placed in a<br>flask of such size that the liquid is                          |  |  |
| about 4 cm deep. The liquid is rapid-  |  |  |
| ly stirred and vacuum is applied in-   | ESTIMATED ERROR:   |  |
| termittently through a liquid N <sub>2</sub> trap<br>until the permanent gas residual  | $\delta T/K = 0.03$  |  |
| pressure drops to 5 microns.   | $\delta P/mmHg = 0.5$  |  |
| Solubility Determination. The  | $\delta X_{1}/X_{1} = 0.03$  |  |
| degassed solvent passes in thin film   | REFERENCES :   |  |
| down a glass spiral at a total pressure of one atm of solute gas plus  |  |  |
| solvent vapor. Solubility equilibrium  | I. Morrison, T. J.; Billett, F.  |  |
| is rapidly attained. The volume of   | <u>J. Chem. Soc</u> . 1948, 2033.  |  |
| gas absorbed is measured, and the  | 2. Battino, R.; Evans, F. D.;  |  |
| solvent is collected in a tared flask and weighed.   | Danforth, W. F.  |  |
|  | J. Am. Oil Chem. Soc. 1968, 45,  |  |
|  | 830.   |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| 1. Helium; He; 7440-59-7  | Byrne, J. E.; Battino, R.;  |
|   | Wilhelm, E.   |
| <pre>2. 1,4-Dimethylbenzene (p-Xylene);<br/>C8H10; 106-42-3</pre>                     |   |
| C8H10; 100-42-5   | J. Chem. Thermodyn. 1975, 7, 515-522.   |
|   | <u>J. Chem. Thermodyn.</u> 1975, <u>7</u> , 515-522.                                  |
|   |   |
| VARIABLES:<br>T/K: 288.13 - 313.17  | PREPARED BY:<br>H. L. Clever  |
| P/kPa: 101.325 (1 atm)  |   |
|   |   |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Fraction  | Bunsen Ostwald<br>Coefficient Coefficient   |
| $x_1 \times 10^4$   | $\alpha \times 10^2$ L $\times 10^2$  |
| 288.13 0.922  | 1.68 1.777  |
| 288.15 0.923  | 1.69 1.780  |
| 288.17 0.901<br>298.13 1.051  | 1.65 1.736<br>1.90 2.074  |
| 298.13 1.051  | 1.95 2.125  |
| 298.13 1.051  | 1.90 2.074  |
| 298.15 1.072<br>298.17 1.103  | 1.94 2.117<br>1.99 2.177  |
| 298.17 1.103  | 1.94 2.114  |
| 313.16 1.293  | 2.30 2.641  |
| 313.17 1.309<br>313.17 1.303  | 2.33 2.673<br>2.32 2.662  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \text{ Ir}$                |   |
|   | Coef. Corr. = 0.9957  |
|   | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -40.830$  |
|   |   |
| T/K Mol Frac<br>X1 x 1  | n4 The solubility   |
| 283.15 0.85   |   |
| 288.15 0.92   | 20 22,265 pressure of hel-  |
| 293.15 0.99<br>298.15 1.07  |   |
|   |   |
| 308.15 1.22<br>313.15 1.31  |   |
| 318.15 1.39   | 23,490 calculated by the  |
| AUXILIARY   | INFORMATION COMpiler.   |
| METHOD: The apparatus is based on the   | SOURCE AND PURITY OF MATERIALS:   |
| design by Morrison and Billett (1)  | 1. Helium. Either Air Products &  |
| and the version used is described by Battino, Evans, and Danforth (2).                | Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mol % or better.                         |
|   |   |
|   | 2. 1,4-Dimethylbenzene. Phillips  |
|   | Petroleum Co., pure grade.  |
| APPARATUS/PROCEDURE: Degassing. Up to   |   |
| 500 cm <sup>3</sup> of solvent is placed in a flask of such size that the liquid is   |   |
| about 4 cm deep. The liquid is rapid-   |   |
| ly stirred, and vacuum is applied in-   |   |
| termittently through a liquid N <sub>2</sub> trap<br>until the permanent gas residual | ESTIMATED ERROR:  |
| pressure drops to 5 microns.  | $\delta T/K = 0.03$   |
| Solubility Determination. The de-   | $\begin{array}{rcl} & \delta P/mmHg &= 0.5\\ & \delta X_1/X_1 &= 0.03 \end{array}$    |
| gassed solvent passes in a thin film<br>down a glass spiral tube containing           |   |
| the solute gas plus the solvent vapor   | REFERENCES:   |
| at a total pressure of one atm. The   | <ol> <li>Morrison, T. J.; Billett, F.<br/>J. <u>Chem. Soc</u>. 1948, 2033.</li> </ol> |
| volume of gas absorbed is found by<br>difference between the initial and              |   |
| final gas volume in the buret system.   | 2. Battino, R.; Evans, F. D.;<br>Danforth, W. F.                                      |
| The solvent is collected in a tared flask and weighed.                                | J. Am. Oil Chem. Soc. 1968, 45,   |
|   | 830.  |
|   |   |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |
|--|---|--|
|  | Lannung, A.   |  |
| 1. Helium; He; 7440-59-7   |   |  |
| 2. Methanol; CH <sub>4</sub> O; 67-56-1  |   |  |
|  | <u>J. Am. Chem. Soc</u> . 1930, <u>52</u> , 68 - 80.  |  |
| VARIABLES:   | PREPARED BY:  |  |
| T/K: 288.15 - 303.15<br>P/kPa: 101.325 (l atm)   | P.L.Long  |  |
| EXPERIMENTAL VALUES:   |   |  |
| T/K Mol Fraction   | BunsenOstwaldDefficientCoefficient $\propto x \ 10^2$ L x $10^2$  |  |
| 288.15 0.533<br>288.15 0.535   | 2.97 3.13<br>2.98 3.14  |  |
| 293.15 0.564<br>293.15 0.567   | 3.12 3.35<br>3.14 3.37  |  |
|  | 3.27 3.57   |  |
| 303.15 0.625   | 3.42 3.80   |  |
| Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln$  | $X_1 = 7591.9 + 55.436 T$   |  |
| Std. Dev. $\Delta G^{O} = 6.3$ ,   | Coef. Corr. = 0.9998  |  |
| $\Delta \mathrm{H}^{\mathrm{O}}/\mathrm{J} \mathrm{mol}^{-1} = 7591.9,$  | $\Delta s^{\circ}/J \ \kappa^{-1} \ mol^{-1} = -55.436$   |  |
| T/K Mol Fraction $\Delta G^{O}/J \text{ mol}^{-1}$<br>$X_1 \times 10^4$  |   |  |
|  | 535 23,566  |  |
| 293.15 0.1<br>298.15 0.1   | 564 23,843<br>595 24,120<br>625 24,397  |  |
|  | e fraction solubilities of helium were  |  |
| calculated by the compiler.  | _   |  |
| Clever and Reddy (2) report a Bunsen $0.618 \times 10^{-4}$ at 303 15 K and 101 32   | coefficient of 3.38 x $10^{-2}$ (X <sub>1</sub> = 5 kPa, Value not used in smoothed fit.  |  |
|  | INFORMATION   |  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:   |  |
| Gas absorption. The gas is presat-<br>urated with solvent vapor. The gas<br>volume absorbed is the difference  | <ol> <li>Helium. Linde Liquid Air Factory.<br/>Contained 0.5 per cent by volume<br/>neon.</li> </ol>  |  |
| between initial and final gas vol-<br>umes.The amount of solvent is deter-<br>mined by the weight of mercury<br>displaced.   | <ol> <li>Methanol. B.A.S.F. Distilled from<br/>freshly cut strips of mag-<br/>nesium metal. The first one-third<br/>was discarded.</li> </ol> |  |
|  | OTHER DATA: Popov and Drakin report(3 the apparent partial molal volume of He in $CH_3OH$ as 35.3 ± 0.6 cm <sup>3</sup> mol <sup>-1</sup>     |  |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of von Antropoff<br>(1). A calibrated combined all glass<br>manometer and bulb is enclosed in an                                 | ESTIMATED ERROR: $\delta T/K = 0.03$  |  |
| air thermostat. Mercury is used as<br>the calibration and confining liquid<br>The solvent is degassed in the appa-<br>ratus. The solvent and the gas are<br>shaken together until equilibrium is | <ol> <li>von Antropoff, A.</li> <li><u>Z</u>. <u>Elektrochem</u>. 1919, <u>25</u>, 269.</li> <li>Clever, H.L.; Reddy, G.S.</li> </ol>         |  |
| established.   | J. <u>Chem. Eng.Data</u> 1963, <u>8</u> , J91.<br>3. Popov, G.A.; Drakin, S.I.<br><u>Zh. Fiz. Khim</u> . 1974, <u>48</u> , 631.               |  |

| COMPONENTS :                | <u></u>   | E                                      | VALUATOR:                         | ······································   |               |
|-----------------------------|---|--|-----------------------------------|--|---------------|
|                             |   |  |                                   |  |               |
| l Helium.                   | He; 7440-59-7   |  | H. L. Clever<br>Chemistry Depar   | tment  |               |
| r. nerrum;                  | ne, /440-55-7   |  | Emory University                  |  |               |
|                             | (Ethyl Alcohol);  |  | Atlanta, Georgi                   |  |               |
| 64-17-5                     |   | - · .                                  | USA                               |  |               |
|                             |   |  | February 1978                     |  |               |
| CRITICAL EVALUA             | TION:   | ······································ |                                   | and the second |               |
| Cargill (2).<br>and 303 K.  | ability of helium<br>, There is a 15<br>Over that temper<br>fraction solubil    | degree rang<br>ature range             | e of common mea<br>there is an in | surement between<br>creasing diverge   | n 288<br>ence |
| used by Caro                | ium gas used by L<br>gill contained 0.<br>nese impurities w                     | 71 weight p                            | ained 0.5 perce<br>ercent water.  | nt neon. The ef<br>No correction fo  | thanol<br>or  |
|                             | gives details on<br>erature function  |  |                                   |  |               |
| TABLE 1. Pa                 | arameters for $\Delta G^{\circ}$  | = A + BT                               |                                   |  |               |
| ∆G°/J mo                    | $L^{-1} = A + BT$   | Std. Dev. A                            | G° No. Exp.                       | Points Weight  | Ref           |
| 7 050 0                     |   | 10.2                                   |                                   |  |               |
| 7,250.9 -                   | ⊢ 54.434 T<br>⊢ 45.547 T  | 19.3<br>79.1                           | 6<br>6                            | 1  | 1<br>2        |
|                             | + 45.428 T  | 80.0                                   | 12                                | -  | -             |
| Gibbs energy<br>TABLE 2. Ca | (1 atm) from the<br>y values in Table<br>alculated mole fr<br>D1.325 kPa (1 atm | 2 are for                              | the combined fi                   | t.   | • 1110        |
| т/к                         | Mol F   | 'raction/X1                            |                                   | ∆G°/J mol <sup>-1</sup>  |               |
|                             | Lannung (1)   | Cargill (2                             | ) <u>Combined</u>                 |  |               |
| 278.15                      | -   | 0.605                                  | 0.594                             | 22,503   |               |
| 283.15                      | ~   | 0.652                                  | 0.641                             | 22,730   |               |
| 288.15<br>293.15            | 0.695<br>0.732  | 0.701<br>0.752                         | 0.689<br>0.740                    | 22,957<br>23,184   |               |
| 298.15                      | 0.770   | 0.804                                  | 0.740                             | 23,411   |               |
| 303.15                      | 0.808   | 0.858                                  | 0.845                             | 23,638   |               |
| 308.15                      | _   | 0.914                                  | 0.901                             | 23,866   |               |
| 313.15                      | -   | 0.972                                  | 0.958                             | 24,093   |               |
| 318.15                      | -   | 1.030                                  | 1.015                             | 24,320   |               |
| 323.15                      | -   | 1.090                                  | 1.075                             | 24,547   |               |
| 328.15<br>333.15            | -   | 1.155<br>1.220                         | 1.140<br>1.200                    | 24,774<br>25,001   |               |
|                             | <u></u>   |  |                                   | hefore solubili  | ,             |
| values can b<br>recommended | an important sys<br>be recommended.<br>with<br>p/J mol <sup>-1</sup> = - RT     | A tentative                            | acceptance of                     | the combined da  |               |

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 9,866.8, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -45.428$ 

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Lannung, A. J. Am. Chem. Soc. 1930, 52, 68.
 Cargill, R. W. J. Chem. Soc., Faraday Trans. 1. 1978, 74, 1444.

| COMPONENTS:   |  |  |  |   |  |
|---|--|--|--|---|--|
| CONFORMENTS:  |  |  | ORIGINAL MEAS  | UREMENTS :  | · ···  |
| 1. Helium; He; 7440-59-7  |  |  | Lannung, A   | ۰.  |  |
| <ol> <li>Allow, Ne, 7440 55 7</li> <li>Ethanol (Ethyl Alcohol); C<sub>2</sub>H<sub>6</sub>O;</li> </ol> |  |  |  |   |  |
| 64-17-5   |  | - 0  |  |   |  |
| WARTARI PC -  |  |  |  | <u>em. Soc</u> . 1930,  | <u>52, 68 - 80.</u>                                  |
| VARIABLES:<br>T/K: 288.15 - 303.15<br>P/kPa: 101.325 (1 atm)  |  |  | PREPARED BY:   | . L. Long   |  |
| EXPERIMENTAL VALU   | IES:   |  | - 4  |   | ······································               |
|   | т/к  | Mol Fraction $x_1 \times 10^4$   | Bunsen<br>Coefficient<br>a x 10 <sup>2</sup>   | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>                         |  |
|   | 288.15<br>288.15<br>293.15<br>293.15<br>303.15<br>303.15   | 0.699<br>0.689<br>0.732<br>0.737<br>0.800<br>0.814   | 2.70<br>2.66<br>2.81<br>2.83<br>3.04<br>3.09   | 2.85<br>2.81<br>3.02<br>3.04<br>3.37<br>3.43                          | _  |
| See the evaluation  |  | stwald solubil:  |  | atculated by t  | me compiler.   |
|   | y equatio<br>y values  | n.<br>were adjusted t  |  |   |  |
| The solubility  | y equatio<br>y values  | n.<br>were adjusted f<br>Henry's law.  | to a partial   |   |  |
| The solubilit<br>101.325 kPa (  | y equatio<br>y values  | n.<br>were adjusted f<br>Henry's law.  | to a partial   | pressure of h   | elium of   |
| METHOD:<br>Gas absorption<br>rated with so<br>volume absorbe  | y equatio<br>y values<br>l atm) by<br>n. The g<br>lvent vap<br>ed is the<br>al and fi<br>ount of s | n.<br>were adjusted f<br>Henry's law.<br>AUXILIARY<br>as is presatu-<br>or. The gas<br>difference<br>nal gas vol-<br>olvent is de- | V INFORMATION<br>SOURCE AND PU<br>1. Helium<br>Contai<br>neon.<br>2. Ethanc<br>dan.) | pressure of h<br>URITY OF MATERIAN<br>n. Linde's Li<br>ined 0.5 perce | LS:<br>Lquid Air.<br>ent by volume<br>absolutus, Ph. |

| COMPONENTS:   | <u></u>  |                                  | ORIGI  | NAL MEASUREMEN               | TS:   |   |
|---|--|----------------------------------|--|------------------------------|---|---|
| l. Helium; He; 7440-59-7  |  |                                  | Cargill, R. W.   |                              |   |   |
| 2. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O;<br>64-17-5 |  |                                  | J. Chem. Soc., Faraday Trans. 1.<br>1978, 74, 1444 - 1456. |                              |   |   |
|   |  |                                  |  |                              |   |   |
| VARIABLES:  |  |                                  | PREPA  | RED BY:                      |   |   |
|   | 78.85 - 333.15<br>101.325 (1 atm)  |                                  |  | H. L.                        | Clever  |   |
| EXPERIMENTAL VALUES   | :  |                                  |  | ·                            | ·   |   |
| T/K   | Solubility* Mol F<br>cm <sup>3</sup> kg <sup>-1</sup> X <sub>1</sub>                             |                                  |  |                              | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup> | • |
| 278.15<br>289.15<br>299.15<br>309.15                                    | 34.8 (<br>38.4 (<br>43.9 (   | 0.627<br>0.715<br>0.789<br>0.902 |  | 2.45<br>2.76<br>3.01<br>3.40 | 2.50<br>2.92<br>3.30<br>3.85                  |   |
| 320.15<br>333.15  |  | 1.035                            |  | 3.86<br>4.64                 | 4.52<br>5.66                                  |   |
|   |  |                                  | . 1 .  |                              |   |   |
|   | 273.15 K and 1 at  |                                  |  | -                            |   |   |
| Smoothed Data:  | $\Delta G^{\circ}/J \mod^{-1} = -I$  | RT ln                            | × <sub>1</sub> =   | 9,791.5 + 4                  | 5.547 T                                       |   |
|   | Std. Dev. $\Delta G^\circ = 7$   | 79.1,                            | Coe  | f. Corr. = 0                 | .9963   |   |
| ded free energy   | equation.  |                                  |  |                              |   |   |
|   | AUXI   | LIARY                            | INFOR  | 1ATION                       |   |   |
| METHOD: Modified  | Morrison and Bill  |                                  | -  | E AND PURITY C               | F MATERIALS:                                  |   |
| apparatus (1);<br>addition of a c<br>measuring the m<br>(instead of vol | modifications inc<br>onstant flow pump,<br>ass of the solvent<br>ume) on a top-par               | lude<br>, and<br>t<br>n bal-     | 1.   | Helium.                      |   |   |
| 20 cm <sup>3</sup> of gas i<br>solvent. The s                           | ermination used ak<br>n up to 500 cm <sup>3</sup> of<br>olvent was degasse<br>-pump principle (1 | f<br>eđ                          | 2.   |                              | ource not giv<br>mol % (0.71 v                |   |
|   |  |                                  | FSTT   | ATED ERROR:                  |   |   |
| APPARATUS/PROCEDUR  | 3:   |                                  | ESIIF  | AILD ERKOR:                  |   |   |
|   |  |                                  | REFEI  | RENCES:                      |   |   |
|   |  |                                  |  |                              | J.; Billett,<br>. 1948, 2033;<br>3819.        |   |
|   |  | -                                |  |                              |   |   |

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| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |  |  |
|---|---|--|--|
| 1. Helium; He; 7440-59-7  | Battino, R.; Evans, F. D.;<br>Danforth, W. F.; Wilhelm, E.                                    |  |  |
| 2. 2-Methyl-1-propanol; C <sub>4</sub> H <sub>10</sub> O;<br>78-83-1        |   |  |  |
|   | <u>J. Chem. Thermodyn</u> . 1971, <u>3</u> , 743-751.   |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |
| T/K: 274.02 - 312.76<br>P/kPa: 101.325 (1 atm)                              | H. L. Clever  |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |
| T/K Mol Fraction  | Bunsen Ostwald  |  |  |
| $x_1 \times 10^4$   | Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>                            |  |  |
| 274.02 0.87   | 2.15 2.16<br>2.17 2.25  |  |  |
| 282.91 0.89<br>295.85 1.00  | 2.17 2.25<br>2.43 2.63  |  |  |
| 312.76 1.12   | 2.66 3.05   |  |  |
| Smoothed Data: $\Delta G^\circ = - RT \ln X_1 = 49$                         | 17.5 + 59.956 T   |  |  |
| Std. Dev. ∆G° = 43.8,   | Coef. Corr. = 0.9991  |  |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 4917.5,$                             | $\Delta S^{0}/J K^{-1} mol^{-1} = -59.956$  |  |  |
| , T/K Mol Frac<br>X <sub>1</sub> x 1  | tion $\Delta G^{\circ}/J$ mol <sup>-1</sup>   |  |  |
| 273.15 0.84   | 7 21,294  |  |  |
| 278.15 0.88   | 1 21,594  |  |  |
| 283.15 0.91<br>288.15 0.94  |   |  |  |
| 293.15 0.98   | 2 22,494  |  |  |
| 298.15 1.02<br>303.15 1.05  |   |  |  |
| 308.15 1.08   | 23,393  |  |  |
| 313.15 1.12<br>The solubility values were adjusted t                        | 23,693  |  |  |
| 101.325 kPa (1 atm) by Henry's law.   |   |  |  |
| The Bunsen coefficients were calculat                                       |   |  |  |
|   | INFORMATION   |  |  |
| METHOD: A. Degasser (1). B. Absorp-<br>tion of gas in a thin film of liquid | SOURCE AND PURITY OF MATERIALS:   |  |  |
| (2, 3).   | <ol> <li>Helium. The Matheson Co., Inc.<br/>greater than 99 mol %.</li> </ol>                 |  |  |
|   | <ol> <li>2-Methyl-l-propanol. Fisher<br/>Scientific Co., certified<br/>(99 mol %).</li> </ol> |  |  |
|   |   |  |  |
|   |   |  |  |
| APPARATUS/PROCEDURE: Degassing.<br>The solvent is sprayed into an evacu-    |   |  |  |
| ated chamber of an all glass appara-  | ESTIMATED ERROR:  |  |  |
| tus; it is stirred and heated until<br>the pressure drops to the vapor      | $\delta T/K = 0.03$ $\delta P/mmHq = 0.5$   |  |  |
| pressure of the liquid. Solubility<br>Determination. The degassed liquid    | $\delta x_1/x_1 = 0.03$   |  |  |
| passes in a thin film down a glass  | REFERENCES :  |  |  |
| spiral tube at a total pressure of  | 1. Battino, R.; Evans, D. F.  |  |  |
| one atm of solute gas plus solvent<br>vapor. The gas absorbed is measured   | Anal. Chem. 1966, <u>38</u> , 1627.<br>2. Morrison, T. J.;Billett, F.                         |  |  |
| in the attached buret system, and the                                       | 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   |  |  |
| solvent is collected in a tared flask and weighed.                          | 3. Clever, H. L.; Battino, R.;  |  |  |
|   | Saylor, J. H.; Gross, P. M.<br>J. Phys. Chem. 1957, <u>61</u> , 1078.                         |  |  |
|   |   |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| 1. Helium; He; 7440-59-7  | Wilcock, R.S.; Battino, R.;   |
|   | Danforth, W.F; Wilhelm, E.  |
| 2. 1-Octanol; C <sub>8</sub> H <sub>18</sub> O; 111-87-5  | J.Chem.Thermodyn. 1978, 10, 817-822.  |
|   |   |
|   |   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 282.45 - 298.17  | A.L. Cramer   |
| P/kPa: 101.325 (1 atm)  |   |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Fraction  | Bunsen Ostwald  |
|   | Coefficient Coefficient   |
| $\qquad \qquad $ | $\alpha \times 10^2$ L x $10^2$   |
| 282.45 1.105<br>298.17 1.207  | 1.585 1.639<br>1.709 1.866  |
| Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = -RT \ln T$  | ζ, = 3932.8 + 61.823 T  |
|   | $^{1}$ $^{1}$ $^{1}$ mol <sup>-1</sup> = -61.823                                |
|   |   |
| T/K Mol Frac<br>X <sub>1</sub> x 1  | $\Delta G^{2} J \text{ mol}^{-1}$   |
|   |   |
| 283.15 1.1<br>288.15 1.1  |   |
| 293.15 1.1  | 75 22,056   |
| 298.15 1.20   | 07 22,365   |
| The solubility values were adjusted to 101.325 kPa by Henry's law.  | o a partial pressure of helium of   |
| The Bunsen coefficients were calculate  | ed by the compiler.   |
|   | ~   |
| A preliminary report of this work app<br>{C.R.}, 4th 1975, <u>6</u> , 122-128; <u>Chem.Ab</u>   | eared in <u>Conf. Int. Thermodyn</u> . <u>Chim</u> .,<br>str. 1977, 86, 22375d. |
|   |   |
|   |   |
| AUXILIARY   | INFORMATION   |
| METHOD / APPARATUS / PROCEDURE:   | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Matheson Co. Inc.                 |
| The apparatus is based on the de-<br>sign of Morrison and Billett (1), and  | Purest commercially available   |
| the version used is described by  | grade.  |
| Battino, Evans, and Danforth (2). The degassing apparatus and procedure are   | 2. 1-Octanol. Eastman Organic   |
| described by Battino, Banzhof, Bogan,   | Chemicals. Distilled.   |
| and Wilhelm (3).<br>See the helium + octane data sheet  |   |
| for more details.   |   |
|   |   |
|   | ESTIMATED ERROR:  |
|   | $\delta T/K = 0.03$   |
|   | $\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$                                |
|   |   |
|   | REFERENCES:   |
|   | 1.Morrison,T.J.;Billett,F.<br>J. Chem. Soc. 1948, 2033.                         |
|   | 2.Battino,R.;Evans,F.D.;Danforth,W.F.   |
|   | J.Am.Oil Chem. Soc. 1968, <u>45</u> , 830.<br>3.Battino,R.;Banzhof,M.;Bogan,M.; |
| }   | Wilhelm,E.<br>Anal. Chem. 1971, 43, 806.  |
|   | 1 AHAL, CHEM, 17/1, 43, 000.  |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |
|--|---|--|
| 1. Helium; He; 7440-59-7   | Wilcock, R.J.; Battino, R.;   |  |
|  | Danforth, W.F; Wilhelm, E.  |  |
| 2. 1-Decanol; C <sub>10</sub> H <sub>22</sub> O; 112-30-1  | J. <u>Chem</u> . <u>Thermodyn</u> . 1978, <u>10</u> , 817-822.  |  |
| VARIABLES:   | PREPARED BY:  |  |
| T/K: 282.64 - 313.49   | A.L. Cramer   |  |
| P/kPa: 101.325 (1 atm)   |   |  |
| EXPERIMENTAL VALUES:   |   |  |
| T/K Mol Fraction   | Bunsen Ostwald<br>Coefficient Coefficient   |  |
| $x_{1} \times 10^{4}$  | $\alpha \times 10^2$ L × 10 <sup>2</sup>  |  |
| 282.64 1.338<br>298.11 1.512<br>313.49 1.736   | 1.587<br>1.642<br>1.770<br>2.006<br>2.302   |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = -RT \ln$   | $x_1 = 6230.2 + 52.158 T$   |  |
| Std. Dev. $\Delta G^{\circ} = 22$ , C  |   |  |
|  | $\Delta S^{O}/J \ \kappa^{-1} \ mol^{-1} = -52.158$   |  |
| T/K Mol Fra  | ction $\Delta G^{O}/J \text{ mol}^{-1}$   |  |
| x <sub>1</sub> x   |   |  |
|  |   |  |
| 283.15 1.3<br>288.15 1.4   |   |  |
| 293.15 1.4   |   |  |
| 298.15 1.5<br>303.15 1.5   |   |  |
| 308.15 1.6   | 58 22,303   |  |
| 313.15 1.7   |   |  |
| The solubility values were adjusted t<br>101.325 kPa by Henry's law.   | o a partial pressure of helium of   |  |
| The Bunsen coefficients were calculat  | ed by the compiler.   |  |
|  |   |  |
|  | INFORMATION   |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See the helium + octane data sheet<br>for more details. | grade.<br>2. 1-Decanol. Eastman Organic<br>Chemicals. Distilled.  |  |
| A preliminary report of this work<br>appeared in <u>Conf. Int. Thermodyn</u> .<br><u>Chim.</u> , {C.R.}, 4th, 1975, 6, 122-128;<br><u>Chem. Abstr</u> . 1977, <u>86</u> , 22375d.  | $\delta P/mHg = 0.03$<br>$\delta P/mHg = 0.5$<br>$\delta X_1/X_1 = 0.02$  |  |
|  | REFERENCES:<br>1.Morrison,T.J.;Billett,F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.;Evans,F.D.;Danforth,W.F.<br>J.Am.Oil Chem. Soc. 1968, 45, 830.<br>3.Battino,R.;Banzhof,M.;Bogan,M.;<br>Wilhelm, E.<br><u>Anal. Chem</u> . 1971, 43, 806. |  |

| COMPONENTS:  |                          |   | ORIGINAL MEASUREMENTS:   |  |  |
|--|--------------------------|---|--|--|--|
|  |                          |   |  |  |  |
| 1. Helium; He; 7440-59-7   |                          |   | Lannung, A.  |  |  |
| 2. Cyclohexanol; C <sub>6</sub> H <sub>12</sub> O; 108-93-0  |                          |   |  |  |  |
|  |                          |   | <u>J. Am. Chem. Soc</u> . 1930, <u>52</u> , 68 - 80.   |  |  |
| VARIABLES:   |                          |   | PREPARED BY:   |  |  |
|  | 298.15 - 3<br>Pa: 101.32 |   | P. L. Long   |  |  |
| EXPERIMENTAL VALUE   | S:                       |   |  |  |  |
| -  | T/K M                    | ol Fraction<br>4<br>X <sub>1</sub> x 10 | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$   |  |  |
|  | 298.15                   | 0.468                                   | 0.99 1.08  |  |  |
|  | 298.15                   | 0.482                                   | 1.02 1.11<br>1.02 1.13   |  |  |
|  | 303.15<br>303.15         | 0.484<br>0.532                          | 1.02 1.13<br>1.12 1.24   |  |  |
|  | 310.15                   | 0.558                                   | 1.17 1.33  |  |  |
| -  | 310.15                   | 0.578                                   | 1.21 1.37  |  |  |
| Smoothed Data:   | ∆G°/J mo                 | $1^{-1} = - RT ln$                      | $X_1 = 11,532 + 44.122 T$  |  |  |
|  | Std. Dev                 | $\Delta G^{\circ} = 84.9,$              | Coef. Corr. = 0.9418   |  |  |
|  | ΔH <sup>0</sup> /J mo    |   | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -44.122$   |  |  |
|  | T/1                      | $ - \frac{x_1 \times 10}{2} $           |  |  |  |
| 298.15 0.473<br>303.15 0.511   |                          |   |  |  |  |
|  |                          |   | 24,907<br>25,128   |  |  |
| 308.15 0.550<br>313.15 0.591   |                          |   | 25,349   |  |  |
| The mole fract<br>by the compile   |                          |   | Ostwald coefficients were calculated   |  |  |
| METHOD   |                          |   | · · · · · · · · · · · · · · · · · · ·  |  |  |
| METHOD:<br>Gas absorption. The gas is presatu-<br>rated with solvent vapor. The gas<br>volume absorbed is the difference<br>between initial and final gas vol-<br>umes. The amount of solvent is deter-<br>mined by the weight of mercury<br>displaced.  |                          |   | <pre>SOURCE AND PURITY OF MATERIALS: 1. Helium. Linde's Liquid Air. Contained 0.5 per cent by volume neon. 2. Cyclohexanol. "pur", Poulenc Freres, fractionated twice in vacuo; used portion with m.p. = 23.6 - 23.9 °C.</pre> |  |  |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of von Antropoff<br>(1). A calibrated, combined all glass<br>manometer and bulb is enclosed in an<br>air thermostat. Mercury is used as<br>the calibration and confining liquid.<br>The solvent is degassed in the appa-<br>ratus. The solvent and the gas are<br>shaken together until equilibrium is<br>established. |                          |   | ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>REFERENCES:<br>1. v. Antropoff, A.<br><u>Z. Electrochem</u> . 1919, <u>25</u> , 269.  |  |  |
|  |                          |   |  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |  |  |
|---|--|--|--|
| l. Helium; He; 7440-59-7  | Lannung, A.  |  |  |
| 2. 2-Propanone (Acetone); C <sub>3</sub> H <sub>6</sub> O;<br>67-64-1   |  |  |  |
|   | J. Am. Chem. Soc. 1930, 52, 68 - 80.                                       |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |
| т/к: 288.15 - 298.15  | P. L. Long   |  |  |
| He P/kPa: 101.325 (1 atm)   |  |  |  |
| EXPERIMENTAL VALUES:  |  |  |  |
| T/K Mol Fraction  | Bunsen Ostwald   |  |  |
| $x_1 \times 10^4$   | Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>         |  |  |
| 288.15 0.907  | 2.79 2.94  |  |  |
| 288.15 0.927<br>288.15 0.924  | 2.85 3.01<br>2.84 3.00   |  |  |
| 293.15 0.966  | 2.95 3.17  |  |  |
| 293.15 1.01<br>293.15 1.01  | 3.10 3.33<br>3.09 3.32   |  |  |
| 298.15 1.05   | 3.19 3.48  |  |  |
| 298.15 1.09   | 3.32 3.62  |  |  |
| 298.15 1.09   | 3.31 3.61  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln T$   | v _ 11 077 1 20 142 m  |  |  |
| Smoothed Data: $\Delta G^{2}/J$ mol $^{-} = -RI$ In   | $x_1 = 11,277 + 38.143$ T  |  |  |
|   | Coef. Corr. = 0.9669   |  |  |
| $\Delta H^{0}/J \text{ mol}^{-1} = 11,277,$   | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -38.143$                             |  |  |
| T/K Mol Fract   | $\Delta G^{\circ}/J \text{ mol}^{-1}$                                      |  |  |
| $\frac{x_1 \times 10}{2}$   | )4<br>   |  |  |
| 288.15 0.919  | 22,268   |  |  |
| 293.15 0.996  |  |  |  |
| 298.15 1.075  | 5 22,650   |  |  |
| The mole fraction solubility and the by the compiler.   | Ostwald coefficients were calculated                                       |  |  |
| AUXILIARY   | INFORMATION  |  |  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:  |  |  |
| Gas absorption. The gas is presatu-<br>rated with solvent vapor. The gas<br>volume absorbed is the difference | 1. Helium. Linde's Liquid Air.<br>Contained 0.5 percent by volume<br>neon. |  |  |
| between initial and final gas vol-<br>umes. The amount of solvent is deter-                                   | 2. Acetone. Kahlbaum's "zur Analyse".                                      |  |  |
| mined by the weight of mercury  | Used after tests showed absence of   |  |  |
| displaced.  | water, acid and aldehyde.  |  |  |
|   |  |  |  |
|   |  |  |  |
|   |  |  |  |
|   | ESTIMATED ERROR:   |  |  |
| APPARATUS/PROCEDURE: The apparatus is a modification of that of von Antropoff                                 | $\delta T/K = 0.03$  |  |  |
| (1). A calibrated, combined all glass   |  |  |  |
| manometer and bulb is enclosed in an  |  |  |  |
| air thermostat. Mercury is used as the calibration and confining liquid.                                      | REFERENCES:  |  |  |
| The solvent is degassed in the appa-  | 1. v. Antropoff, A.  |  |  |
| ratus. The solvent and the gas are  | Z. Electrochem. 1919, 25, 269.   |  |  |
| shaken together until equilibrium is established.   |  |  |  |
| C. CANTTRUCK  |  |  |  |
|   |  |  |  |
|   | 1  |  |  |

| COMPONENTS :   |   |   | ORIGINAL MEA   | SUBEMENTS .                                |  |
|--|---|---|--|--|--|
| 1. Helium; He; 7440-59-7   |   |   | ORIGINAL MEASUREMENTS:<br>Kobatake, Y.; Hildebrand, J.H. |  |  |
|  |   |   | , KODALAKE,  | , introducing o                            |  |
| 2. Hexadecafluc  | 2. Hexadecafluoroheptane; C <sub>7</sub> F <sub>16</sub> ;                |   |  |  |  |
| 335-57-5   | 335-57-9  |   |  | <u>Chem</u> . 1961, <u>65</u> , 331 - 335. |  |
|  |   |   |  |  |  |
| VARIABLES:   | <u> </u>  |   |  | ······                                     |  |
|  | 91.40 - 3   | 103.23  | PREPARED BY:   | .Edelman, M.E.Derrick                      |  |
| He P/kPa:  |   |   |  |  |  |
| ļ  | ·····   |   |  |  |  |
| EXPERIMENTAL VALUE   |   |   |  | 0 - 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2  |  |
|  | т/к   | Mol Fraction  | Bunsen<br>Coefficient                                    | Ostwald<br>Coefficient                     |  |
|  |   | $x_{1} \times 10^{4}$   | $\propto \times 10^2$                                    | $L \times 10^2$                            |  |
|  | 291.40  | 8.314   | 8.29   | 8.85                                       |  |
|  | 295.47  | 8.58  | 8.50   | 9.20                                       |  |
|  | 299.24<br>303.23  | 8.991<br>9.294  | 8.86<br>9.10   | 9.70<br>10.10                              |  |
| .  |   |   |  |  |  |
| Smoothed Data:   | <b>∆</b> G <sup>O</sup> ∕J r  | $nol^{-1} = - RT lr$  | $x_1 = 7124.$  | 4 + 34.543T                                |  |
|  |   | ev. $\Delta G^{\circ} = 11.3$   | -  |  |  |
|  |   |   |  | _  |  |
|  | ∆H <sup>O</sup> /J r  |   |  | $mol^{-1} = -34.543$                       |  |
|  |   |   | action AGO   | /J mol <sup>-1</sup>                       |  |
|  | _   | x <sub>1</sub> x  | 104  |  |  |
|  | 21  | 38.15 8.02  | 2 17   |  |  |
|  | 29  | 93.15 8.44<br>98.15 8.86  | 1 17   | ,251<br>,423                               |  |
|  |   | 03.15 9.29  |  | ,425,596                                   |  |
|  |   |   |  |  |  |
| The solubility<br>101.325 kPa (1   | y values  | were adjusted   | to a partia  | l pressure of helium of                    |  |
|  | -   | -   |  |  |  |
| The Bunsen and   | d Ostwald   | coefficients  | were calcul  | ated by the compiler.                      |  |
|  |   |   |  |  |  |
|  |   | AUXILIARY   | INFORMATION  |  |  |
| METHOD: The appar  | catus cor   | sists of a gas  | SOURCE AND H   | PURITY OF MATERIALS:                       |  |
| measuring buret  | t, an abs   | sorption pipet,   | 1. Helium  | . Linde Oxygen Co. Purity                  |  |
| and reservoir to<br>connections. The   |   |   | 1e 99.9 p  | er cent.                                   |  |
| at 25 °C, the p  | pipet at  | any temperatur  | e 2. Hexade  | cafluoroheptane. Source not                |  |
| from 5 to 30 of<br>glass-enclosed  | C. The pi   | pet contains a.   | given.   | Purified as described in                   |  |
| vide gentle, co  | ontinuous   | s magnetic stir   | - refere   | nce 1.                                     |  |
| ring. Pure sol   |   |   | 1  |  |  |
| freezing with 1<br>uating, then be   |   |   |  |  |  |
| The degassing p  | process i   | s repeated  |  |  |  |
| three times. The into the pipet,   | , where i   | t is then flow.<br>t is again boi   |  |  |  |
| led under tow by   | resaure r   | or rinar de-  |  |  |  |
| gassing. Manipu<br>is such that th   | ne solver   | it never comes  |  | K = 0.02<br>$X_1 = 0.003$                  |  |
| in contact with  | n stopcòc   | k grease. The   |  | <b>T</b>                                   |  |
| liquid in the p  |   | the difference  | REFERENCES:  |  |  |
|  |   | the pipet and   | l l. Glew,   | D.N.; Reeves, L.W.                         |  |
| between the car  |   |   | I T Dhu  |  |  |
| between the can<br>the volume of r   | mercury t   |   | $\frac{1}{2} \cdot \frac{1}{1}$                          | <u>s. Chem</u> . 1956, <u>60</u> , 615.    |  |
| between the cap<br>the volume of r<br>it. Gas is adm<br>exact amount is                    | mercury t<br>itted to<br>s determi  | the pipet. Its<br>ned by P-V  | <u><u> </u></u>  | s. <u>Chem</u> , 1956, <u>60</u> , 615.    |  |
| between the cap<br>the volume of r<br>it. Gas is adm<br>exact amount is<br>measurements in | mercury t<br>itted to<br>s determi<br>n the bur                           | the pipet. Its<br>ned by P-V<br>et before and                                   |  | <u>s. Chem</u> . 1956, <u>60</u> , 615.    |  |
| between the cap<br>the volume of r<br>it. Gas is admi<br>exact amount is                   | mercury t<br>itted to<br>s determi<br>n the bur<br>tion of g<br>rrer is s | the pipet. Its<br>ned by P-V<br>et before and<br>gas into the<br>set in motion. |  | <u>s. Cnem</u> . 1956, <u>60</u> , 615.    |  |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |  |
|--|---|--|--|--|
| 1. Helium; He; 7440-59-7   | Clever, H. L.; Saylor, J. H.;<br>Gross, P. M.   |  |  |  |
| 2. Undecafluoro(trifluoromethyl)-<br>cyclohexane (Perfluoromethyl-   | Gross, F. M.  |  |  |  |
| cyclohexane); C <sub>7</sub> F <sub>14</sub> ; 355-02-2  | J. Phys. Chem. 1958, 62, 89-91.   |  |  |  |
| VARIABLES:   | PREPARED BY:  |  |  |  |
| T/K: 289.15 - 316.25   | P. L. Long  |  |  |  |
| P/kPa: 101.325 (1 atm)   |   |  |  |  |
| EXPERIMENTAL VALUES:   |   |  |  |  |
| T/K Mol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup>   | Bunsen Ostwald<br>Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>                                |  |  |  |
| 289.15 7.05  | 8.17 8.65   |  |  |  |
| 303.15 7.85  | 8.93 9.91   |  |  |  |
| 316.25 8.23  | 9.16 10.6   |  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$  |   |  |  |  |
| Std. Dev. ΔG° = 35.0,  |   |  |  |  |
|  | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -45.274$  |  |  |  |
| $\begin{array}{ccc} T/K & Mol Fract \\ X_{1} \times 10 \\ \hline \end{array}$  | tion ΔG°/J mol <sup>-1</sup><br>04  |  |  |  |
| 288.15 7.06  |   |  |  |  |
| 293.15 7.28<br>298.15 7.51   |   |  |  |  |
| 303.15 7.73  | 18,061  |  |  |  |
| 308.15 7.94<br>313.15 8.16   | 18,288<br>18,514  |  |  |  |
| 318.15 8.38  | 18,741  |  |  |  |
| The solubility values were adjusted to a partial pressure of helium of 101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated by the compiler. |   |  |  |  |
|  |   |  |  |  |
|  | INFORMATION   |  |  |  |
| METHOD: Volumetric. (1) The apparatus<br>is a modification of that used by<br>Morrison and Billett ( $2$ ). Modifica-<br>tions include the addition of a               | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Matheson Co., Inc. Both<br>standard and research grades<br>were used. |  |  |  |
| spiral solvent storage tubing, a manometer for constant reference  | 2. Perfluoromethylcyclohexane.  |  |  |  |
| pressure, and an extra gas buret for   | du Pont FCS-326, shaken with  |  |  |  |
| highly soluble gases.  | concentrated H <sub>2</sub> SO <sub>4</sub> , washed,   |  |  |  |
|  | dried over Drierite and distilled<br>b.p. 75.95 to 76.05° at 753 mm.,   |  |  |  |
|  | lit. b.p. 76.14 °C at 760 mmHg.   |  |  |  |
|  |   |  |  |  |
| APPARATUS/PROCEDURE: (a) Degassing. 700ml  | ESTIMATED ERROR:  |  |  |  |
| of solvent is shaken and evacuated   | $\delta T/K = 0.05$   |  |  |  |
| while attached to a cold trap, until<br>no bubbles are seen; solvent is then   | $\frac{\delta P/mm}{\delta X_1/X_1} = 0.03$   |  |  |  |
| transferred through a 1 mm. capillary  |   |  |  |  |
| tubing, released as a fine mist into a continuously evacuated flask.   | REFERENCES:<br>1. Clever, H. J.; Battino, R.;   |  |  |  |
| (b) Solvent is saturated with gas as   | Saylor, J. H.; Gross, P. M.   |  |  |  |
| it flows through 8 mm x 180 cm of<br>tubing attached to a gas buret. Pres-   | <u>J. Phys. Chem</u> . 1957, <u>61</u> , 1078.  |  |  |  |
| sure is maintained at 1 atm as the gas is absorbed.  | <ol> <li>Morrison, T. J.; Billett, F.<br/>J. Chem. Soc. 1948, 2033;<br/>ibid.1952, 3819.</li> </ol>                 |  |  |  |
|  |   |  |  |  |

| COMPONENTS .  | ODICINAL ADICADO   |
|---|--|
| COMPONENTS:   | ORIGINAL MEASUREMENTS:<br>Evans, F. D.; Battino, R.                            |
| 1. Helium; He; 7440-59-7  | Drundy I. Dey Ducchio, Ke  |
| 2. Hexafluorobenzene; C <sub>6</sub> F <sub>6</sub> ; 392-56-3  |  |
|   | J. Chem. Thermodyn. 1971, 3, 753-760.  |
|   |  |
|   |  |
| VARIABLES:  | PREPARED BY:   |
| т/к: 282.91 - 298.46  | H. L. Clever   |
| P/kPa: 101.325 (1 atm)  | n. L. Clever   |
|   |  |
| EXPERIMENTAL VALUES:<br>T/K Mol Fraction  | Bunsen Ostwald   |
|   | Coefficient Coefficient  |
| $\underline{\qquad \qquad x_1 \times 10^4}$   | $\frac{\alpha \times 10^2}{2} \qquad L \times 10^2$                            |
| 282.91 1.43   | 2.82 2.92  |
| 283.10 1.41   | 2.79 2.89  |
| 297.63 2.13<br>298.46 2.13  | 4.13 4.50<br>4.13 4.51   |
|   |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$   | $x_1 = 18873 + 6.968 T$  |
| Std. Dev. AG° = 28.5,   | Coef. Corr. = 0.9049   |
|   | $\Delta s^{-1} K^{-1} mol^{-1} = -6.968$                                       |
|   |  |
| T/K Mol Frac<br>X <sub>l</sub> x l  | tion ΔG°/J mol <sup>-1</sup><br>0 <sup>4</sup>                                 |
| 278.15 1.23   | 20,812   |
| 283.15 1.43   | 20,847   |
| 288.15 1.64<br>293.15 1.87  |  |
| 298.15 2.13   | 20,951   |
| 303.15 2.42   | 20,986   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate |  |
|   |  |
|   | INFORMATION  |
| METHOD: The apparatus is based on the design by Morrison and Billett (1)  | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Either Air Products &            |
| and the version used is described by  | Chemicals, Inc., or Matheson Co.,  |
| Battino, Evans, and Danforth (2).   | <pre>Inc. Better than 99 mol per cent.<br/>(usually 99.9+).</pre>              |
|   | (usually ssesry.   |
|   | 2. Hexafluorobenzene. Imperial   |
| APPARATUS/PROCEDURE: Degassing. Up to   | Smelting Co., Avonmouth, U.K.<br>GC purity 99.7%, density at 25 <sup>o</sup> C |
| 500 cm <sup>3</sup> of solvent is placed in a   | $1.60596 \text{ g cm}^{-3}$ , Purified by                                      |
| flask of such size that the liquid is<br>about 4 cm deep. The liquid is rapid-  | see: <u>Anal</u> . <u>Chem</u> . 1968, <u>40</u> , 224.                        |
| ly stirred, and vacuum is applied in-   |  |
| termittently through a liquid N <sub>2</sub> trap   | DOMINAMED EDDOR:   |
| until the permanent gas residual pressure drops to 5 microns.   | ESTIMATED ERROR:<br>$\delta T/K = 0.03$  |
| Solubility Determination. The de-   | $\delta P/mmHg = 0.5$  |
| gassed solvent passes in a thin film<br>down a glass spiral tube containing   | $\delta x_1 / x_1 = 0.03$  |
| the solute gas plus the solvent vapor   | REFERENCES :   |
| at a total pressure of one atm. The   |  |
| volume of gas absorbed is found by<br>difference between the initial and  | 1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.                   |
| final gas volume in the buret system.   |  |
| The solvent is collected in a tared flask and weighed.  | 2. Battino, R.; Evans, F. D.;<br>Danforth, W. F.                               |
| LIASY and METAUCA.  | J. Am. Oil Chem. Soc. 1968, 45,  |
|   | 830.   |

| Loour oursured   |   |
|--|---|
| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |
| 1. Helium; He; 7440-59-7   | Saylor, J. H.; Battino, R.  |
| 2. Fluorobenzene; C <sub>6</sub> H <sub>5</sub> F; 462-06-6                  |   |
| <u> </u>   | J. Phys. Chem. 1958, 62, 1334-1337.   |
|  | <u>J. Phys. Chem</u> . 1958, <u>62</u> , 1334-1357.   |
|  |   |
|  |   |
| VARIABLES:   | PREPARED BY:  |
| т/к: 288.15 - 328.15   | H. L. Clever  |
| P/kPa: 101.325 (1 atm)   |   |
| EXPERIMENTAL VALUES:   |   |
| T/K Mol Fraction   | Bunsen Ostwald  |
| $x_{1} \times 10^{4}$  | Coefficient Coefficient<br>$\alpha \ge 10^2$ L $\ge 10^2$   |
|  |   |
| 288.15 1.01<br>298.15 1.16   | 2.44 2.57<br>2.75 3.00  |
| 313.15 1.35  | 3.14 3.60   |
| 328.15 1.52  | 3.49 4.19   |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$                      | X <sub>2</sub> = 7036 8 + 49 930 m  |
| Smootned Data: $\Delta G^{2}/J \mod 4 = -KT \ln I$                           | ~1 - /930.0 + 40.030 I  |
| Std. Dev. ΔG° = 35.4,  | Coef. Corr. = 0.9991  |
|  | $\Delta s^{\circ}/J K^{-1} mol^{-1} = -48.830$  |
| $\Delta H^{2}/3 \text{ mol} = 7936.8,$                                       |   |
| T/K Mol Frac   |   |
| x <sub>1</sub> × 1   | 04  |
| 288.15 1.02  | 22,007  |
| 293.15 1.08  | 22,251  |
| 298.15 1.15<br>303.15 1.21   |   |
| 308.15 1.27  | •   |
| 313.15 1.34  | 23,228  |
| 318.15 1.40  |   |
| 323.15 1.47<br>328.15 1.53   |   |
|  |   |
| The solubility values were adjusted t<br>101.325 kPa (1 atm) by Henry's law. | o a partial pressure of helium of   |
| The Bunsen coefficients were calculat  | ed by the compiler.   |
|  | INFORMATION   |
|  | INFORMATION   |
| METHOD: The apparatus is based on the  | SOURCE AND PURITY OF MATERIALS:   |
| design by Morrison and Billett (1)<br>and the version used is described by   | 1. Helium. Matheson Co., Inc. Both  |
| Clever, Battino, Saylor, and Gross (2  | standard and research grades were used.   |
|  |   |
|  | 2. Fluorobenzene. Eastman Kodak Co.   |
|  | 2. Fluorobenzene. Eastman Kouak Co.<br>white label, dried over P40 <sub>10</sub> ,<br>distilled, b.p. 84.28 - 84.68 °C. |
|  | distilled, b.p. 04.20 % 04.00 C.  |
|  | }   |
|  |   |
|  |   |
|  | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE: The solvent is de-                                      | $\delta T/K = 0.03$   |
| gassed by evacuating the space above<br>the liquid and shaking, followed by  | $\delta P/mmHg = 1$   |
| passage of the liquid as a fine mist   | $\delta X_1 / X_1 = 0.04$   |
| into an evacuated container. The   | REFERENCES :  |
| degassed liquid passes as a thin<br>liquid film down a glass spiral tube     | 1. Morrison, T. J.; Billett, F.   |
| containing the solute gas at a total   | J. Chem. Soc. 1948, 2033.   |
| pressure of one atm (1,2).   |   |
|  | 2. Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.   |
|  | J. Phys. Chem. 1957, 61, 1078.  |
|  |   |
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| CONDONENTS  |   |  |  |  |
|---|---|--|--|--|
| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |  |  |  |
| 1. Helium; He; 7440-59-7  | de Wet, W. J.   |  |  |  |
| 2. 1,1,2,2-Tetrachloroethane;C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub> ;<br>79-34-5 |   |  |  |  |
|   | <u>J. S. Afr. Chem. Inst</u> . 1964, <u>17</u> , 9-13.  |  |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |  |
| T/K: 291.25 - 304.05  | P. L. Long  |  |  |  |
|   |   |  |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |  |
| T/K Mol Fraction<br>$X_1 \times 10^4$   | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$  |  |  |  |
| 291.25 0.997  | 2.12 2.26   |  |  |  |
| 297.45 1.08<br>304.05 1.15  | 2.28 2.48<br>2.42 2.69  |  |  |  |
| 304.05 1.15   | 2.42 2.03   |  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$                                 | +   |  |  |  |
| Std. Dev. ΔG° = 13.2,   |   |  |  |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 8,193.3,$  | $\Delta S^{0}/J K^{-1} mol^{-1} = -48.443$  |  |  |  |
| T/K Mol Fract<br>$X_1 \times 10$  | $AG^{\circ}/J \text{ mol}^{-1}$   |  |  |  |
| 288.15 0.964  |   |  |  |  |
| 293.15 1.02<br>298.15 1.08  | 22,395<br>22,637  |  |  |  |
| 303.15 1.14<br>308.15 1.20  | 22,879<br>23,121  |  |  |  |
| 308.15 1.20   |   |  |  |  |
| The solubility values were adjusted t<br>101.325 kPa (1 atm) by Henry's law.            | o a partial pressure of helium of   |  |  |  |
| The mole fraction solubility and Ostv<br>by the compiler.                               | vald coefficients were calculated   |  |  |  |
| AUXILIARY   | INFORMATION   |  |  |  |
| METHOD: Volumetric.   | SOURCE AND PURITY OF MATERIALS:   |  |  |  |
| To degas, the solvent is placed in  | 1. Helium. No source given. The gas   |  |  |  |
| a large continuously evacuated bulb<br>until the solvent boils freely with-             | purified over activated charcoal  |  |  |  |
| out further release of dissolved gases.   | at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent.                                      |  |  |  |
| To saturate, the solvent is flowed in   |   |  |  |  |
| a thin film through a glass spiral  | <ol> <li>1,1,2,2-Tetrachloroethane. No<br/>source given. 1,1,2,2-Tetrachloro-</li> </ol>                                  |  |  |  |
| containing the gas. The volume of gas absorbed is measured on an attach-                | ethane distilled immediately  |  |  |  |
| ed buret system.  | before use.   |  |  |  |
|   | ESTIMATED EDDOD.  |  |  |  |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:  |  |  |  |
| The apparatus is a modification of  | δτ/κ = 0.05   |  |  |  |
| that used by Morrison and Billett(1)<br>and others (2). The degassed solvent            |   |  |  |  |
| is saturated with gas as it flows   | REFERENCES:   |  |  |  |
| through a glass spiral containing the gas. The amount of solvent passing                | 1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;  |  |  |  |
| through the spiral is such that 10 -  | <u>ibid.</u> 1952, 3819.  |  |  |  |
| 25 ml of gas was absorbed.  | <ol> <li>Clever, H. L.; Battino, R.;<br/>Saylor, J. H.; Gross, P. M.<br/>J. Phys. Chem. 1957, <u>61</u>, 1078.</li> </ol> |  |  |  |
|   |   |  |  |  |

| COMPONENTS:   |   |  |  |
|---|---|--|--|
| COM ONENTS.   | ORIGINAL MEASUREMENTS:<br>Saylor, J. H.; Battino, R.  |  |  |
| l. Helium; He; 7440-59-7  |   |  |  |
| 2. Chlorobenzene; C <sub>6</sub> H <sub>5</sub> Cl; 108-90-7                | <u>J. Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 1334 - 1337.   |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |
| T/K: 288.15 - 328.15  | H. L. Clever  |  |  |
| P/kPa: 101.325 (1 atm)  |   |  |  |
|   |   |  |  |
| EXPERIMENTAL VALUES:<br>T/K Mol Fraction                                    | Bunsen Ostwald  |  |  |
| $x_1 \times 10^4$   | $\begin{array}{ccc} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \\ \hline \end{array}$ |  |  |
| 288.15 0.597  | 1.32 1.39   |  |  |
| 298.15 0.696<br>313.15 0.853  | 1.52 1.66<br>1.84 2.11  |  |  |
| 328.15 0.990  | 2.11 2.53   |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$                    | Х <sub>1</sub> = 9951.1 + 46.251 т  |  |  |
| Std. Dev. ∆G° = 32.0,   | Coef. Corr. = 0.9992  |  |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 9951.1,$                             | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -46.251$  |  |  |
|   |   |  |  |
| T/K Mol Frac<br>X1 x 1  |   |  |  |
| 288.15 0.60<br>293.15 0.64  | •   |  |  |
| 293.15 0.64   |   |  |  |
| 303.15 0.74   | 0 23,972  |  |  |
| 308.15 0.78<br>313.15 0.84  |   |  |  |
| 318.15 0.89   | 2 24,666  |  |  |
| 323.15 0.94<br>328.15 1.00  |   |  |  |
| The solubility values were adjusted to 101.325 kPa (1 atm) by Henry's law.  | o a partial pressure of helium of   |  |  |
| The Bunsen coefficients were calculat                                       | ed by the compiler.   |  |  |
| AUXILIARY   | INFORMATION   |  |  |
| METHOD: The apparatus is based on the                                       | SOURCE AND PURITY OF MATERIALS:   |  |  |
| design by Morrison and Billett (1)  | 1. Helium. Matheson Co., Inc.   |  |  |
| and the version used is described by Clever, Battino, Saylor, and           | Research grade was used.  |  |  |
| Gross (2).  | 2. Chlorobenzene. Eastman Kodak Co.<br>white label. Dried over P4010'<br>distilled b.p. 131.67 - 131.71'°C.                     |  |  |
|   |   |  |  |
| APPARATUS/PROCEDURE: The procedure is to                                    | ESTIMATED ERROR: $\delta T/K = 0.03$  |  |  |
| flow a thin layer of degassed liquid  | $\delta T/K = 0.03$ $\delta P/mmHg = 1$   |  |  |
| through a spiral containing the gas.<br>The gas dissolves rapidly and the   | $\delta x_1 / x_1 = 0.04$   |  |  |
| saturated liquid flows into a buret   |   |  |  |
| system. The volume of gas dissolved<br>is determined by the increase in the | REFERENCES:   |  |  |
| solution level at constant pressure.  | 1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.  |  |  |
| The volume of liquid the gas dissol-<br>ves in is determined in the burets. |   |  |  |
| For low solubilities extra solvent is                                       | <ol> <li>Clever, H. L.; Battino, R.;<br/>Saylor, J. H.; Gross, P. M.</li> </ol>   |  |  |
| run through the buret system and<br>weighed. An auxiliary buret is used     | J. Phys. Chem. 1957, 61, 1078.  |  |  |
| for high solubilities.  |   |  |  |

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| COMPONENTS:   |   |  |  |  |
|---|---|--|--|--|
|   | ORIGINAL MEASUREMENTS:<br>Saylor, J. H.; Battino, R.  |  |  |  |
| 1. Helium; He; 7440-59-7  |   |  |  |  |
| 2. Bromobenzene; C <sub>6</sub> H <sub>5</sub> Br; 108-86-1.  | <u>J. Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 1334 - 1337.                                   |  |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |  |
| T/K: 288.15 - 328.15  | H. L. Clever  |  |  |  |
| P/kPa: 101.325 (1 atm)  |   |  |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |  |
| T/K Mol Fraction<br>$X_1 \times 10^4$   | BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L $\times 10^2$                        |  |  |  |
| 288.15 0.441  | 0.945 0.997   |  |  |  |
| 298.15 0.550<br>313.15 0.701  | 1.16 1.27<br>1.47 1.68  |  |  |  |
| 328.15 0.782  | 1.61 1.94   |  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$  | $X_1 = 11183 + 44.244 T$  |  |  |  |
| Std. Dev. ΔG° = 115.6   | , Coef. Corr. = 0.9890  |  |  |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 11183,$  | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -44.244$  |  |  |  |
| T/K Mol Frac<br>X <sub>1</sub> x 1  | tion $\Delta G^{\circ}/J \text{ mol}^{-1}$<br>04  |  |  |  |
| 288.15 0.45   |   |  |  |  |
| 293.15 0.49<br>298.15 0.53  |   |  |  |  |
| 303.15 0.57   | •   |  |  |  |
| 308.15 0.62   | 1 24,817  |  |  |  |
| 313.15 0.66<br>318.15 0.71  |   |  |  |  |
| 323.15 0.76   | 1 25,480  |  |  |  |
| 328.15 0.81   | 1 25,702  |  |  |  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate |   |  |  |  |
|   | INFORMATION   |  |  |  |
|   |   |  |  |  |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett (1)<br>and the version used is described by     | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Matheson Co., Inc.<br>Research grade was used.    |  |  |  |
| Clever, Battino, Saylor, and<br>Gross (2).  | 2. Bromobenzene. Eastman Kodak Co.,   |  |  |  |
|   | white label, dried over P4010,<br>distilled, b.p. 155.86 - 155.90°C                             |  |  |  |
|   |   |  |  |  |
|   |   |  |  |  |
|   |   |  |  |  |
|   |   |  |  |  |
|   | ESTIMATED ERROR:  |  |  |  |
| APPARATUS/PROCEDURE: The procedure is to<br>flow a thin layer of degassed liquid  | δm/// 0.00  |  |  |  |
| through a spiral containing the gas.  | $\begin{array}{rcl} \delta T/K &= 0.03 \\ \delta P/mmHg &= 1 \end{array}$                       |  |  |  |
| The gas dissolves rapidly and the saturated liquid flows into a buret   | $\delta X_1 / X_1 = 0.04$   |  |  |  |
| system. The volume of gas dissolved   | REFERENCES:   |  |  |  |
| is determined by the increase in the  | 1. Morrison, T. J.; Billett, F.   |  |  |  |
| solution level at constant pressure.<br>The volume of liquid the gas dissol-  | <u>J. Chem. Soc</u> . 1948, 2033.   |  |  |  |
| ves in is determined in the burets.   | 2. Clever, H. L.; Battino, R.;  |  |  |  |
| For low solubilities extra solvent is<br>run through the buret system and<br>weighed. An auxiliary buret is used        | 2. Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.<br>J. Phys. Chem. 1957, 61, 1078. |  |  |  |
| for high solubilities.  | I   |  |  |  |

| COMPONENTS :  |   |  |  |  |
|---|---|--|--|--|
|   | ORIGINAL MEASUREMENTS:  |  |  |  |
| l. Helium; He; 7440-59-7  | Saylor, J. H.; Battino, R.  |  |  |  |
| 2. Iodobenzene; C <sub>6</sub> H <sub>5</sub> I; 591-50-4   |   |  |  |  |
|   | J. Phys. Chem. 1958, 62, 1334 - 1337.   |  |  |  |
|   | and another and and a set of the |  |  |  |
|   |   |  |  |  |
| VARIABLES:  | PREPARED BY:<br>H. L. Clever  |  |  |  |
| T/K: 288.15 - 328.15<br>P/kPa: 101.325 (1 atm)  | n. L. Clever  |  |  |  |
|   |   |  |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |  |
| T/K Mol Fraction  | Bunsen Ostwald<br>Coefficient Coefficient   |  |  |  |
| $x_1 \times 10^4$   | Coefficient Coefficient<br>$\alpha \times 10^2$ L x 10 <sup>2</sup>   |  |  |  |
| 288.15 0.298  | 0.601 0.634   |  |  |  |
| 298.15 0.385  | 0.770 0.840   |  |  |  |
| 313.15 0.504<br>328.15 0.592  | 0.994 1.14<br>1.16 1.39   |  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln^{-1}$  | $X_1 = 13325 + 40.068 T$  |  |  |  |
| Std. Dev. AG° = 105.9,  | Coef. Corr. = 0.9888  |  |  |  |
| $AH^{2}/I = 13325$  | $\Delta s^{-1} K^{-1} mol^{-1} = -40.068$   |  |  |  |
|   | ······································  |  |  |  |
| $\begin{array}{c} T/K & Mol Fract \\ X_1 \times 10 \end{array}$   | $\Delta G^{\circ}/J \text{ mol}^{-1}$   |  |  |  |
| 288.15 0.310  | 24,871  |  |  |  |
| 293.15 0.341<br>298.15 0.374  | L 25,071<br>4 25,271  |  |  |  |
| 303.15 0.408  | 3 25,472  |  |  |  |
| 308.15 0.445<br>313.15 0.484  |   |  |  |  |
| 318.15 0.524  | · · · · · · · · · · · · · · · · · · ·   |  |  |  |
| 323.15 0.560<br>328.15 0.61   |   |  |  |  |
|   |   |  |  |  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate |   |  |  |  |
|   | INFORMATION   |  |  |  |
|   |   |  |  |  |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett (1)   | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Matheson Co., Inc.  |  |  |  |
| and the version used is described by  | Research grade used.  |  |  |  |
| Clever, Battino, Saylor, and<br>Gross (2).  | 2. Iodobenzene. Eastman Kodak Co.,  |  |  |  |
|   | white label, shaken with dil.   |  |  |  |
|   | ag. thiosulfate, washed with water, dried over P40 <sub>10</sub> , distil-  |  |  |  |
|   | led 77.40 - 77.60 °C under 20   |  |  |  |
|   | mmHg.   |  |  |  |
| }   |   |  |  |  |
| }   |   |  |  |  |
| APPARATUS/PROCEDURE: The procedure is to  | ESTIMATED ERROR:<br>$\delta T/K = 0.03$   |  |  |  |
| flow a thin layer of degassed liquid<br>through a spiral containing the gas.  | $\delta P/mmHg = 1$   |  |  |  |
| The gas dissolves rapidly and the   | $\delta X_1 / X_1 = 0.04$   |  |  |  |
| saturated liquid flows into a buret<br>system. The volume of gas dissolved  | REFERENCES:   |  |  |  |
| is determined by the increase in the  | 1. Morrison, T. J.; Billett, F.   |  |  |  |
| solution level at constant pressure.<br>The volume of liquid the gas dissol-  | <u>J. Chem. Soc</u> . 1948, 2033.   |  |  |  |
| ves in is determined in the burets.   | 2. Clever, H. L.; Battino, R.;  |  |  |  |
| For low solubilities extra solvent is<br>run through the buret system and   | Saylor, J. H.; Gross, P. M.   |  |  |  |
| weighed. An auxiliary buret is used   | J. Phys. Chem. 1957, <u>61</u> , 1078.  |  |  |  |
| for high solubilities.  | L   |  |  |  |

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| COMPONENTS :   | ORIGINAL MEASUREMENTS:   |  |  |  |  |
|--|--|--|--|--|--|
| 1. Helium; He; 7440-59-7   | Powell, R. J.  |  |  |  |  |
| 2. Carbon Disulfide; CS <sub>2</sub> ; 75-15-0   |  |  |  |  |  |
| 2. Carbon 22001110, 052, 70 10 0   |  |  |  |  |  |
|  | <u>J. Chem. Eng. Data</u> 1972, <u>17</u> , 302-304.   |  |  |  |  |
| VARIABLES:   | PREPARED BY:   |  |  |  |  |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)  | P. L. Long   |  |  |  |  |
| EXPERIMENTAL VALUES:   |  |  |  |  |  |
| T/K Mol Fraction   | Bunsen Ostwald   |  |  |  |  |
| $x_1 \times 10^4$  | Defficient Coefficient<br>$\alpha \ge 10^2$ L $\ge 10^2$   |  |  |  |  |
| 298.15 0.39  | 1.44 1.57  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| AUXILIARY  | INFORMATION  |  |  |  |  |
| METHOD:  | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium. No source given. Research grade, dried over CaCl<sub>2</sub> before use.</li> <li>2. Carbon Disulfide. No source given. Spectrochemical grade.</li> </ul> |  |  |  |  |
| APPARATUS/PROCEDURE: Dymond and Hilde-<br>brand (1) apparatus which uses an all<br>glass pumping system to spray slugs<br>of degassed solvent into the gas.<br>The amount of gas dissolved is calcu- | ESTIMATED ERROR:<br>$\delta X_1 / X_1 = 0.002$   |  |  |  |  |
| lated from the initial and final gas<br>pressures. The solvent is degassed<br>by freezing and pumping followed by<br>boiling under reduced pressure.   | REFERENCES:<br>1. Dymond, J. H.; Hildebrand, J. H.<br><u>Ind. Eng. Chem. Fundam</u> . 1967, <u>6</u> ,<br>130.   |  |  |  |  |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |  |  |  |  |
|--|--|--|--|--|--|
|  | Dymond, J.H.   |  |  |  |  |
| 1. Helium; He; 7440-59-7   |  |  |  |  |  |
| <pre>2. Sulfinylbismethane (Dimethyl Sulf-<br/>oxide); C<sub>2</sub>H<sub>6</sub>OS (CH<sub>3</sub>SOCH<sub>3</sub>);<br/>67-68-5</pre>  | <u>J. Phys</u> . <u>Chem</u> . 1967, <u>71</u> , 1829 - 1831.  |  |  |  |  |
| VARIABLES:   | PREPARED BY:   |  |  |  |  |
| T/K: 298.15<br>He P/kPa: 101.325 (1 atm)   | M.E.Derrick  |  |  |  |  |
| EXPERIMENTAL VALUES:   |  |  |  |  |  |
| T/K Mol Fraction   | Bunsen Ostwald<br>Coefficient Coefficient  |  |  |  |  |
| $x_1 \times 10^4$  | $\alpha \times 10^2$ L x $10^2$  |  |  |  |  |
| 298.15 0.284   | 0.893 0.975  |  |  |  |  |
|  |  |  |  |  |  |
| AUXILIARY  | INFORMATION  |  |  |  |  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS;  |  |  |  |  |
| The liquid is saturated with the gas   | 1. Helium. Stuart Oxygen Co. Dried   |  |  |  |  |
| at a gas partial pressure of 1 atm.<br>The apparatus is that described by  | <ol> <li>before use.</li> <li>Dimethylsulfoxide. Matheson, Coleman, and Bell Co. Spectroguality</li> </ol>   |  |  |  |  |
| at a gas partial pressure of 1 atm.<br>The apparatus is that described by<br>Dymond and Hildebrand (1). The appa-<br>ratus uses an all-glass pumping system<br>to spray slugs of degassed solvent<br>into the gas. The amount of gas dis-<br>solved is calculated from the initial | before use.<br>2. Dimethylsulfoxide. Matheson, Cole-<br>man, and Bell Co. Spectroquality<br>reagent. Dried over 4A molecular<br>seive and a fraction frozen out. |  |  |  |  |

| COMPONENTS:  |  |  | 1  | ORIGINAL                                       | MEASUREMENTS:  |   |                      |
|--|--|--|--|--|--|---|----------------------|
| 1. Helium; He; 7440-59-7   |  |  |  | Chang, E. T.; Gokcen, N. A.                    |  |   |                      |
|  | ydrazine;  | сн <sub>6</sub> n <sub>2</sub> (NHCH   | 3 <sup>NH</sup> 2)   | 21   |  | ·   |                      |
|  |  |  |  | J. Phys  | s. <u>Chem</u> . 196   | 58, <u>72</u> , 638   | - 642.               |
|  |  | - 298.14<br>- 217.383<br>- 2.1454 a  | tm)  | PREPARED                                       | BY:<br>P. L. Lor   | ng  |                      |
| EXPERIMENTAL V.<br>T/K   | ALUES:<br>P/Atm  | Henry's<br>Constant  |  | raction  | Coefficier   | nt Coeffi   |                      |
| 253.24   | 0.8264   | $\frac{K \times 10^4}{1.39}$ 1.57  | $\frac{X_1 \times 0.1}{0.3}$   | .15  | $\frac{\alpha \times 10^2}{0.65}$  | L x   |                      |
| 273.15   | 1.0000<br>1.1448<br>2.1454   | 1.78<br>1.95   | 0.1<br>0.2<br>0.4  | 18   |  | 0.6   |                      |
| 298.14   | 1.0000<br>1.1272<br>2.0617   | 2.46<br>2.63   | 0.1<br>0.2<br>0.5  | 78   | 0.81   | 0.8   | 3 L                  |
| The Henry's  | 1.0000<br>constant   | is defined   | 0.2<br>as K/a  | $1 \pm 1 = 2$                                  |  |   | alues at             |
| one atm wer<br>Smoothed Da<br>mole fracti-<br>fitted to:   | ta: The 10   | 1.325 kPa (  |  | -  | Mol Fractic $X_1 \times 10^4$  | -   | nol <sup>-1</sup>    |
| ΔG°/J mol <sup>-1</sup><br>Std. Dev. Δ   | $G^{\circ} = 38.4,$  | Coef.  |  | 258.15<br>263.15<br>268.15<br>273.15           | 0.156<br>0.167<br>0.178<br>0.190   | 23,76<br>24,07<br>24,38<br>24,69                            | 50<br>71<br>32<br>93 |
| ∆H°/J mol-l  | Corr. = 0<br>= 7699.0,<br>As°/J K <sup>-1</sup>  |  | 2.213  | 278.15<br>283.15<br>288.15<br>293.15<br>298.15 | 0.226  | 25,00<br>25,31<br>25,62<br>25,93<br>26,24                   | L5<br>26<br>37       |
| <del></del>  |  | AUX  | LLIARY 1   | INFORMATIC                                     | ······   | 20,2-   |                      |
| METHOD: The so<br>vacuum in t<br>aratus, App<br>were weighe<br>the apparat<br>liquid stir<br>served unti<br>change. Equ<br>within 10 m<br>40 m. Subst<br>decompose w<br>solvents th<br>2 h, and the<br>rected for<br>APPARATUS/PROCE | he previou<br>aratus and<br>d. Gas was<br>us at a kn<br>red, and t<br>l there wa<br>ilibrium w<br>and the P<br>ituted hyd<br>ith time.<br>e P was fo<br>e solubili<br>the gaseou | degassed un<br>sly weighed<br>degassed s<br>introduced<br>own P and T<br>he pressure<br>s no furthe<br>as establis<br>was follow<br>razines app<br>For decompo<br>llowed for<br>ty value wa<br>s decomp. p | der<br>app-<br>olvent<br>into<br>, the<br>ob-<br>r<br>hed<br>ed for<br>ear to<br>sing<br>up to<br>s cor-<br>rod. | SOURCE AN<br>1. Ho<br>2. Mo<br>t:<br>No        | D PURITY OF M<br>elium. No ir<br>ethylhydrazi<br>ially distil<br>o source or | nformation g<br>ine. Used ir<br>lled, pure s<br>% purity gi | n ini-<br>state.     |
| all Pyrex g<br>sisted of the<br>the measured<br>tainer for<br>stirred with<br>and a manome<br>cathetometed<br>sure. The<br>capacity for<br>5 ml gas specific   | lass const<br>hree calib<br>ment of th<br>the solven<br>h a glass<br>eter with<br>r for meas<br>solvent co<br>r 100 g of<br>ace above<br>apparatus                               | ruction. It<br>rated volum<br>e gas, a co<br>t, which wa<br>enclosed ma<br>a microslid<br>uring the p<br>ntainer had<br>solvent wi<br>the liquid<br>sections we  | con-<br>es for<br>n-<br>s<br>gnet,<br>e<br>res-<br>a<br>th a<br>sur-<br>re                                       | REFERENCE                                      | $\delta P/mmF$<br>$\delta X_1/X_1$   |   |                      |

| COMPONENTS:   |   |                                     | ORIGINAL MEASUREMENTS: |           |                        |                                  |  |
|---|---|-------------------------------------|------------------------|-----------|------------------------|----------------------------------|--|
| 1. Helium; He; 7440-59-7  |   |                                     | Cha                    | ang, E.   | . T.; Gokcen,          | N. A.                            |  |
|   | -   |                                     |                        |           |                        |                                  |  |
|   |   | zine; C <sub>2</sub> H <sub>8</sub> | <sup>N</sup> 2         |           |                        |                                  |  |
|   | CH <sub>3</sub> ) <sub>2</sub> ); 57-   | -14-/                               |                        | <u></u> . | Phys.                  | Chem. 1968,                      | 72, 638 - 642.                         |
|   |   |                                     |                        |           |                        |                                  |  |
| VARIABLES:  | ·····   |                                     |                        | PREP      | ARED BY                | :                                |  |
| T/K:<br>He P/kP   | 253.05 -<br>a: 118.743  |                                     |                        |           |                        | P. L. Long                       |  |
|   |   | - 2.2511 A                          | .tm)                   |           |                        |                                  |  |
| EXPERIMENTAL  | VALUES:   |                                     |                        |           |                        |                                  | ······································ |
| T/K   | P/Atm   | Henry's                             | Mol F                  | ract      | ion                    | Bunsen                           | Ostwald                                |
|   |   | Constant<br>K x 10 <sup>5</sup>     | X <sub>1</sub> x       | 104       |                        | Coefficient $\alpha \times 10^2$ | Coefficient<br>L x 10 <sup>2</sup>     |
| 253.05  | 1.1719  | 4.97                                | 0.5                    |           |                        |                                  |  |
|   | 2.0347  | 4.93                                | 1.0                    |           |                        | 1.53                             | 1.42                                   |
|   | 1.0000  |                                     |                        |           |                        | 1.55                             | 1.42                                   |
| 273.15  | 1.3684<br>2.2511  | 6.72<br>6.89                        | 0.9<br>1.5             |           |                        |                                  |  |
|   | 1.0000  | 0.05                                | 0.6                    |           |                        | 2.05                             | 2.05                                   |
| 293.16  | 1.4394  | 8.70                                | 1.2                    | 953       |                        |                                  |  |
| 293.10  | 2.2158  | 8.94                                | 1.9                    | 81        |                        |                                  |  |
|   | 1.0000  |                                     | 0.8                    |           |                        | 2.56                             | 2.77                                   |
|   |   |                                     |                        |           |                        |                                  | ility values at the compiler.          |
| Smoothed Da   |   |                                     |                        |           | T/K                    | Mol Fraction                     | $\Delta G^{\circ}/J \text{ mol}^{-1}$  |
| mole fract:   | ion solubil   | lities were                         | fitted                 |           | 248.15                 | $\frac{X_1 \times 10^4}{0.457}$  | 20,616                                 |
| to:<br>∆G°/J mol <sup>-</sup>   | 1 = -BT ln  | X.                                  |                        |           | 253.15                 | 0.498                            | 20,855                                 |
|   |   | + 47.667 I                          | •                      |           | 258.15                 | 0.539<br>0.583                   | 21,093<br>21,331                       |
| Std. Dev.   |   |                                     |                        |           | 268.15                 | 0.628                            | 21,531                                 |
|   | Corr. = (   |                                     |                        |           | 273.15                 | 0.676<br>0.724                   | 21,808<br>22,046                       |
| ∆H°/J mol-  | L = 8787.8  | $m_{ol} - 1 = -$                    | 47 667                 | 2         | 283.15                 | 0.774                            | 22,285                                 |
|   | 72 /0 K -   |                                     | 47.007                 |           | 288.15                 | 0.826<br>0.880                   | 22,523<br>22,761                       |
|   |   |                                     |                        |           | 298.15                 | 0.934                            | 23,000                                 |
|   |   | AU                                  | XILIARY                | INFOR     | MATION                 |                                  |  |
| METHOD: The   | colvent was   |                                     |                        |           |                        |                                  |  |
| vacuum in   | the previou   | usly weighe                         | ed app-                |           |                        | PURITY OF MATERI                 |  |
| aratus. App<br>were weigh   |   |                                     |                        | 1.        | Heliu                  | um. No inform                    | ation given.                           |
| the appara  | tus at a kr   | nown P and                          | T, the                 | 2.        |                        |                                  | zine. Used in                          |
| liquid sti:<br>served unt:  |   |                                     |                        |           |                        | ially distill<br>ource or % pu   | ed, pure state.                        |
| change. Equ   | uilibrium v   | vas establi                         | shed                   |           |                        | Jurou or o pu                    |  |
| within 10 m. Subs   |   |                                     |                        |           |                        |                                  |  |
| decompose v   | with time.  | For decomp                          | osing                  |           |                        |                                  |  |
| solvents the 2 h, and the   |   |                                     | -                      |           |                        |                                  |  |
| rected for  |   |                                     |                        |           | MARED D                | DROD.                            |  |
| APPARATUS/PRO   |   |                                     |                        | 511       | MATED E                | $\delta T/K = 0.0$               | 3                                      |
| all Pyrex glass construction. It con-<br>sisted of three calibrated volumes for |   |                                     | -                      |           | $\delta P/mmHg = 0$    | 0.01                             |  |
| the measure   | the measurement of the gas, a con-<br>tainer for the solvent, which was<br>stirred with a glass enclosed magnet,<br>and a manometer with a microslide |                                     |                        |           | $\delta X_1 / X_1 = 0$ | .05                              |  |
| tainer for stirred with   |   |                                     | REFE                   | RENCES:   |                        |                                  |  |
| and a manor   |   |                                     | 1.                     | Chang     | , E. T.; Gokc          | en, N. A.                        |  |
| sure. The   | cathetometer for measuring the pres-<br>sure. The solvent container had a   |                                     |                        |           | J. Phy                 | ys. Chem. 196                    | 6, <u>70</u> , 2394.                   |
| capacity for  | or 100 g of   | E solvent w                         | with a                 |           |                        |                                  |  |
| o mi qas s  | pace above  | the liquid                          | sur⊷                   |           |                        |                                  |  |
| face. The calibrated  | apparatus s   | sections we                         | ere                    |           |                        |                                  |  |

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|---|---|
| COMPONENTS:<br>1. Helium; He; 7440-59-7   | ORIGINAL MEASUREMENTS:<br>Chang, E.T.; Gokcen, N.A.   |
| 2. 1,2-Dimethylhydrazine; $C_2H_8N_2$<br>(NHCH <sub>3</sub> NHCH <sub>3</sub> ); 540-73-8   | <u>J. Phys</u> . <u>Chem</u> . 1968, <u>72</u> , 638 - 642.   |
| VARIABLES:<br>T/K: 273.15 - 298.15  | PREPARED BY:  |
| P/kPa: 101.325 (1 atm)  | P. L. Long  |
| EXPERIMENTAL VALUES:  |   |
| given an estimated Gibbs energy equ<br>dimethylhydrazine. They used logical<br>ship between the Gibbs energy of so<br>hydrazine, and 1,1-dimethylhydrazin<br>distance of approach of solvent and<br>solvent was determined from a simple<br>extrapolated to obtain the estimate<br>of helium in 1,2-dimethylhydrazine<br>$\Delta G^{O}/cal mol^{-1} = -RT ln$<br>where K is the Henry's constant determined | $K/atm^{-1} = 2,490 + 7.70T$<br>fined as $K/atm^{-1} = X_1/P$ . The pressure is<br>ies at 101.325 kPa (1 atm) tabulated below |
| T/K   | Mol Fraction $X_1 \times 10^4$  |
| 273.1<br>278.1<br>283.1<br>288.1<br>293.1<br>298.1  | 5 0.0229<br>5 0.0248<br>5 0.0268<br>5 0.0289  |
|   |   |
| AUXILI  | LARY INFORMATION  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:   |
| Estimated data, see above.  |   |
| APPARATUS / PROCEDURE :   | ESTIMATED ERROR:  |

**REFERENCES:** 

| COMPONENTS:   |   | ORIGINAL MEASUREMENTS:   |  |  |
|---|---|--|--|--|
| l. Helium; He; 7440-59-7  |   | Chang, E.T.; Gokc  | CH / M+A+  |  |
| 2. Hydrazine; N <sub>2</sub> H  | H <sub>4</sub> ; 302-01-2   |  |  |  |
| <pre>3. 1,1-Dimethylhy</pre>  | ydrazine; C <sub>2</sub> H <sub>8</sub> N <sub>2</sub><br>57-14-7   | <u>J. Phys. Chem</u> . 196   | 8, <u>72</u> , 2556 - 2562.                      |  |
| VARIABLES:  | .15 - 303.15  | PREPARED BY:   |  |  |
|   |   | P.L.Long   | , H.L.Clever                                     |  |
|   | 0.663 (0.5 atm) -<br>253.313 (2.5 atm)  |  |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |  |
| 1,1-Dimethy1-   | $\Delta G^{O} = -RT \ln K H$  | lenry's Constant,  | Mol Fraction                                     |  |
| hydrazine, X <sub>3</sub>   | 273.15 - 303.15 K H<br>Unit:cal mol <sup>-1</sup>   | $K = \bar{X}_{1}/P$ Jnit: atm <sup>-1</sup> K x 10 <sup>6</sup> at 288.15 K                                | $X_1 \times 10^4$<br>At l atm<br>and 288.15 K    |  |
| 0.0   | 1,260 + 19.94T  | 4.86   | 0.0486   |  |
| 0.1   | 1,230 + 19.02T  | 8.14   | 0.0814   |  |
| 0.2   | 1,310 + 17.80T  | 13.07  | 0.1307   |  |
| 0.3<br>0.4  | 1,900 + 15.03T<br>2,150 + 13.71T  | 18.80<br>23.6  | 0.1880<br>0.236                                  |  |
| 0.5   | 2,210 + 13.09T  | 29.0   | 0.290  |  |
| 0.6   | 2,220 + 12.63T  | 36.0   | 0.360  |  |
| 0.7   | 2,200 + 12.29T  | 44.2   | 0.442  |  |
| 0.8   | 2,170 + 11.99T<br>2,140 + 11.67T  | 54.2   | 0.542  |  |
| 0.9<br>1.0  | 2,140 + 11.67T<br>2,110 + 11.36T  | 67.0<br>82.6   | 0.670<br>0.826                                   |  |
| The Gibbs energy equation was fitted to data taken in the 273.15 - 303.15 K temperature range.<br>The Henry's constant is based on data measured over the 0.5 - 2.5 atm pressure range. The value in the Table above is the Henry's constant at 288.15 K. Values at other temperatures can be calculated from the Gibbs |   |  |  |  |
| ulated by the cor   | -   |  |  |  |
| and in four mixtu   | f helium was measured<br>ares at three temperat<br>obtain the Gibbs energy  | ures and several pro   | essures. The data                                |  |
| tervals.  | AUXILIARY   | INFORMATION  |  |  |
| METHOD: The solvent   | was degassed under  | SOURCE AND PURITY OF M   | ATERIALS:  |  |
| vacuum in the pre<br>aratus. Apparatus<br>were weighed. Gas<br>the apparatus at<br>liquid stirred, a<br>served until ther<br>change. Equilibri<br>within 10 m and t<br>40 m. Substituted<br>decompose with ti<br>solvents the P wa<br>2 h, and the solu   | eviously weighed app-<br>s and degassed solvent<br>was introduced into<br>a known P and T, the<br>and the pressure ob-<br>ce was no further<br>tum was established<br>the P was followed for<br>d hydrazines appear to<br>the. For decomposing<br>us followed for up to<br>ability value was cor-<br>aseous decomp.product. | were not given. Th<br>refractive index o<br>components and sev<br>mixtures are given<br>were freshly disti | f the solvent<br>eral of their<br>. The solvents |  |
|   |   | ESTIMATED ERROR:   | 0.02   |  |
|   | The apparatus was of construction. It con-  | δP/mmHg  | = 0.03<br>= 0.01                                 |  |
|   | calibrated volumes for  | $\delta X_1/X_1$   |  |  |
| the measurement of  | of the gas, a containe  |  |  |  |
|   | which was stirred   | REFERENCES :   |  |  |
| with a glass end  | Losed magnet, and a microslide catheto-   | 1. Chang, E.T.; Go   | kcen, N.A.                                       |  |
|   | ing the pressure. The   | J. Phys. Chem.   |  |  |
| solvent container   | had a capacity for  |  |  |  |
|   | with a 5 ml gas space   |  |  |  |
|   | surface. The apparatulibrated to $\pm$ 0.0002 -   |  |  |  |
| L   |   | <u> </u>   |  |  |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |
|--|---|--|--|
| l. Helium; He; 7440-59-7   | Wood, R.H.; DeLaney, D.E.                                     |  |  |
| <pre>2. N-Methylacetamide; C<sub>3</sub>H<sub>7</sub>NO  (CH<sub>3</sub>CONHCH<sub>3</sub>); 79-16-3</pre>               | J. <u>Phys</u> . <u>Chem</u> . 1968, <u>72</u> , 4651 - 4654. |  |  |
| VARIABLES: T/K: 308.15 - 343.15<br>He P/kPa: 101.325 (1 atm)   | PREPARED BY:<br>P.L.Long                                      |  |  |
| EXPERIMENTAL VALUES:   |   |  |  |
| The authors fitted their experimental data by the method of least squares to the equation $\ln x_1 = -1152.5/T - 6.0579$ |   |  |  |
| which arranges to $\Delta G^{O}/J \mod^{-1} = -RT \ln X_1 = -RT(-1152.5/T - 6.0579)$                                     |   |  |  |

= 9,582.3 + 50.367T

and  $\Delta H^{O}/J \text{ mol}^{-1} = 9,582.3$ ,  $\Delta S^{O}/J \text{ K}^{-1} \text{ mol}^{-1} = -50.367$ 

The experimental data was not included in the paper. It is available in a thesis (1). The smoothed mole fraction helium solubilities at 101.325 kPa and five degree interval from 308.15 to 343.15 K were given in the paper. The Bunsen and Ostwald coefficients and the Gibbs energy of solution were calculated by the compiler.

| Smoothed Data: $T/K$ | Mol Fraction $X_1 \times 10^4$ | Bunsen<br>Coefficient<br>& x 10 <sup>2</sup> | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup> | ∆G <sup>o</sup> /J mol <sup>-1</sup> |
|----------------------|--------------------------------|--|---|--------------------------------------|
| 308,15               | 0.557                          | 1.62   | 1.82  | 25,103                               |
| 313.15               | 0.591                          | 1.71   | 1.96  | 25,355                               |
| 318.15               | 0.626                          | 1.80   | 2.10  | 25,607                               |
| 323.15               | 0.663                          | 1.90   | 2.25  | 25,858                               |
| 328.15               | 0.699                          | 1.99   | 2.39  | 26,110                               |
| 333.15               | 0.738                          | 2.09   | 2.55  | 26,362                               |
| 338.15               | 0.776                          | 2.19   | 2.71  | 26,614                               |
| 343.15               | 0.816                          | 2.30   | 2.88  | 26,866                               |

## AUXILIARY INFORMATION

|   | INFORMITION  |
|---|--|
| METHOD:   | SOURCE AND PURITY OF MATERIALS:  |
|   | <ol> <li>Helium. Source not given. Purity<br/>99.99 per cent.</li> </ol>   |
|   | 2. N-Methylacetamide.Source not<br>given. Recrystallized three times<br>in a dry box. Typically had a<br>water content of 0.04 mol per cent<br>after a solubility run. |
|   |  |
|   | ESTIMATED ERROR:   |
| APPARATUS/PROCEDURE: A gas buret was<br>connected to a solvent buret through<br>a three-way capillary stopcock. A<br>measured volume of gas was transferred<br>to a known volume of solvent; when | Duplicate runs checked to within 0.5<br>percent.   |
| equilibrium was reached the total   | REFERENCES:  |
| pressure and volume of the system was<br>measured (1). The apparatus and<br>procedure were checked by measuring<br>the solubility of Ar in H <sub>2</sub> O at 298.15                             | <ol> <li>DeLaney, D.E.<br/>M.S. Thesis, University of<br/>Delaware, 1968.</li> </ol>   |
| K. The Bunsen coefficient of 0.03105<br>checked well with the literature (2).   | 2. Ben-Naim, A.; Baer, S.<br>Trans. Faraday Soc. 1963,59,2735;<br><u>ibid</u> . 1964, <u>60</u> , 1736.  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
|   |  |
| l. Helium; He; 7440-59-7  | Saylor, J. H.; Battino, R.   |
| 2. Nitrobenzene; C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> ; 98-95-3      |  |
|   | J. Phys. Chem. 1958, 62, 1334 - 1337.  |
|   |  |
|   |  |
| VARIABLES:  | PREPARED BY:<br>H. L. Clever   |
| T/K: 288.15 - 328.15<br>P/kPa: 101.325 (l atm)                                | n. h. Cievei   |
| 1/// dt 101/015 (1 ddm/   |  |
| EXPERIMENTAL VALUES:<br>T/K Mol Fraction                                      | Bunsen Ostwald   |
| , c   | Coefficient Coefficient  |
| $x_1 \times 10^4$   | $\frac{\alpha \times 10^2}{10^2} = \frac{10^2}{10^2}$                        |
| 288.15 0.265  | 0.581 0.613<br>0.822 0.897   |
| 298.15 0.377<br>313.15 0.494  | 0.822 0.897<br>1.06 1.22   |
| 328.15 0.540  | 1.15 1.38  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$                      | X <sub>1</sub> = 13508 + 39.990 T  |
|   | Coef. Corr. = 0.9503   |
|   |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 13508,$                                | $\Delta s^{-1} = -39.990$  |
| T/K Mol Fract   | $\Delta G^{\circ}/J \text{ mol}^{-1}$  |
| $x_1 \times 10$   | )4   |
| 288.15 0.290  |  |
| 293.15 0.319<br>298.15 0.350  |  |
| 303.15 0.383  | 3 25,631   |
| 308.15 0.418<br>313.15 0.45   |  |
| 318.15 0.494  | 4 26,231   |
| 323.15 0.53<br>328.15 0.57  |  |
|   |  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law. | a partial pressure of helium of  |
| The Bunsen coefficients were calculate  | ed by the compiler.  |
| AUXILIARY   | INFORMATION  |
| METHOD: The apparatus is based on the   | SOURCE AND PURITY OF MATERIALS:  |
| design by Morrison and Billett (1)  | 1. Helium. Matheson Co., Inc.  |
| and the version used is described by  | Research grade was used.   |
| Clever, Battino, Saylor, and<br>Gross (2).                                    | 2. Nitrobenzene. Eastman Kodak Co.,  |
|   | white label, distilled from $P_4O_{10}$ , reduced pressure of 10 mm          |
|   | of Hg, b.p. $81.0 - 81.2$ C.   |
|   |  |
|   |  |
|   |  |
|   | REMINIMED RDDOD-   |
| APPARATUS/PROCEDURE: The procedure is to                                      | ESTIMATED ERROR:   |
| flow a thin layer of degassed liquid<br>through a spiral containing the gas.  | $\delta T/K = 0.03$  |
| The gas dissolves rapidly and the   | $\begin{array}{rcl} \delta P/mmHg &= 1\\ \delta X_1/X_1 &= 0.04 \end{array}$ |
| saturated liquid flows into a buret<br>system. The volume of gas dissolved    | REFERENCES :   |
| is determined by the increase in the  | 1. Morrison, T. J.; Billett, F.  |
| solution level at constant pressure.<br>The volume of liquid the gas dissol-  | J. Chem. Soc. 1948, 2033.  |
| ves in is determined in the burets.   | 2. Clever, H. L.; Battino, R.;   |
| For low solubilities extra solvent is<br>run through the buret system and     | Saylor, J. H.; Gross, P. M.<br>J. Phys. Chem. 1957, 61, 1078.                |
| weighed. An auxiliary buret is used   | 0. rilys. cilem. 1937, 01, 1078.   |
| for high solubilities.  |  |

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| COMPONENTS :                                      |  | ORIGIN   | AL MEASUREMENT   | S:   |
|---|--|--|--|--|
| l. Helium; He;                                    | 7440-59-7  | 1  | 11, R.J.   |  |
| bis (nonaflu                                      | 4,4,4-Nonafluoro-N,N-<br>orobutyl)-l-butanamine<br>ibutylamine) ;C <sub>12</sub> F <sub>27</sub> N,  |  | em. Eng. Dat   | <u>a</u> 1972, <u>17</u> , 302-304.  |
| VARIABLES:  | <u> </u>   | PREPAR   | ED BY:   | <u></u>  |
| T/K: 288.15 - 313.15<br>He P/kPa: 101.325 (1 atm) |  |  | P.L.Lo   | ng   |
| EXPERIMENTAL VALUES                               | •  | ······································             |  |  |
| т/к   | $\begin{array}{c} \text{Mol Fraction} \\ \underline{X_1 \times 10^4} \\ \underline{\qquad }  | cient  | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>                  | $R\frac{\Delta \log X_{1}}{\Delta \log T} = N$   |
| 298.15  | 11.67 7.3  | 4  | 8.01   | 4.13   |
| slope R(Alog X1                                   | ÷  | ne smoo<br>orm:                                    | thed data be   | low were calculated by   |
| Smoothed Data:                                    | T/K Mo   | ol Frac<br>X <sub>l</sub> x l                      |  |  |
| The Bunsen and                                    | 288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>Ostwald coefficients v   | 10.87<br>11.27<br>11.67<br>12.08<br>12.50<br>12.92 | 2<br>  | the compiler.  |
| <u></u>   | AUXILIAR   | V INFORM   | ΙΔΤΤΩΝ   |  |
|   |  |  |  |  |
| METHOD:   |  | 1. He  |  | rce given. Research  |
|   |  | Mi<br>eđ<br>44                                     | erfluorotribu<br>ning & Manuf<br>1, used porti<br>17.85-448.64 | ver CaCl <sub>2</sub> before use.<br>tylamine. Minnesota<br>acturing Co. Distill-<br>on boiling between<br>K which gave a single<br>.15 = 1.880 g cm <sup>-3</sup> . |

| 1.Helium-3; ${}^{3}$ He; 14762-55-1Fowell, R. J.2.1,1,2,2,3,3,4,4,4-nonafluoro-N,N-<br>bis(nonafluorobutyl)-1-butnamine<br>(Perfluorotibutylanine); C12F27N<br>311-89-7J. Chem. Eng. Data 1972, 17, 302-30<br>J. Chem. Eng. Data 1972, 17, 302-30VARIABLES:<br>T/K 273,15 - 318,15<br>He P/KPa: 101,325 (1 atm)PREPARED EY:<br>Coefficient<br>a x 102J. L. LongEXPERIMENTAL VALUES: $\frac{X_1 \times 10^4}{298,15}$ Desme<br>Coefficient Coefficient<br>$\times 102^2$ $\frac{Alog X_1}{C} = N$<br>$4.24$ The author states that solubility measurements were made between 288.15 ar<br>313,15 x, but only the solubility at 298.15 was given in the paper. The<br>shope R(Alog X_1/Alog T) was given. The smoothed data below were calculated<br>by the compiler from the slope in the form:<br>$\log X_1 = \log(11.02 \times 10^{-4}) + (4.24/R)\log(T/298.15)$ with R = 1.9872 cal R <sup>-1</sup> mol <sup>-1</sup> .Smoothed Data:T/K MOI Fraction<br>X_1 \times 10^4<br>293.15 11.02<br>303.15 11.42<br>313.15, 12.24<br>313.15, 12.24<br>313.15 12.24<br>313.15 12.266The Bunsen and Ostwald coefficients were calculated by the compiler.AUXILIARY INFORMATIONMETHOD:AUXILIARY INFORMATION<  | COMPONENTS :  | ORIGINAL MEASUREMENTS:  |
|---|---|---|
| 2. $1, 1, 2, 2, 3, 3, 4, 4, 4$ -nonafluoro-N, N-<br>bis (nonafluorobuty1)-1-butanamine<br>(Perfluorotributylanine); C12F27N<br>311-89-7<br>VARTABLES:<br>   | _   |   |
| bis (nonafluorobutyl)-1-butanamine<br>(Perfluorotributylamine); Cl2F27N<br>31-69-7<br>VARIABLES:<br>T/K: 273.15 - 318.15<br>He P/KPa: 101.325 (1 atm)<br>EXPERIMENTAL VALUES:<br>T/K MOI Fraction<br>Variable States that solubility measurements were made between 268.15 ar<br>11.02 6.93 7.56 4.24<br>The author states that solubility measurements were made between 268.15 ar<br>313.15 K, but only the solubility at 298.15 was given in the paper. The<br>slope R(Alog X/Alog T) was given. The smoothed data below were calculated<br>by the compiler from the slope in the form:<br>log X <sub>1</sub> = log(11.02 x 10 <sup>-4</sup> ) + (4.24/R) log(T/298.15)<br>with R = 1.9872 cal K <sup>-1</sup> mol <sup>-1</sup> .<br>Smoothed Data:<br>T/K MOI Fraction<br>298.15 11.02<br>MUXILLARY INFORMATION<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>APPARATUS/FROCEDURE: Dymond and Hilde-<br>brand (1) apparatus which uses an all<br>gas pressures. The solvent is de-<br>gassed by freezing and pumping (50-<br>Classic classed and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by freezing and pumping (50-<br>Classed by f   |   | Powell, R. J.   |
| T/K: 273.15 - 318.15<br>He F/KPa: 101.325 (1 atm)P. L. LongEXPERIMENTAL VALUES:T/K Mol Fraction<br>298.15Bunsen<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<br>Coefficient<  | bis(nonafluorobutyl)-l-butanamine<br>(Perfluorotributylamine); C <sub>12</sub> F <sub>27</sub> N  | J. <u>Chem. Eng</u> . <u>Data</u> 1972, <u>17</u> , 302-304.  |
| $\frac{1}{X_1 \times 10^4}$ $\frac{1}{298,15}$ $\frac{1}{11.02}$ $\frac{1}{6.93}$ $\frac{1}{7.56}$ $\frac{1}{4.24}$ The author states that solubility measurements were made between 288.15 ar<br>slope R(Alog X_1/Alog T) was given. The smoothed data below were calculated<br>by the compiler from the slope in the form:<br>$\log X_1 = \log(11.02 \times 10^{-4}) + (4.24/R)\log(T/298.15)$ with R = 1.9872 cal K <sup>-1</sup> mol <sup>-1</sup> .<br>Smoothed Data:<br>$\frac{1}{7/K}$ $\frac{1}{288.15}$ $\frac{1}{10.25}$ $\frac{1}{299.15}$ $\frac{1}{1.02}$ $\frac{1}{299.15}$ $\frac{1}{299.15}$ $\frac{1}{1.02}$ $\frac{1}{2.24}$ $\frac{1}{318.15}$ $\frac{1}{2.266}$ The Bunsen and Ostwald coefficients were calculated by the compiler. $\frac{1}{1.02}$ $$ | T/K: 273.15 - 318.15  |   |
| $\frac{x_1 \times 10^4}{298.15  11.02}  a \times 10^2  L \times 10^2$ $\frac{x_1 \times 10^4}{298.15  11.02}  6.93  7.56  4.24$ The author states that solubility measurements were made between 288.15 ar<br>313.15 K, but only the solubility at 298.15 was given in the paper. The<br>slope R(ldog X_1/dlog T) was given. The smoothed data below were calculated<br>by the compiler from the slope in the form:<br>$\log X_1 = \log(11.02 \times 10^{-4}) + (4.24/R)\log(T/298.15)$ with R = 1.9872 cal K <sup>-1</sup> mol <sup>-1</sup> .<br>Smoothed Data:<br>$\frac{T/K}{288.15}  10.25$ 293.15 10.63<br>298.15 11.02<br>303.15 11.42<br>308.15 11.62<br>303.15 11.62<br>303.15 12.24<br>318.15 12.66<br>The Bunsen and Ostwald coefficients were calculated by the compiler.<br>$\frac{AVXILIARY INFORMATION}{METHOD:}$ METHOD:<br>$\frac{AVPARATUS/PROCEDURE: Dymond and Hilde- Drand (1) apparatus which uses an all gas presures. The solvent is de- gassed by freezing and pumping fol- lowed by boiling under reduced \frac{K_1 \times 10^4}{288.15} = 0.16 \frac{K_1 \times 10^4}{288.15} = 0.16 \frac{K_1 \times 10^4}{288.15} = 0.16$  | EXPERIMENTAL VALUES:  |   |
| The author states that solubility measurements were made between 288.15 ar<br>313.15 K, but only the solubility at 298.15 was given in the paper. The<br>slope R( $\lambda$ log X <sub>1</sub> / $\lambda$ log T) was given. The smoothed data below were calculated<br>by the compiler from the slope in the form:<br>log X <sub>1</sub> = log(11.02 x 10 <sup>-4</sup> ) + (4.24/R)log(T/298.15)<br>with R = 1.9872 cal K <sup>-1</sup> mol <sup>-1</sup> .<br>Smoothed Data:<br>T/K Mol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup><br>288.15 10.25<br>293.15 10.25<br>293.15 11.02<br>303.15 11.42<br>303.15 11.42<br>313.15 12.26<br>The Bunsen and Ostwald coefficients were calculated by the compiler.<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>AUXILIARY INFORMATION<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>AUXILIARY INFORMATION<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:<br>METHOD:  | Coet  | $\begin{array}{llllllllllllllllllllllllllllllllllll$  |
| 313.15 K, but only the solubility at 298.15 was given in the paper. The<br>shope K( $\log X_1/\Delta \log T$ ) was given. The smoothed data below were calculated<br>by the compiler from the slope in the form:<br>$\log X_1 = \log(11.02 \times 10^{-4}) + (4.24/R)\log(T/298.15)$<br>with R = 1.9872 cal K <sup>-1</sup> mol <sup>-1</sup> .Smoothed Data:T/KMol Fraction<br>$X_1 \times 10^4$<br>298.15288.1510.63<br>298.15298.1510.63<br>298.15298.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15308.1511.42<br>308.15AUXILIARY INFORMATIONMETHOD:Source AND PURITY OF MATERIALS:<br>1. Helium-3. Lawrence Radiation Lab<br>oratory, Berkeley, through the<br>efforts of B. J. Alder.Colspan="2">APPARATUS/PROCEDURE: Dymond and Hilde-<br>brand (1) apparatus which uses an all<br>glass pumping system to spray slugs<br>of degased solvent into the gas.<br>The amount of gas dissolved is cal-<br>culated from the initial  | 298.15 11.02 6  | 5.93 7.56 4.24  |
| Smoothed Data:<br>$T/K  Mol \; Fraction \\ x_1 \times 10^4 \\ \hline 288.15 \\ 10.25 \\ 293.15 \\ 10.63 \\ 298.15 \\ 11.62 \\ 303.15 \\ 11.42 \\ 308.15 \\ 11.82 \\ 313.15 \\ 12.66 \\ \hline \\ The Bunsen and Ostwald coefficients were calculated by the compiler. \\ \hline \\ AUXILIARY INFORMATION \\ \hline \\ METHOD: \\ \hline \\ METHOD: \\ \hline \\ METHOD: \\ \hline \\ APPARATUS/PROCEDURE: Dymond and Hilde-brand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is cal-culated from the initial and final gas pressures. The solvent is de-gassed by freezing and pumping fol-lowed by boiling under reduced \\ \hline \\ \hline \\ T/K  Mol \; Fraction \\ \hline \\ No return (1) = 0.1 \\ \delta X_1/X_1 = 0.002 \\ \hline \\ REFERENCES: \\ Dymond, J. H.; Hildebrand, J. H. \\ Ind. \; Eng. Chem. Fundam. 1967, 6, 130. \\ \hline \\ \ \\ \ \end{array}$  | 313.15 K, but only the solubility at a slope $R(\Delta \log X_1/\Delta \log T)$ was given. The by the compiler from the slope in the log $X_1 = \log(11.02)$  | 298.15 was given in the paper. The<br>ne smoothed data below were calculated<br>form:   |
| $\frac{x_1 \times 10^4}{10.25}$ $\frac{x_1 \times 10^4}{10.25}$ $\frac{293.15}{10.63}$ $\frac{298.15}{11.02}$ $\frac{303.15}{11.42}$ $\frac{308.15}{11.82}$ $\frac{313.15}{12.66}$ The Bunsen and Ostwald coefficients were calculated by the compiler.<br>AUXILIARY INFORMATION<br>METHOD:<br>METHOD:<br>4000000000000000000000000000000000000   | with $R = 1.9872$ cal $K^{-1}$ mol <sup>1</sup> .   |   |
| <ul> <li>METHOD:</li> <li>METHOD:</li> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>Helium-3. Lawrence Radiation Laboratory, Berkeley, through the efforts of B. J. Alder.</li> <li>Perfluorotributylamine. Minnesota Mining &amp; Mfg. Co., column distilled, used portion with b.p.=447.85-448.64K, &amp; single peak GC.</li> <li>APPARATUS/PROCEDURE: Dymond and Hildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressures. The solvent is degassed by freezing and pumping 'followed by boiling under reduced</li> <li>SOURCE AND PURITY OF MATERIALS:         <ul> <li>Helium-3. Lawrence Radiation Laboratory, Berkeley, through the efforts of B. J. Alder.</li> <li>Perfluorotributylamine. Minnesota Mining &amp; Mfg. Co., column distilled, used portion with b.p.=447.85-448.64K, &amp; single peak GC.</li> </ul> </li> <li>ESTIMATED ERROR:         <ul> <li>N/cal K<sup>-1</sup> mol<sup>-1</sup> = 0.1</li></ul></li></ul>   | 288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15  | $\begin{array}{c} x_1 \times 10^4 \\ 10.25 \\ 10.63 \\ 11.02 \\ 11.42 \\ 11.82 \\ 12.24 \\ 12.66 \end{array}$   |
| <ul> <li>APPARATUS/PROCEDURE: Dymond and Hildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final gas pressures. The solvent is degassed by freezing and pumping 'followed by boiling under reduced</li> <li>I. Helium-3. Lawrence Radiation Laboratory, Berkeley, through the efforts of B. J. Alder.</li> <li>Perfluorotributylamine. Minnessota Mining &amp; Mfg. Co., column distilled, used portion with b.p.=447.85-448.64K, &amp; single peak GC.</li> <li>ESTIMATED ERROR:</li> <li>ESTIMATED ERROR:</li> <li>More and Mildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The solvent is degassed by freezing and pumping 'followed by boiling under reduced</li> </ul>  | AUXILIARY   | INFORMATION   |
| APPARATUS/PROCEDURE: Dymond and Hilde-<br>brand (1) apparatus which uses an all<br>glass pumping system to spray slugs<br>of degassed solvent into the gas.<br>The amount of gas dissolved is cal-<br>culated from the initial and final<br>gas pressures. The solvent is de-<br>gassed by freezing and pumping 'fol-<br>lowed by boiling under reduced $K^{-1} mol^{-1} = 0.1$<br>$\delta N/cal K^{-1} mol^{-1} = 0.1$<br>$\delta X_1/X_1 = 0.002$<br>REFERENCES:<br>1. Dymond, J. H.; Hildebrand, J. H.<br>Ind. Eng. Chem. Fundam. 1967, 6<br>130.  |   | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Helium-3. Lawrence Radiation Laboratory, Berkeley, through the efforts of B. J. Alder.</li> <li>2. Perfluorotributylamine. Minnesota Mining &amp; Mfg. Co., column distilled, used portion with b.p.=447.85-448.64K, &amp; single</li> </ul> |
|   | brand (1) apparatus which uses an all<br>glass pumping system to spray slugs<br>of degassed solvent into the gas.<br>The amount of gas dissolved is cal-<br>culated from the initial and final<br>gas pressures. The solvent is de-<br>gassed by freezing and pumping 'fol-<br>lowed by boiling under reduced | $\delta N/cal K^{-1} mol^{-1} = 0.1$<br>$\delta X_1/X_1 = 0.002$<br>REFERENCES:<br>1. Dymond, J. H.; Hildebrand, J. H.<br>Ind. Eng. Chem. Fundam. 1967, <u>6</u> ,  |

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|   | <u>.</u>  |  |   |  |
|---|---|--|---|--|
| COMPONENTS:   |   | ORIGINAL MEASUREMENTS:   |   |  |
| 1. Helium; He; 7440-59-7  |   |  | J.; McHale, J.L.;<br>B.: Wilhelm, E.  |  |
| <pre>2. Octamethylcyclotetrasiloxane;<br/>C<sub>8</sub><sup>H</sup>24<sup>O</sup>4<sup>Si</sup>4; 556-67-2</pre>                              |   | Battino, B.; Wilhelm, E.<br><u>Fluid Phase</u> <u>Equilib</u> .1978, <u>2</u> , 225-230. |   |  |
|   |   |  |   |  |
| VARIABLES:  |   | PREPARED BY:   |   |  |
| VARIABLES: T/K: 292.15 - 313  |   |  | I.L. Clever   |  |
| P/kPa: 101.325 (1 a   | itm)  |  |   |  |
| EXPERIMENTAL VALUES:  |   | L  | — — — — — — — — — — — — — — — — — — —   |  |
| Т/К МС  | $x_1 \times 10^4$   | Bunsen<br>Coefficient<br>α x 10 <sup>2</sup>   | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>   |  |
| 292.15  | 5.20  | 3.763  | 4.025   |  |
| 298.48<br>313.15  | 5.57<br>6.25  | 4.005<br>4.408   | 4.376<br>5.054  |  |
| *****   |   |  |   |  |
| The solubility values were kPa by Henry's law.  | e adjusted t  | o a gas partia   | al pressure of 101.325  |  |
| The Bunsen coefficients we  | re calculat   | ed by the com  | niler   |  |
| Smoothed Data: $\Delta G^{O}/J$ mol   |   |  |   |  |
|   |   | L Coef. Corr. =  |   |  |
|   |   | $\Delta S^{O}/J K^{-1} mol$  |   |  |
| LIOM J MOL  |   |  |   |  |
| د<br>د  |   | action $\Delta G^{O}/J$  | mol <sup>-1</sup>   |  |
|   | x <sub>1</sub> x  | : 10 <sup>4</sup>  |   |  |
| 29  | <u> </u>  | 27 18,   | 396   |  |
|   |   | 52 18,   | 598   |  |
|   |   | 76 18,   |   |  |
|   | 8.15 6.<br>8.15 6.  | 01 19,<br>26 19,   |   |  |
|   |   |  |   |  |
|   |   |  |   |  |
|   | <u></u>   | . <u> </u>   |   |  |
|   | AUXILIARY   | INFORMATION  |   |  |
| METHOD/APPARATUS/PROCEDURE:   |   | SOURCE AND PURI  | TY OF MATERIALS:  |  |
| The apparatus is based  | on the de-  | 1. Helium.   | Matheson Co., Inc.  |  |
| sign of Morrison and Bille  |   | Minimum<br>99.995.   | mole per cent purity  |  |
| the version used is described Battino, Evans, and Danfor  |   | 55.555.  |   |  |
| The degassing apparatus an  | nd procedure  | 2. Octamet   | hylcyclotetrasiloxane.  |  |
| are described by Battino,<br>Bogan, and Wilhelm (3).  | Banzhof,  |  | Electric Co. Distilled<br>of 298.15 K was 0.9500  |  |
| Degassing. Up to 500 d  | cm <sup>3</sup> of sol-                                     | $g \text{ cm}^{-3}$ .  |   |  |
| vent is placed in a flask   | of such   | g cm .   |   |  |
| size that the liquid is all deep. The liquid is rapid   |   |  |   |  |
| and vacuum is applied inte  | ermittently   |  |   |  |
| through a liquid N <sub>2</sub> trap u<br>permanent gas residual pre  |   | ESTIMATED ERROR  |   |  |
| drops to 5 microns.   | -DOULC  |  | T/K = 0.03  |  |
| Solubility Determination  |   |  | mHg = 0.5<br>$/x_1 = 0.02$  |  |
| gassed solvent is passed :<br>film down a glass spiral t  |   | 1  | L   |  |
| I say would a diggo obright (   |   | REFERENCES:  |   |  |
| taining the solute gas plu  | is the sol-   |  |   |  |
| vent vapor at a total pres  | ssure of  |  | F.J.;Billett,F.   |  |
| vent vapor at a total pres<br>one atm. The volume of ga   | ssure of<br>as absorbed                                     | J. Chem.   | Soc. 1948, 2033.  |  |
| vent vapor at a total pres  | ssure of<br>as absorbed<br>ween the                         | J. Chem.<br>2.Battino,R<br>J.Am.Oil  | Soc. 1948, 2033.<br>.;Evans,F.D.;Danforth,W.F.<br><u>Chem.Soc</u> . 1968, <u>45</u> , 830.                            |  |
| vent vapor at a total pres<br>one atm. The volume of ga<br>is found by difference be<br>initial and final volumes<br>buret system. The solven | ssure of<br>as absorbed<br>tween the<br>in the<br>t is col- | J. Chem.<br>2.Battino,R<br>J.Am.Oil<br>3.Battino,R                                       | Soc. 1948, 2033.<br>.;Evans,F.D.;Danforth,W.F.<br><u>Chem.Soc</u> . 1968, <u>45</u> , 830.<br>.;Banzhof,M.;Bogan, M.; |  |
| vent vapor at a total pres<br>one atm. The volume of ga<br>is found by difference be<br>initial and final volumes                             | ssure of<br>as absorbed<br>tween the<br>in the<br>t is col- | J. Chem.<br>2.Battino,R<br>J.Am.Oil<br>3.Battino,R<br>Wilhelm,                           | Soc. 1948, 2033.<br>.;Evans,F.D.;Danforth,W.F.<br><u>Chem.Soc</u> . 1968, <u>45</u> , 830.<br>.;Banzhof,M.;Bogan, M.; |  |

| COMPONENTS:   |  | ORIGINAL MEASUREMENTS:   | ~  |  |
|---|--|--|----|--|
| 1. Helium; He; 7440-59-7  |  | Karasz, F.E.; Halsey, G.D.Jr.  |    |  |
|   |  |  | 1  |  |
| 2. Argon; Ar; 7440-37-1   |  |  |    |  |
|   |  | <u>J. Chem. Phys</u> . 1958, <u>29</u> , 173 - 179.  |    |  |
|   |  |  |    |  |
| VARIABLES:  |  | PREPARED BY:   | ٦  |  |
| T/K: 84.54 - 86.89<br>He P/kPa: 2.666 - 21.33   |  | P. L. Long   |    |  |
| (2 - 16  cmHg)  | 2  |  |    |  |
| EXPERIMENTAL VALUES:  |  |  | -1 |  |
| т/к не  | nry's Consta   |  |    |  |
| 10.   | <sup>-5</sup> K/cmHg   | At He P = 1 cmHg At He P = 76 cm<br>$X_1 \times 10^4$ $X_1 \times 10^4$  | нg |  |
|   | ····   |  | -  |  |
| 84.54<br>86.11  | 4.25<br>3.53   | 0.0235 1.79<br>0.0283 2.15   |    |  |
| 86.89   | 3.40   | 0.0294 2.23  | ļ  |  |
|   |  |  |    |  |
| The data were shown in two<br>against mole fraction He d<br>l/T plot. The compiler tool<br>graph to obtain the Henry's  | graphs: one<br>issolved in<br>< log K valu<br>s constant va          | al values of their solubility data.<br>was a Henry's law plot of He P/cmHg<br>argon; the other was a log K against<br>ues from the points on the second<br>alues given in the Table above. The<br>solubility of He in liquid Ar at |    |  |
| pressures of one and 76 cml   |  |  |    |  |
| The Henry's constant is 1   | K/cmHg = (P·   | $1/cmHg)/X_1$ .  |    |  |
|   |  |  |    |  |
|   |  |  |    |  |
|   |  |  |    |  |
|   |  |  |    |  |
|   |  |  |    |  |
|   |  |  |    |  |
|   |  |  |    |  |
|   | AUXILIARY  | INFORMATION  |    |  |
| METHOD:   |  | SOURCE AND PURITY OF MATERIALS:  |    |  |
| A measured amount of hel  | ium ase was  |  |    |  |
| placed in the cell with a placed  | measured   | received in glass sealed bulbs.  |    |  |
| amount of liquid argon. The<br>was recorded as a function   | e pressure<br>of the   | 2. Argon. Air Reduction Co. Used as  |    |  |
| amount of gas (isotherm) of   | r as a   | received in glass sealed bulbs fo  |    |  |
| function of temperature (i<br>Only the results from the   | sostere).<br>isotherm  | reference compartment. The actual solvent was tank argon purified  | r  |  |
| runs are given above.   |  | with titanium metal.   | r  |  |
|   |  |  | r  |  |
|   |  |  | r  |  |
| 1   |  |  | r  |  |
|   | ······································                               | ESTIMATED ERROR:   | r  |  |
| APPARATUS/PROCEDURE:  | ith one  | $\delta T/K = 0.01$  | r  |  |
| A stainless steel cell w<br>compartment for the soluti  | on and one   | ESTIMATED ERROR:<br>$\delta T/K = 0.01$ $\delta P/cmHg = 0.002$ $\delta X_1/X_1 = 0.001$   | r  |  |
| A stainless steel cell w<br>compartment for the soluti<br>compartment containing pur  | on and one<br>e liquid   | $\delta T/K = 0.01$<br>$\delta P/cmHg = 0.002$<br>$\delta X_1/X_1 = 0.001$   | r  |  |
| A stainless steel cell w<br>compartment for the soluti<br>compartment containing pur<br>argon as a reference. The<br>mounted so that movement is  | on and one<br>e liquid<br>cell was<br>n one                          | $\delta T/K = 0.01  \delta P/cmHg = 0.002  \delta X_1/X_1 = 0.001  REFERENCES:$  | r  |  |
| A stainless steel cell w<br>compartment for the soluti<br>compartment containing pur<br>argon as a reference. The   | on and one<br>e liquid<br>cell was<br>n one<br>net agi-              | $\delta T/K = 0.01$<br>$\delta P/cmHg = 0.002$<br>$\delta X_1/X_1 = 0.001$<br>REFERENCES:<br>1. Mallett, M. W.   | r  |  |
| A stainless steel cell w<br>compartment for the soluti<br>compartment containing pur<br>argon as a reference. The<br>mounted so that movement in<br>direction by an electromagnetic the solution. The ar-<br>pressure checked with lite | on and one<br>e liquid<br>cell was<br>n one<br>net agi-<br>gon vapor | $\delta T/K = 0.01  \delta P/cmHg = 0.002  \delta X_1/X_1 = 0.001  REFERENCES:$  | r  |  |
| A stainless steel cell w<br>compartment for the soluti<br>compartment containing pur<br>argon as a reference. The<br>mounted so that movement is<br>direction by an electromag<br>tated the solution. The ar                            | on and one<br>e liquid<br>cell was<br>n one<br>net agi-<br>gon vapor | $\delta T/K = 0.01$<br>$\delta P/cmHg = 0.002$<br>$\delta X_1/X_1 = 0.001$<br>REFERENCES:<br>1. Mallett, M. W.   | r  |  |

| COMPONENTS:              |                         | <del>,</del>                                  |           | ORIGINA                     | L MEASI | UREMENTS :                                   |   |
|--------------------------|-------------------------|---|-----------|-----------------------------|---------|--|---|
| l. Helium; He; 7440-59-7 |                         | Chang, E. T.; Gokcen, N. A.                   |           |                             |         |  |   |
|                          |                         |   |           |                             | · · ·   |  |   |
| 2. 11000                 | gen Oxide,              | <sup>120</sup> 4, 10344-                      | 12-0      |                             |         |  |   |
|                          |                         |   |           | <u>J. Ph</u>                | iys. Cl | <u>hem</u> . 1966,                           | <u>70</u> , 2394-2399.                        |
| VARIABLES:               |                         | <u>, , , , , , , , , , , , , , , , , , , </u> |           | PREPARE                     | ED BY:  | ······                                       | <u>.                                    </u>  |
|                          | r/K: 262.0              | )2 - 303.16                                   |           |                             | -       |  |   |
| не н                     | P/kPa: 39.<br>(0.3      | .689 - 193.784<br>3917 - 1.925 a              | 4<br>atm) |                             | 1       | P. L. Long                                   |   |
| EXPERIMENTAL             | VALUES:                 |   |           |                             |         |  |   |
| т/к                      | P/Atm                   | Henry's<br>Constant<br>K x 10 <sup>4</sup>    |           | ractic<br>x 10 <sup>4</sup> |         | Bunsen<br>Defficient<br>$\alpha \times 10^2$ | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup> |
| 262.02                   | 0.5261                  | 0.55  |           | .289                        |         |  |   |
|                          | 1.0149<br>1.2393        | 0.59<br>0.56                                  |           | ).599<br>).694              |         |  |   |
|                          | 1.8346                  | 0.61  | ]         | .12                         |         |  |   |
|                          | 1.9125<br>1.0000        | 0.55  |           | .05                         |         | 2.11   | 2.03  |
| 070.35                   |                         | 0 70  |           |                             |         |  |   |
| 273.15                   | 0.4951<br>0.6624        | 0.73<br>0.68                                  |           | ).361<br>).453              |         |  |   |
|                          | 0.9566                  | 0.73  |           | .698                        |         |  |   |
|                          | 1.2315<br>1.4186        | 0.69<br>0.67                                  |           | ).852<br>).950              |         |  |   |
|                          | 1.8770                  | 0.69  |           | L.30<br>).698               |         | 2.54   | 2.54  |
|                          | 1.0000                  |   | , i       | .090                        |         | 2.54   | 2.54  |
| 288.10                   | 0.9773<br>1.3153        | 0.89<br>0.86                                  |           | ).870<br>L.13               |         |  |   |
|                          | 1.0000                  | 0.00  |           | 0.877                       |         | 3.11   | 3.28  |
| 298.15                   | 0.3917                  | 1.02  | (         | 0.401                       |         |  |   |
|                          | 0.3963                  | 1.02  |           | .404                        |         |  |   |
|                          | 0.7836<br>1.0192        | 1.06<br>0.98                                  |           | 0.830<br>L.00               |         |  |   |
|                          | 1.1195<br>1.1455        | 0.99<br>1.07                                  |           | L.11<br>L.23                |         |  |   |
|                          | $\frac{1.1455}{1.0000}$ | 1.07  |           | .02                         |         | 3.57   | 3.89  |
|                          |                         | AUXI  | LIARY     | INFORMA                     | TION    |  |   |
| METHOD: The              | solvent w               | as degassed u                                 | nder      | SOURCE                      | AND PIU | RITY OF MATER                                | TALS  |
| vacuum in                | the previo              | ously weighed<br>nd degassed so               | app-      | ł –                         | Heliu   |  | ce qiven.                                     |
|                          |                         | s introduced                                  |           | ±•                          | nerru   | III. NO SOUL                                 | ce given.                                     |
|                          |                         | nown P and T<br>the pressure                  |           | 2.                          |         |  | Research grade.<br>y, source not              |
| served unt               | til there w             | vas no furthe                                 | r         |                             | given   | -  | y, source not                                 |
|                          |                         | was establish<br>P was follow                 |           |                             |         |  |   |
| 40 m.                    |                         |   | 101       |                             |         |  |   |
|                          |                         |   |           |                             |         |  |   |
|                          |                         |   |           |                             |         |  |   |
|                          |                         | e apparatus wa                                | 20.05     | ESTIMAT                     | TED ERR | OR:  | ······  |
| all glass                | construct:              | ion. It consis                                | sted      |                             | ለጥ /    | K = 0.03                                     |   |
|                          |                         | volumes for t<br>gas, a contain               |           |                             | δΡ/1    | mmHg = 0.01                                  |   |
| for the so               | olvent, whi             | ich was stirre                                | ed        | DEFERRE                     |         | $/X_1 = 0.05$                                |   |
|                          |                         | ed magnet, and<br>ring the press              |           | REFERE                      | NUES:   |  |   |
| with a mid               | croslide ca             | athetometer. !                                | The       |                             |         |  |   |
|                          |                         | had a capacity<br>th a 5 ml gas               |           |                             |         |  |   |
| above the                | liquid su               | face. The appalibrated to                     |           |                             |         |  |   |
| ± 0.0002-3               |                         | arthrated to                                  |           |                             |         |  |   |
| L                        | -                       |   |           | l                           |         |  |   |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
| l. Helium; He; 7440-59-7   | Chang, E. T.; Gokcen, N. A.  |
| 2. Nitrogen Oxide; N <sub>2</sub> O <sub>4</sub> ; 10544-72-6  |  |
|  | T Thurs them 1966 70 2204-2200   |
| VARIABLES:   | <u>J. Phys. Chem. 1966, 70, 2394-2399.</u>   |
| T/K: 262.02 - 303.16   | PREPARED BY:   |
| He P/kPa: 39.689 - 193.784   | P. L. Long   |
| EXPERIMENTAL VALUES:   |  |
|  | Fraction Bunsen Ostwald<br>Coefficient Coefficient<br>$10^4$ $\alpha \times 10^2$ L x $10^2$ |
| 303.16         0.5759         1.07         0.63           0.8867         1.03         0.83   |  |
| 0.8867 1.03 0.90<br>1.0000 1.03  | 5 3.64 4.04  |
| The Henry's constant is defined as K/a<br>one atm were calculated from the avera<br>Smoothed Data: The 101.325 kPa (1 atm<br>fitted to:<br>$\Delta G^{\circ}/J \text{ mol}^{-1} = - \text{ RT ln}$ | ) mole fraction solubilities were  |
| Std. Dev. $\Delta G^{\circ} = 35.5$ ,  | -  |
|  | $\Delta s^{\circ}/J \ k^{-1} \ mol^{-1} = -43.241$   |
| T/K Mol Frac   | tion $\Delta G^{\circ}/J \mod^{-1}$  |
| $\frac{X_1 \times 1}{258,15}$ 0.53   |  |
| 263.15 0.58  | 8 21,312   |
| 268.15 0.64<br>273.15 0.69   |  |
| 273.15 0.69<br>278.15 0.75   |  |
| 283.15 0.81  | 1 22,177   |
| 288.15 0.87<br>293.15 0.93   | •  |
| 298.15 1.00  | 22,825   |
| 303.15 1.07<br>308.15 1.14   | 23,042<br>23,258   |
| AUXILIARY  | INFORMATION  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:  |
| See preceding page.  | See preceding page.  |
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| APPARATUS / PROCEDURE :  | ESTIMATED ERROR:   |
|  | Soo preceding -200   |
| See preceding page.  | See preceding page.  |
|  | REFERENCES:  |
|  | See preceding page.  |
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| COMPONENTS:   |  |   |  | ORIGINA   | L MEASUREMENTS:   |  |
|---|--|---|--|---|---|--|
| l. Helium;  | He; 7440-  | 59-7  |  | Chang, E.T.; Gokcen, N.A.;<br>Poston, T.M.  |   |  |
| 2. Hydrazine; H <sub>4</sub> N <sub>2</sub> ; 302-01-2  |  |   |  |   |   |  |
|   |  |   |  | J. Phy  | <u>s. Chem</u> . 1968   | , <u>72</u> , 638 - 642.   |
| VARIABLES:  |  |   |  | PREPARE   | D BY:   | ·····  |
|   | K: 278.15 ·  |   |  |   | P. L. Lo  | ng   |
| He P/k  | Pa: 110.46<br>233  | 5 (l.09 Atm<br>.757 (2.307  |  |   |   |  |
| EXPERIMENTAL  |  |   |  | ·   |   |  |
| т/к   | P/Atm  | Henry's<br>Constant<br>K x 10 <sup>5</sup>  | Mol Fra<br>X <sub>l</sub> x  |   | Bunsen<br>Coefficient<br>$\alpha \times 10^2$   | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>  |
| 278.15  | 1.2333<br>2.1927<br>1.0000   | 0.41<br>0.49  | 0.05   | 8   | 0.321   | 0.327  |
| 293.16  | 1.1411<br>2.0451   | 0.46<br>0.54  | 0.05   | 2<br>.0   |   |  |
| 308.18  | 1.0000<br>1.0902<br>1.3121<br>1.9941<br>2.3070   | 0.52<br>0.52<br>0.59<br>0.62  | 0.05<br>0.05<br>0.06<br>0.11<br>0.14   | 57<br>58<br>.7  | 0.352   | 0.378  |
|   | 1.0000   | 0.02  | 0.05   |   | 0.390   | 0.439  |
| 283.15<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15  | 0.047<br>0.0485<br>0.050<br>0.052<br>0.054<br>0.056<br>0.058   | 28,479<br>28,898<br>29,316<br>29,735<br>30,153<br>30,572<br>30,990<br>31,409  | Β Δ<br>5<br>3 S<br>2 Δ   | td Dev  | $\Delta G^{O} = 13.4,$<br>$D1^{-1} = 5198.0$  | + 83.701T<br>Coef. Corr.= 0.999  |
| 515.15  | 0.038  |   | UXILIARY   | INFORMA   | <b>FION</b>   | <u></u>  |
| vacuum in<br>aratus. Ap<br>weighed. G<br>apparatus<br>uid was st<br>observed u<br>change. Th<br>appear to<br>time. When<br>was follow<br>the solubi<br>the presen<br>tion produ |  | Isly weighed<br>d degassed<br>roduced int<br>P and T. T<br>the pressu<br>was no fur<br>ted hydrazi<br>with<br>ened the pr<br>to two hour<br>was correc<br>gaseous dec | ed app-<br>solvent<br>to the<br>The liq-<br>ire was<br>ther<br>ines<br>cessure<br>ts, and<br>ted for<br>composi- | <ol> <li>He</li> <li>Hy</li> <li>It</li> <li>us</li> <li>fi</li> <li>ρ/9</li> </ol> | drazine.No in:<br>was freshly o<br>e. The density<br>tted to the ed<br>g ml <sup>-1</sup> = 1.020 | rmation given.<br>formation on sourc<br>distilled before<br>y was measured, ar<br>guation:<br>492 - 0.000865t/C. |
| all glass<br>of three c<br>measuremen<br>for the so<br>a glass en<br>meter for<br>a microsli<br>container<br>solvent wi<br>the liquid   | OCEDURE: The<br>construction<br>alibrated with<br>t of the gas<br>lvent, which<br>closed mages<br>measuring the<br>de cathetor<br>had a capase<br>th a 5 ml of<br>surface. The<br>calibrated | on. It cons<br>volumes for<br>as, a conta<br>h was stirn<br>het, and a<br>the pressur-<br>meter.The s<br>city for 10<br>gas space a<br>he apparatu                    | sisted<br>the<br>ainer<br>ced with<br>mano-<br>ce with<br>solvent<br>00 g of<br>above<br>15 sec-                 | REFEREN   | $\delta T/K$<br>$\delta P/mmH_0$<br>$\delta X_1/X_1$<br>NCES:<br>ang, E.T.; Go                    | = 0.03<br>g = 0.01<br>= 0.05<br>kcen, N.A.<br>1966, $\underline{70}$ , 2394.                                     |

| COMPONENTS:                           |           |  | ORIGINAL MEASUREM   |  |
|---------------------------------------|-----------|--|---|--|
| 1. Helium; He; 74                     | 40-59-7   |  |   | <pre>.; Makarenkov, V.V.;<br/>V.; Panchenko, G.M.</pre>  |
| 2. Hydrogenated Fi                    | uel       |  | $\frac{\text{Khim. Tekhnol}}{15(5), 27 -}$  | <u>Topl. Masel</u> 1970, 29.   |
|                                       |           |  |   | <u>Fuels</u> <u>Oils</u> (Engl.tran-<br>353 - 355.   |
| VARIABLES:                            | _         |  | PREPARED BY:  |  |
| T/K: 293<br>He P/kPa: 10              |           | atm)   | S.A   | .Johnson   |
| EXPERIMENTAL VALUES:                  |           |  | · · · · · · · · · · · · · · · · · · ·   |  |
|                                       | т/к       | Bunsen<br>Coefficient<br>a x 10 <sup>2</sup> | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>   |  |
|                                       | 293.15    | 2.1  | 2.3   | _  |
|                                       |           |  |   | -  |
| The Ostwald coeff:                    | icient wa | s calculated                                 | by the compile  | er.  |
|                                       |           |  |   |  |
|                                       |           |  |   |  |
|                                       |           |  |   |  |
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|                                       |           |  |   | i  |
|                                       |           |  |   |  |
| · · · · · · · · · · · · · · · · · · · |           |  |   |  |
|                                       |           | AUXILIARY                                    | INFORMATION   |  |
| METHOD:                               |           |  | SOURCE AND PURITY   |  |
| Described in refe                     | cence (1) | •  | l. Helium. No   | information given.   |
|                                       |           |  | 2. Hydrogenate<br>given. Dens   | d Fuel. Source not<br>sity/g cm <sup>-3</sup> 0.832.   |
|                                       |           |  |   |  |
|                                       |           |  |   |  |
|                                       |           |  | POTIMATED PROD-   | ······   |
| APPARATUS/PROCEDURE:                  |           |  | ESTIMATED ERROR:<br>δL/L  | = 0.06   |
| No description giv                    | ven.      |  |   |  |
|                                       |           |  | REFERENCES :  |  |
|                                       |           |  | <ol> <li>Gogitidze,<br/>Makarenkov,<br/>Malyshev, V<br/>"Method of<br/>ing Propert</li> </ol> | L.D.; Logvinyuk, V.P.;<br>V.V.; Panchenkov, G.M.;<br>V.V.; Yakovlevskii, V.V.<br>Evaluating the Operat-<br>ties of Jet Fuels and |
| l                                     |           |  | Lubricating<br>Mashinostro  | Materials"(Russian),<br>Denie, 1966.   |

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| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| l. Helium; He; 7440-59-7  | Steinberg, M.; Manowitz, B.   |
| 2. Amsco 123-15   |   |
|   | <u>Ind</u> . <u>Eng</u> . <u>Chem</u> . 1959, <u>51</u> , 47 - 51.                    |
|   |   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 218.15 - 297.15  | H.L.Clever  |
| P/kPa: 101.325 (1 atm)  |   |
| EXPERIMENTAL VALUES:  |   |
| Coeff   | ption<br>icient*  |
|   | $\frac{10^2}{6}$  |
|   | .3  |
| *The authors define the absorption coe<br>corrected to 288.15 K and 101.325 kPa<br>pressure of 101.325 kPa (1 atm) per un | (1 atm), absorbed under a total system  |
| an Ostwald coefficient.   | tify their absorption coefficient as  |
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|   |   |
|   |   |
|   | 7.120 D.1/1 D.2 O.1   |
|   | INFORMATION   |
| METHOD: Van Slyke method (1).   | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. No information given.                   |
|   |   |
|   | 2. Amsco 123-15. American Mineral<br>Spirits Solvent Co., No. 140.                    |
|   | The composition is stated to be 59.6 wt % paraffin, 27.2 wt %                         |
|   | naphthene, and 13.2 wt %  |
|   | aromatics.  |
|   |   |
|   |   |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:  |
|   | 10 per cent.  |
|   |   |
|   | REFERENCES:   |
|   | 1. Van Slyke, D.D.<br>J. <u>Biol</u> . <u>Chem</u> . 1939, <u>130</u> , 545.          |
|   |   |
|   | Van Slyke, D.D.; Neill, J.M.<br>J. <u>Biol</u> . <u>Chem</u> . 1924, <u>61</u> , 523. |
|   |   |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
| l. Helium; He; 7440-59-7   | Burrows, G.; Preece. F. H.   |
| 2. Apiezon GW oil  |  |
|  | <u>J. Appl. Chem</u> . 1953, <u>3</u> , 451 - 462.   |
| VARIABLES:   | PREPARED BY:   |
| T/K: 293.15 - 356.15<br>He P/kPa: 101.325 (l atm)  | P. L. Long   |
| EXPERIMENTAL VALUES:   |  |
| T/K Bunsen   | Ostwald -log L   |
| $\frac{10^{2}}{\alpha \times 10^{2}}$  | $\frac{L \times 10^2}{1000}$   |
| 293.15 1.33  | 1.43 1.846   |
| 295.15 1.45<br>298.15 1.49   | 1.57 1.805<br>1.63 1.789*  |
| 307.15 1.82  | 2.05 1.689   |
| 320.65 2.27<br>321.65 2.26   | 2.67 1.574<br>2.67 1.574   |
| 341.65 2.65  | 3.31 1.480   |
| 342.15 2.64<br>355.15 2.85   | 3.30 1.481<br>3.71 1.431   |
| 355.15 2.85<br>356.15 2.76   | 3.60 1.444   |
| ^The −log L value is from a graphi   | cal interpolation by the authors.  |
| "The -log L value is from a graphi   | cal interpolation by the authors.  |
|  | cal interpolation by the authors.  |
| AUXIL<br>METHOD: Volumetric. Helium gas and  | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS;  |
| AUXIL  | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8   |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso   | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS;<br>1. Helium. Source not given. 99.8<br>per cent purity.   |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in   | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS;<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.   |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac   | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5  |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac<br>tension of the solvent was determi   | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7   |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac   | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K Above properties at 293.15 K.   |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and   | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K<br>Above properties at 293.15 K.  |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and<br>Purity of Materials.<br>APPARATUS/PROCEDURE: The mixing chambe   | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K<br>Above properties at 293.15 K.<br>ESTIMATED ERROR:  |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and<br>Purity of Materials.<br>APPARATUS/PROCEDURE: The mixing chambe<br>was all glass with a capacity of 3   | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K<br>Above properties at 293.15 K.<br>ESTIMATED ERROR:<br>δL/L = 0.05                                     |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and<br>Purity of Materials.<br>APPARATUS/PROCEDURE: The mixing chambe<br>was all glass with a capacity of 3<br>cm <sup>3</sup> . Stirring was accomplished by<br>magnetically driven disc. The sol  | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K<br>Above properties at 293.15 K.<br>ESTIMATED ERROR:<br>δL/L = 0.05                                     |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and<br>Purity of Materials.<br>APPARATUS/PROCEDURE: The mixing chambe<br>was all glass with a capacity of 3<br>cm <sup>3</sup> . Stirring was accomplished by<br>magnetically driven disc. The sol  | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K<br>Above properties at 293.15 K.<br>ESTIMATED ERROR:<br>δL/L = 0.05<br>A a                              |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surface<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and<br>Purity of Materials.<br>APPARATUS/PROCEDURE: The mixing chamber<br>was all glass with a capacity of 3<br>cm <sup>3</sup> . Stirring was accomplished by<br>magnetically driven disc. The sol<br>was degassed by boiling in a heater<br>flask fitted with a water-cooled r<br>flux condenser. The degassed solv  | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K<br>Above properties at 293.15 K.<br>ESTIMATED ERROR:<br>δL/L = 0.05<br>r a<br>vent<br>REFERENCES:       |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surfac<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and<br>Purity of Materials.<br>APPARATUS/PROCEDURE: The mixing chambe<br>was all glass with a capacity of 3<br>cm <sup>3</sup> . Stirring was accomplished by<br>magnetically driven disc. The sol<br>was degassed by boiling in a heater<br>flask fitted with a water-cooled r<br>flux condenser. The degassed solv<br>was transferred to the mixing cham  | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K<br>Above properties at 293.15 K.<br>ESTIMATED ERROR:<br>δL/L = 0.05<br>value<br>REFERENCES:             |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surface<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and<br>Purity of Materials.<br>APPARATUS/PROCEDURE: The mixing chambe<br>was all glass with a capacity of 3<br>cm <sup>3</sup> . Stirring was accomplished by<br>magnetically driven disc. The sol<br>was degassed by boiling in a heate<br>flask fitted with a water-cooled r<br>flux condenser. The degassed solv<br>was transferred to the mixing cham<br>evacuated to 0.005 mmHg without br<br>ing the vacuum. The helium and so | <pre>IARY INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Helium. Source not given. 99.8 per cent purity. 2. Apiezon GW oil. density/g cm<sup>3</sup> 0.878 viscosity/cpoise 160.5 surface tension/ 31.7 dyne cm<sup>-1</sup> K Above properties at 293.15 K. ESTIMATED ERROR:</pre>  |
| AUXIL<br>METHOD: Volumetric. Helium gas and<br>solvent brought into contact. The<br>solvent stirred until Hg levels in<br>helium buret indicate no more abso<br>tion of gas.<br>The density, viscosity, and surface<br>tension of the solvent was determi<br>at temperatures of 293.15, 313.15,<br>333.15, and 353.15 K. The 293.15<br>values are given in the Source and<br>Purity of Materials.<br>APPARATUS/PROCEDURE: The mixing chamber<br>was all glass with a capacity of 3<br>cm <sup>3</sup> . Stirring was accomplished by<br>magnetically driven disc. The sol<br>was degassed by boiling in a heater<br>flask fitted with a water-cooled r<br>flux condenser. The degassed solv<br>was transferred to the mixing cham<br>evacuated to 0.005 mmHg without br                                    | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Source not given. 99.8<br>per cent purity.<br>2. Apiezon GW oil.<br>density/g cm <sup>3</sup> 0.878<br>viscosity/cpoise 160.5<br>surface tension/ 31.7<br>dyne cm <sup>-1</sup><br>K<br>Above properties at 293.15 K.<br>ESTIMATED ERROR:<br>$\delta L/L = 0.05$<br>reak-<br>New REFERENCES: |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |  |  |  |
|---|---|--|--|--|
| 1. Helium; He; 7440-59-7  | Burrows, G.; Preece, F.H.   |  |  |  |
|   |   |  |  |  |
| 2. Silicone Oils  |   |  |  |  |
|   | J. Appl. Chem. 1953, 3, 451 - 462.                                      |  |  |  |
|   |   |  |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |  |
| T/K: 293.15 - 358.15<br>He P/kPa: 101.325 (l atm)                                     | P.L.Long  |  |  |  |
|   |   |  |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |  |
| T/K Bunsen  | Ostwald -log L  |  |  |  |
| Coefficient<br>∝x 10 <sup>2</sup>   | Coefficient<br>L x 10 <sup>2</sup>                                      |  |  |  |
| Silicone oil, Dow Co  |   |  |  |  |
| 293.15 2.90   | 3.11 1.507  |  |  |  |
| " 3.10  | 3.33 1.478  |  |  |  |
| 298.15 3.30<br>303.15 3.52  | 3.61 1.443 <sup>*</sup><br>3.91 1.408                                   |  |  |  |
| 318.15 3.80   | 4.43 1.354  |  |  |  |
| 320.15 4.36<br>337.15 4.80  | 5.10 1.292<br>5.93 1.227  |  |  |  |
| 339.65 4.79   | 5.96 1.225  |  |  |  |
| 352.65 5.08<br>357.15 4.90  | 6.56 1.183<br>6.41 1.193  |  |  |  |
| Silicone oil, Dow Co  | rning 702   |  |  |  |
| 293.15 1.46   | 1.57 1.805  |  |  |  |
| 294.15 1.53<br>298.15 1.59  | 1.64 1.784<br>1.74 1.760*   |  |  |  |
| 303.15 1.65   | 1.83 1.737  |  |  |  |
| 319.15 2.05<br>326.15 1.99  | 2.40 1.620<br>2.38 1.624  |  |  |  |
| 339.65 2.39   | 2.97 1.527  |  |  |  |
| 357.65 2.35<br>358.15 2.37  | 3.08 1.512<br>3.11 1.507  |  |  |  |
| The authors reported the belium solu  | bilities as -log(Ostwald coefficient),                                  |  |  |  |
| the compiler calculated Bunsen and O  | stwald coefficients from the log L.                                     |  |  |  |
| * The -log L value is from a graphic  | al interpolation by the authors.  |  |  |  |
| AUXILIAF  | Y INFORMATION   |  |  |  |
| METHOD: Volumetric. Helium gas and  | SOURCE AND PURITY OF MATERIALS:   |  |  |  |
| solvent brought into contact. The solvent stirred until Hg levels in                  | <ol> <li>Helium. Source not given. 99.8<br/>per cent purity.</li> </ol> |  |  |  |
| helium buret indicate no more absorp  | - 2. Silicone Oils. DC 200 DC 702                                       |  |  |  |
| tion of gas.  | density/g cm <sup>-3</sup> 0.971 1.072                                  |  |  |  |
| The density, viscosity, and surface tension of the solvent were determined            | viscosity/cpoisel04.4 39.8<br>surface tension/ 26.7 29.1                |  |  |  |
| at temperatures of 293.15, 313.15,  | dyne cm <sup>-1</sup>   |  |  |  |
| 333.15, and 353.15 K. The 293.15 K values are given in the Source and                 | Above properties at 293.15 K.   |  |  |  |
| Purity of Materials.  |   |  |  |  |
|   |   |  |  |  |
| APPARATUS/PROCEDURE: The mixing chamber   | $= \text{ESTIMATED ERROR:} \\ \delta L/L = 0.05$                        |  |  |  |
| was all glass with a capacity of 306 cm <sup>3</sup> . Stirring was accomplished by a | 54/4 - 0.05   |  |  |  |
| magnetically driven disc. The solven  | t   |  |  |  |
| was degassed by boiling in a heated<br>flask fitted with a water-cooled re-           | REFERENCES:   |  |  |  |
| flux condenser. The degassed solvent  |   |  |  |  |
| was transferred to the mixing chambe<br>evacuated to 0.005 mmHg, without brea         |   |  |  |  |
| ing the vacuum. The helium and solve  |   |  |  |  |
| were brought into contact at a pre-<br>determined temperature and pressure.           |   |  |  |  |
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| COMPONENTS:   |                     |   | ORIGINAL MEASUREMENTS:   |  |  |  |
|---|---------------------|---|--|--|--|--|
|   |                     |   | Behnke, A.R.; Yarbrough, O.D.  |  |  |  |
| 1. Helium; He; 7440   | )-59-7              |   |  |  |  |  |
| 2. Olive Oil  |                     |   |  |  |  |  |
|   |                     |   | <u>U.S. Naval Med. Bull</u> . 1938, <u>36</u> , 542-<br>548.   |  |  |  |
| VARIABLES:  |                     |   | PREPARED BY:   |  |  |  |
| T/K: 311.<br>P/kPa: 101.  |                     | atm)  | P.L.Long   |  |  |  |
| EXPERIMENTAL VALUES:  |                     | ·····   |  |  |  |  |
|   | т/к                 | Bunsen<br>Coefficien<br>$\alpha \times 10^2$                | Ostwald<br>t Coefficient<br>L x 10 <sup>2</sup>  |  |  |  |
|   | 311.15              | 1.489<br>1.482<br>1.477<br>1.485<br><u>1.467</u><br>1.48 Av | . 1.69   |  |  |  |
| Pressure is 101.325   | 5 kPa (1            | atm).   |  |  |  |  |
| The Ostwald coeffic   | rient wa            | s calculate   | d by the compiler.   |  |  |  |
|   |                     |   |  |  |  |  |
|   |                     | AUXILIARY   | INFORMATION  |  |  |  |
| METHOD:   | ····                | <u> </u>  | SOURCE AND PURITY OF MATERIALS:  |  |  |  |
| Gas-liquid equilibred at 311.15 K by B<br>through the olive of<br>up to 1½ hours.                               | oubbling            | the helium  | 1. Helium. Source not given. 97.65<br>per cent pure. Passed through $H_2SO_4$ and pyrogallic acid to re-<br>move $O_2$ and $CO_2$ . Dried. |  |  |  |
|   |                     |   | 2. Olive oil. Source not given. U.S.P.<br>grade. The composition is about<br>72 % olein and 28 % palmitin.                                 |  |  |  |
|   |                     |   | ESTIMATED ERROR:   |  |  |  |
| APPARATUS/PROCEDURE:<br>After establishment<br>the gas was extract<br>urated solution in<br>ed shaking in a Van | ted from<br>vacuo b | the sat-<br>y repeat-                                       |  |  |  |  |
| The procedure and similar to those de Slyke (1,2).  | calculat            | ions were   | REFERENCES:<br>1. Van Slyke, D.D.; Stadie, W.C.<br><u>J. Biol</u> . <u>Chem</u> . 1021, <u>56</u> , 765.                                   |  |  |  |
|   |                     |   | 2. Van Slyke, D.D.; Dillon, R.T.;<br>Margaria, R.<br>J. Biol. Chem. 1934, 105, 571.  |  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |  |  |
|---|--|--|--|
| 1. Helium; He; 7440-59-7  | Battino, R.; Evans, F. D.;<br>Danforth, W. F.                        |  |  |
| 2. Olive Oil  |  |  |  |
|   | J. Am. Oil Chem. Soc. 1968, 45,                                      |  |  |
|   | 830 - 833.   |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |
| T/K: 297.84 - 327.93  | H. L. Clever   |  |  |
| P/kPa: 101.325 (1 atm)  |  |  |  |
| EXPERIMENTAL VALUES:  |  |  |  |
| T/K Mol Fraction  |  |  |  |
| $x_{1} \times 10^{4}$   | Coefficient Coefficient<br>$\alpha \ge 10^2$ L $\ge 10^2$            |  |  |
| 297.84 7.01   | 1.60 1.75  |  |  |
| 307.86 6.88<br>317.98 6.61  | 1.57 1.76<br>1.49 1.74   |  |  |
| 317.98 6.61   | 1.49 1.74<br>1.45 1.75   |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$               | $X_1 = -2273.7 + 67.990 T$   |  |  |
| Std. Dev. ∆G° = 13.9,   | -  |  |  |
|   | $\Delta s^{\circ}/J K^{-1} mol^{-1} = -67.990$                       |  |  |
|   | $\frac{100}{\Delta G^{\circ}/J} = 10^{-1}$                           |  |  |
| x x 10  | )4   |  |  |
| 293.15 7.14   |  |  |  |
| 298.15 7.03   | 17,998   |  |  |
| 303.15 6.92<br>308.15 6.82  | 18,338<br>18,678   |  |  |
| 313.15 6.73   | 19,017   |  |  |
| 318.15 6.64   | •  |  |  |
| 323.15 6.55<br>328.15 6.46  | 19,697<br>20,037   |  |  |
| The solubility values were adjusted to  |  |  |  |
| 101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate |  |  |  |
|   | INFORMATION  |  |  |
|   |  |  |  |
| METHOD: The apparatus is based on the design by Morrison and Billett (1)      | SOURCE AND PURITY OF MATERIALS:<br>1. Helium. Matheson Co., Inc.     |  |  |
| and the version used is a modificatior  | 99.9995 Min. Vol % Purity.   |  |  |
| of the apparatus of Clever, Battino,<br>Saylor, and Gross (2).                | 2. Olive Oil. A. U.S.P., Fisher                                      |  |  |
|   | Scientific Co., 0.58% free fatty                                     |  |  |
|   | acid.<br>B. Nutritional Biochemicals                                 |  |  |
|   | Corp., 0.30% free fatty acid.  |  |  |
|   | The density was measured and   |  |  |
|   | fitted to the equation $\rho/g \text{ cm}^{-3}$                      |  |  |
| APPARATUS/PROCEDURE: Degassing.   | = $0.9152 - 0.000468t/C$ . The aver-<br>age mol wt is $884 \pm 45$ . |  |  |
| The solvent is sprayed into an evacu-   | ESTIMATED ERROR:   |  |  |
| ated chamber of an all glass appara-<br>tus; it is stirred and heated until   | $\delta T/K = 0.03$  |  |  |
| the pressure drops to the vapor   | $\delta P/mmHg = 0.5$  |  |  |
| pressure of the liquid. Solubility  | $\delta x_1 / x_1 = 0.03$  |  |  |
| Determination. The degassed liquid passes in a thin film down a glass         | REFERENCES:  |  |  |
| spiral tube at a total pressure of  | 1. Morrison, T. J.; Billett, F.                                      |  |  |
| one atm of solute gas plus solvent  | J. <u>Chem</u> . <u>Soc</u> . 1948, 2033.                            |  |  |
| vapor. The gas absorbed is measured<br>in the attached buret system, and the  | 2. Clever, H. L.; Battino, R.;                                       |  |  |
| solvent is collected in a tared   | Saylor, J. H.; Gross, P. M.  |  |  |
| flask and weighed.  | <u>J. Phys. Chem</u> . 1957, <u>61</u> , 1078.                       |  |  |
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| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |  |
|--|---|--|--|--|
| l. Helium; He; 7440-59-7   | Cander, L.  |  |  |  |
|  |   |  |  |  |
| 2. Human Lung Homogenate   |   |  |  |  |
|  |   |  |  |  |
|  | <u>J. Appl. Physiol</u> . 1959, <u>14</u> , 538 - 540.  |  |  |  |
| VARIABLES:<br>T/K: 310.15  | PREPARED BY:  |  |  |  |
| He P/kPa: 101.325 (1 atm)  | P.L.Long, A.L.Cramer  |  |  |  |
|  |   |  |  |  |
| EXPERIMENTAL VALUES:   | sen Ostwald   |  |  |  |
| Coeff  | Ficient Coefficient<br>$10^2$ L x $10^2$  |  |  |  |
| 310.15 0.  | 92 1.04   |  |  |  |
|  | 90 1.02<br>94 1.07  |  |  |  |
|  | 94 1.07   |  |  |  |
|  |   |  |  |  |
| from four deceas<br>history of acute   | are for lung samples<br>ed patients who had no<br>e or chronic lung disease.<br>coefficient is 0.0092 with<br>er cent.  |  |  |  |
| The Ostwald coefficients were calcula  | ted by the compiler.  |  |  |  |
|  |   |  |  |  |
| AUXILIARY  | INFORMATION   |  |  |  |
| METHOD: Lung sample were obtained from   | SOURCE AND PURITY OF MATERIALS:   |  |  |  |
| deceased patients. The lung was re-<br>moved, perfused with isotonic saline<br>until blood free, minced, blended, and  | <ol> <li>Helium. Matheson Co., East<br/>Rutherford, NJ.Pure grade.</li> </ol>   |  |  |  |
| homogenized. The homogenate was press-<br>ed through several layers of gauze to<br>remove any large shreds of connective<br>tissue. The fluid homogenate was<br>deaerated.   | <ol> <li>Human Lung Homogenate. Lung from<br/>four deceased patients who had no<br/>history of acute or chronic lung<br/>disease. See Method for details<br/>of preparation.</li> </ol> |  |  |  |
| APPARATUS/PROCEDURE: The manometric Van<br>Slyke apparatus was used. The tissue<br>homogenate was equilibrated for five<br>minutes by shaking. Excess gas was<br>expelled, and the dissolved gas<br>extracted (1). | ESTIMATED ERROR:<br>Reproducibility was ± 2 percent.<br>REFERENCES:<br>1. Van Slyke, D.D.; Neill, J.M.<br>J. Biol. Chem. 1924, 61, 523.   |  |  |  |
|  |   |  |  |  |

|  | OR OTHER STREET  |  |  |
|--|--|--|--|
| COMPONENTS:  | ORIGINAL MEASUREMENTS:<br>Campos Carles, A.;Kawashiro, T.;   |  |  |
| 1. Helium; He; 7440-59-7   | Piiper, J.   |  |  |
| 2. Rat Abdominal Muscle  |  |  |  |
|  | <u>Pflugers</u> <u>Arch</u> . 1975, <u>359</u> , 209 - 218.  |  |  |
| VARIABLES:   | PREPARED BY:   |  |  |
| т/к: 310.15  | A.L.Cramer   |  |  |
| EXPERIMENTAL VALUES:   | · · · · · · · · · · · · · · · · · · ·  |  |  |
| · · ·  | prrected Bunsen<br>Dubility Coefficient  |  |  |
| Amol 1 <sup>-1</sup> torr <sup>-1</sup> Am   |  |  |  |
| 310.15 0.521 ± 0.012 <sup>*</sup>  | 0.608 1.03   |  |  |
|  | y gives Krogh's diffusion constant,  |  |  |
| AUXILIARY  | INFORMATION  |  |  |
|  |  |  |  |
| METHOD: The helium gas was presaturated<br>with water vapor, then passed through<br>an equilibration chamber containing<br>the muscle sample resting on a screen<br>to expose all sides. The gas was<br>passed through the equilibration cham-<br>ber for one hour at a rate of 8 ml m <sup>-1</sup><br>The muscle was transferred to an ex-<br>traction chamber filled with air, for<br>the same length of time as equilibra-<br>tion. The gas in the extraction<br>chamber was then forced into a gas<br>chromatograph by mercury entering the<br>chamber. | <ol> <li>Helium. No source given. Purity<br/>better than 99.9 per cent.</li> <li>Rat Abdominal Muscle. Flat abdom-<br/>inal wall muscle layer of about<br/>1.6 g, 1.4 mm thickness, and sur-<br/>face area of 10 cm<sup>2</sup> on one side<br/>taken from 250 - 430 g rat.</li> </ol> |  |  |
| APPARATUS/PROCEDURE:   | ESTIMATED ERROR:   |  |  |
|  |  |  |  |
|  | REFERENCES:  |  |  |
|  | <pre>1. Kawashiro, T.;Campos Carles, A.;<br/>Perry, S.F.; Piiper, J.<br/>Pflugers Arch. 1975, 359, 219.</pre>  |  |  |
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| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |                                  |  |                                  |   |  |
|--|---|----------------------------------|--|----------------------------------|---|--|
| 1. Helium; He; 7440-59-7   |   |                                  | Lange, P.; Nyström, O.; Röckert, H.                  |                                  |   |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |   |                                  |  |                                  |   |  |
| <ol> <li>Components of infusion solutions,<br/>and some other mixtures.</li> </ol>   |   |                                  | <u>Foersvarsmedicin</u> 1975, <u>11</u> , 230 - 234. |                                  |   |  |
| VARIABLES:<br>T/K: No information given.   |   |                                  | ARED BY:   |                                  | · · · ·                                   |  |
| He P/kPa: 607.950 (6 atm)  |   |                                  | н.г.   | Clever                           |   |  |
| EXPERIMENTAL VALUES:   |   |                                  |  |                                  |   |  |
| Liquid   | Cm <sup>3</sup> of<br>cm <sup>3</sup> of<br>x 10                                    | Liq                              | Standard<br>Error of<br>the Mean                     | Number of<br>Determina-<br>tions | Ostwald<br>Coefficient<br>$L \times 10^2$ |  |
| Blood with added ascorbic acid, citrate, and dextrose.   | 4   |                                  | 0.6  | 11                               | 0.8                                       |  |
| Water + 0.9 wt % NaCl  | 4   |                                  | 0.7  | 8                                | 0.8                                       |  |
| Macrodex with NaCl (Pharmacia),<br>100 ml contain 6 g Dextran 70,<br>and 0.9 g NaCl.   | 2   |                                  | 0.6  | 10                               | 0.4                                       |  |
| Macrodex with glucose (Pharm-<br>acia), 100 ml contain 6 g<br>Dextran 70, and 5 g glucose.   | 3   |                                  | 0.1  | 6                                | 0.6                                       |  |
| Rheomacrodex with NaCl (Pharm-<br>acia), 100 ml contain 10 g<br>Dextran 70, and 0.9 g NaCl.  | 2   |                                  | 0.4  | 11                               | 0.4                                       |  |
| Rheomacrodex with glucose (Pharm-<br>acia), 100 ml contain 10 g Dex-<br>tran 70, and 5 g glucose.  | - 4   |                                  | 0.1  | 5                                | 0.8                                       |  |
| Aminosol 10% (Vitrum), 100 ml<br>contain 10 g amino acids and low<br>mol wt peptides obtained by<br>enzymatic hydrolysis and dialys:<br>of casein.   |   |                                  | 0.2  | 10                               | 0.4                                       |  |
| Table continued on next page.  |   |                                  |  |                                  |   |  |
| AU:  | XILIARY   | INFO                             | MATION   |                                  |   |  |
| METHOD /APPARATUS/PROCEDURE: The   |   | SOUR                             | CE AND PURIT   | Y OF MATERIALS                   | :   |  |
| ent was kept under 6 atm absolu<br>pressure of the gas for seven h<br>while constantly agitated with   | ours  | 1. Helium. No information given. |  |                                  |   |  |
| netic stirrer. The gas evolved<br>compression from 6 to 1 atm was<br>ured by one of two methods. A.<br>solution under pressure was tra<br>to a closed pipet. The pressure<br>decreased from 6 to 1 atm, and<br>gas evolved from the known solu<br>volume was measured in a calibr<br>part of the pipet (1). B. The g<br>that collected in an inverted t<br>tube from a known volume of the<br>urated solution on decompression | on de-<br>meas-<br>The<br>nsferr<br>was<br>the<br>tion<br>ated<br>as<br>est<br>sat- | ed<br>ESTI                       | Solvents.<br>above.<br>MATED ERROR:                  | Information                      | in text                                   |  |
| 6 to 1 atm was measured by merc<br>displacement.<br>There was no mention of eithe<br>gassing the solvent or of the t   | ury<br>r de-  |                                  | δL/L <u>&gt;</u>                                     | 0.25                             |   |  |
| erature of the measurement in the  |   |                                  | RENCES:  | I. Mombines                      | <b>. .</b>                                |  |
| paper.   |   | 1 **                             | Lange, P.V   | N.; Martinsso                    | л, А.;                                    |  |

paper.

The compiler estimated an Ostwald coefficient by assuming a 5 atm pres-sure change and dividing (v gas/v solvent) x 100 by 500. The results are useful only as relative solubilities in solvents reported in this paper.

| 1. | Lange, P.W.; Martinsson, A.;      |
|----|-----------------------------------|
|    | Rockert, H.O.E.                   |
|    | "Underwater Physiology"           |
|    | Lambertsen, C. J., Editor         |
|    | Academic Press, NY, 1971, p. 239. |

| COMPONENTS:   | · · · · ·                   | ORIGI                               | NAL MEASURE  | MENTS:                   |   |
|---|-----------------------------|-------------------------------------|--|--------------------------|---|
| 1. Helium; He; 7440-59-7  |                             | Lange, P.; Nyström, O.; Röckert, H. |  |                          |   |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |                             |                                     |  |                          |   |
| <ol> <li>Components of infusion solutions,<br/>and some other mixtures.</li> </ol>  |                             |                                     | <u>Foersvarsmedicin</u> 1975, <u>11</u> , 230 - 234.           |                          |   |
| VARIABLES:  |                             |                                     | RED BY.  | om previous              | page.                                     |
| T/K: No information given.  |                             |                                     | н.1  | L.Clever                 |   |
| He P/kPa: 607.950 (6 atm)   |                             |                                     |  |                          |   |
| EXPERIMENTAL VALUES:  |                             |                                     |  | <u></u>                  |   |
| Liquid Cm   | 1 <sup>3</sup> of           | Liq                                 | Standard<br>Error of<br>the Mean                               | Determina-               | Ostwald<br>Coefficient<br>$L \times 10^2$ |
| Vamin N (Vitrum), 100 ml contain<br>a total of 6.995 g of 18 differ-<br>ent amino acids. See complete<br>list below.*   | 5                           |                                     | 0.5  | 10                       | 1.0                                       |
| Intralipid 20% (Vitrum), 100 ml<br>contain 20 g fractionated soy-<br>bean oil, 12 g fractionated egg<br>lecithin, and 25 g dilute glycerol<br>(Ph. Int.).   | 6                           |                                     | 0.3  |                          | 1.2                                       |
| Water + 5.5 wt % glucose.   | 5                           | •                                   | 0.1  | 5                        | 1.0                                       |
| Water + 20 wt % fructose.   | 2                           |                                     | 0.3  | 10                       | 0.4                                       |
| Ethanol, 99.5 %.  | 9                           | )                                   | 0.6  | 11                       | 1.8                                       |
| * 100 ml Vamin N contain:<br>L-Alanine 0.300 g L-Histi<br>L-Arginine 0.330 g L-Isole<br>L-Aspartic acid0.405 g L-Leuci<br>L-Cysteine and L-Lysin<br>L-Cystine 0.140 g L-Meth<br>L-Glutamic acid0.900 g L-Pheny<br>Glycine 0.210 g L-Prol: | eucin<br>ine<br>ne<br>ionir | ie                                  | 0.240 g<br>0.390 g<br>0.525 g<br>0.190 g<br>0.545 g<br>0.810 g | L-Threonir<br>L-Tryptoph | ne 0.300 g<br>nan 0.100 g<br>e 0.050 g    |
| AUXIL   | IARY                        | INFOR                               | MATION   |                          |   |
| METHOD:   |                             | SOURC                               | E AND PURI   | TY OF MATERIAL           | S:  |
| See previous page.  |                             |                                     | See pre  | vious page.              |   |
|   |                             |                                     |  |                          |   |
| APPARATUS/PROCEDURE:  |                             | ESTI                                | 1ATED ERROR  | :                        |   |
|   |                             | REFE                                | RENCES :   |                          |   |

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COMPONENTS: 1. Neon; Ne; 7440-01-9 2. Water; H<sub>2</sub>O; 7732-18-5 Wright State University Dayton, Ohio 45431 USA May 1977

CRITICAL EVALUATION:

The experimental solubility data produced by nine workers were considered to be sufficiently reliable to use for the smoothing equation. In fitting the data to the equation, those points which differed by about two standard deviations or more from the smoothed values were rejected. We thus used 59 points which were obtained as follows (reference - number of data points used from that reference): 1-9; 2-8; 3-20;4-2; 5-10; 13-3; 14-4; 15-2; 16-1. The fitting equation used was

 $\ln X_1 = A + B/(T/100K) + C \ln (T/100K) + DT/100K$ (1)

Using T/100K as the variable rather than T/K gives coefficients of approximately equal magnitude. The best fit for the 59 data points gave

 $\ln X_1 = -52.8573 + 61.0494/(T/100K) + 18.9157 \ln (T/100K)$ (2)

where  $X_1$  is the mole fraction solubility of neon at 101.325 kPa (1 atm) partial pressure gas. The fit in ln  $X_1$  gave a standard deviation of 0.47% taken at the middle of the temperature range. Table 1 gives smoothed values of the mole fraction solubility at 101.325 kPa (1 atm) partial pressure of gas and the Ostwald coefficient at 5K intervals.

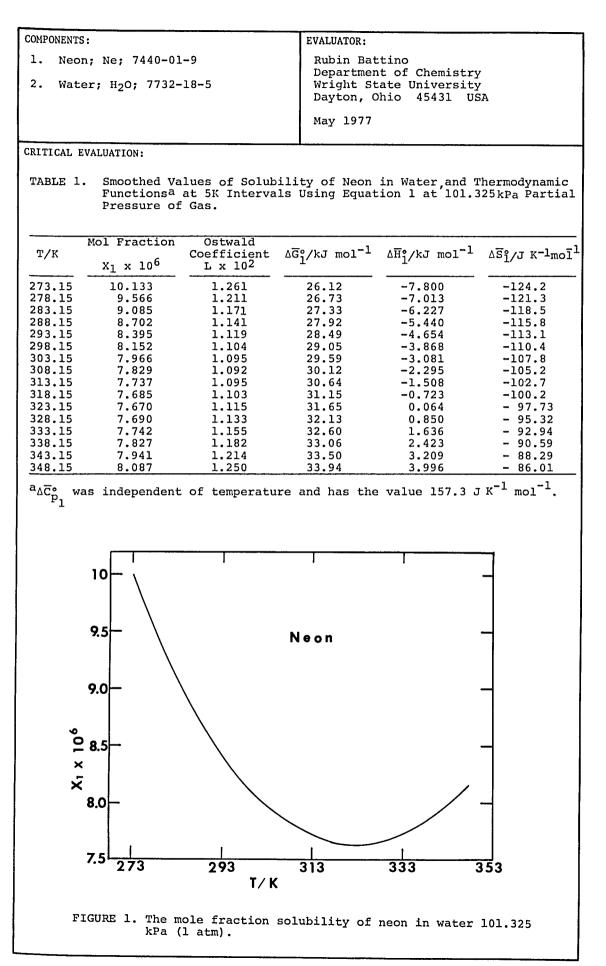
Table 1 also gives the thermodynamic functions  $\Delta \overline{G}_1^\circ$ ,  $\Delta \overline{H}_1^\circ$ ,  $\Delta \overline{S}_2^\circ$ , and  $\Delta \overline{C}^\circ$  for the transfer of gas from the vapor phase at 101.325 kPa<sup>1</sup> partial gas <sup>p</sup><sub>1</sub> pressure to the (hypothetical) solution phase of unit mole fraction. These thermodynamic properties were calculated from the smoothing equation according to the following equations:

| $\Delta \overline{G}_1^\circ = - RAT - 100RB - RCT ln (T/100) - RDT^2/100$        | (3) |
|---|-----|
| $\Delta \overline{S}_{1}^{\circ} = RA + RC \ln (T/100) = RC + 2RDT/100$           | (4) |
| $\Delta \overline{H}_{1}^{o} = -100 \text{ RB} + \text{RCT} + \text{RDT}^{2}/100$ | (5) |
| $\Delta \overline{C}_{p_1}^{\circ} = RC + 2RDT/100$                               | (6) |

Several sets of data from other workers were rejected for various reasons. Ikel's data (6) was 3% too low. König's experimental points were all about 6% too low (7). Antropoff's data (8) ranged from a few percent low to very high values at the higher temperatures he investigated. Clever, et al.'s single test value (9) was 5% low. The data of Krestov and Patsatsiya (10) were between 6 and 13% low. This was also the case for another set of data by Krestov (11). The values of Borina, et al. (12) were low. Strakhov, et al. (17) had measurements which were 1.4% low, but showed a high reproducibility (0.2%). An independent set of measurements by the same group (18) was about 5% high. In general, values which are too low result from poor equilibration, a most common source of error in gas solubility determinations.

Figure 1 shows the temperature dependence of solubility for neon. The points were obtained from the smoothing equation. There is a pronounced minimum at about 323 K.

No report of the partial molal volume of neon in water was found. Alexander (19) measured the enthalpy of solution of neon in water at 298.15 K and reported values of -3.8, -4.6, -8.8, and -6.7 kJ mol<sup>-1</sup>, average -5.85  $\pm$  1.7 kJ mol<sup>-1</sup>. The average calorimetric enthalpy of solution and the enthalpy of solution from the fit of the least square equation of -3.868 kJ mol<sup>-1</sup> differ by just a little more than the estimated experimental error. The agreement is considered satisfactory.



COMPONENTS: EVALUATOR: Rubin Battino 1. Neon; Ne; 7440-01-9 Department of Chemistry Wright State University 2. Water; H<sub>2</sub>O; 7732-18-5 Dayton. Ohio 45431 USA May, 1977 CRITICAL EVALUATION: References Morrison, T. J.; Johnstone, N. B. J. Chem. Soc. 1954, 3441. Lannung, A. J. Am. Chem. Soc. 1930, 52, 68. Weiss, R. F. J. Chem. Eng. Data 1971, 16, 235. de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9. Benson, B. B.; Krause, D. J. Chem. Phys. 1976, 64, 689. Ikels, K. G. DDC, Report No. SAM-TDR-64-28 1964. König, H. Z. Naturforsch. 1963, 18a, 363. von Antropoff, A. Proc. R. Soc. London 1910, 83, 474; Z. Elektrochem. 1919, 25, 269. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1. 2. 3. 4. 5. 6. 7. 8. 9. 1957, <u>61</u>, 1078. 10. Krestov, G. A.; Patsatsiya, K. M. Russ. J. Phys. Chem. (Eng. Transl.) 1971, <u>45</u>, 1000. Krestov, G. A.; Patsatsiya, K. M. <u>Izv. Vyssh. Uchebn.Zaved.</u>, <u>Khim</u>. Khim. <u>Tekhnol</u>. 1969, 12, 1333; Chem. Abstr. 1970, 72, 71204s. Borina, A. F.; Lyashchenko, A. K. <u>Russ. J. Phys. Chem</u>. (Engl. 1972, 46, 150. 11. Transl.) 12. 1972, 46, 150.
Borina, A. F. Zh. Fiz. Khim. 1977, 51, 138.
Borina, A. F. Zh. Fiz. Khim. 1977, 51, 406.
Borina, A. F.; Samoilov, O. Ya. Zh. Strukt. Khim. 1974, 15, 395.
Krestov, G. A.; Patsatsiya, G. M. Izv. Vyssh. Uchebn.Zaved., Khim.
Khim. Tekhnol. 1969, 12, 1333.
Strakhov, A. N.; Krestov, G. A.; Abrosimov, V. K.; Badelin, V. G. 13. 14. 15. 16. 17. Zh. Fiz. Khim. 1975, 49, 1583. Abrosimov, V. K.; Strakhov, A. N.; Krestov, G. A. <u>Izv. Vyssh</u>. <u>Uchebn</u>. 18. Zaved., Khim. Khim. Tekhnol. 1974, 17, 1463. Alexander, D. M. J. Phys. Chem. 1959, 63, 994. 19.

| COMPONENTS :   | ORIGINAL MEASUREMENTS:  |
|--|---|
|  | Lannung, A.   |
| l. Neon; Ne; 7440-01-9   | hamany, A.  |
| 2. Water; H <sub>2</sub> 0; 7732-18-5                                |   |
|  | J. Am. Chem. Soc. 1930, 52, 68 - 80.  |
| VARIABLES:   | PREPARED BY:  |
| T/K: 278.15 - 318.15   | R. Battino  |
| Ne P/kPa: 101.325 (1 atm)  |   |
| EXPERIMENTAL VALUES:   |   |
| T/K Mol Fract  |   |
| $X_1 \times 10^{\circ}$  | 4 Coefficient<br>α  |
| 278.15 0.09565   |   |
| 278.15 0.09404   | 0.0117  |
| 278.15 0.09565   |   |
| 283.15 0.09246<br>283.15 0.08924                                     |   |
| 283.15 0.09085   |   |
| 293.15 0.08293   | 0.0103  |
| 293.15 0.08293   | - *   |
| 293.15 0.08454<br>298.15 0.08222                                     |   |
| 310.15 0.07768   | 0.0096*   |
| 310.15 0.07768   |   |
| 310.15 0.07929   | <b></b>   |
| 318.15 0.07630<br>318.15 0.07630                                     |   |
|  |   |
| AUXILIARY  | INFORMATION   |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:   |
| Manometric/volumetric procedure.                                     |   |
| Water is degassed while over<br>mercury. Gas uptake measured on gas  | 1. Neon. Linde.   |
| buret,   | 2. Water. Distilled. The specific conductivity was 2 x 10 <sup>-7</sup> .                         |
|  |   |
|  |   |
|  | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE:   |   |
| The apparatus is based on the design of v. Antropoff (1). The entire | $\delta T/K = 0.03$   |
| apparatus is designed to be shaken                                   | DEPENDING.  |
| inside of a thermostat.  | REFERENCES:   |
|  |   |
|  | 1. v. Antropoff, A.<br>Z. <u>Elektrochem</u> . 1919, <u>25</u> , 269.                             |
|  | <ol> <li>v. Antropoff, A.</li> <li><u>Z</u>. <u>Elektrochem</u>. 1919, <u>25</u>, 269.</li> </ol> |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Morrison, T. J.; Johnstone, N. B. Water; H<sub>2</sub>O; 7732-18-5 2. J. Chem. Soc. 1954, 3441 - 3446. VARIABLES: PREPARED BY: т/к: 282.25 - 347.25 R. Battino EXPERIMENTAL VALUES: T/K Mol Fraction T/K Mol Fraction Kuenen Kuenen Coefficient Coefficient  $x_1 \times 10^4$  $x_1 \times 10^4$ S x 10<sup>3</sup> <u>s</u> x 10<sup>3</sup> 11.7 0.07645\* 0.09406 322.65 9.40 282.25 0.07728\* 284.65 0.09086 11.3 9.46 331.95 0.07721\* 288.15 0.08769 10.9 334.15 9.44 0.07825\* 337.55 292.95 0.08535 10.6 9.55 0.07813\* 0.08221\* 297.55 10.2 338,55 9.53 0.07851\* 0.08150 301.95 339.75 9.57 10.1 304.45 0.08019 9.93 345.65 0.08101 9.84 0.08021 9.84 347.25 0.08108 305.25 9.93 0.07686\* 9.48 315.25 The original paper reports the neon solubility in water, S, as  $cm^3$  of neon at a partial pressure 760 torr, reduced to 760 torr and 273.15 K, dissolved by 1 kg water. The same solubility value is reported above as the Kuenen coefficient x  $10^3$  at a neon partial pressure of 101.325 kPa (1 atm) The mole fraction solubility at a neon partial pressure of 101.325 kPa (1 atm) was calculated by the compiler. \*Solubility values which were used in the final smoothing equation for the recommended solubility values given in the critical evaluation. The authors fitted their solubility data to the equation  $\log_{10} S_{0} =$ -59.412 + 2890/(T/K). AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The previously degassed solvent is 1. Neon. British Oxygen Co. Ltd. flowed in a thin film through the Spectroscopically pure. gas in a glass absorption spiral. Volume changes are measured in burets. 2. Water. No information given. **ESTIMATED ERROR:** APPARATUS / PROCEDURE : The apparatus described by Morrison and Billett (1) was used. **REFERENCES**: 1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1952, 3819.

| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
|  | de Wet, W. J.  |
| 1. Neon; Ne; 7440-01-9   |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |
|  | J. S. Afr. Chem. Inst. 1964, 17, 9-13  |
|  |  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 291.35 - 306.55   | R. Battino   |
| P/kPa: 101.325 (1 atm)   |  |
| EXPERIMENTAL VALUES:   | L  |
| EXIERTENTAL VALUES:  |  |
| T/K Mol Fract  |  |
| X1 x 10  | $d_{0}^{4}$ Coefficient<br>$\alpha \times 10^{2}$  |
|  |  |
| 291.35 0.08290<br>298.75 0.08143   | * 0.0101   |
| 306.55 0.07920   | <u>,* 0.0098</u>   |
| Mole fraction solubility at 101.325 k  | Pa (1 atm) partial pressure of the   |
| neon acalculated by the compiler.  | · • • • • • • • • • • • • • • • • • • •  |
| *Solubility value which was used in t  | the final smoothing equation for the   |
| recommended solubility values given i  | n the critical evaluation.   |
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| AUXILIARY  | INFORMATION  |
|  |  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:  |
| METHOD:<br>Degassed liquid is flowed in a thin   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Contained less than 0.3  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Contained less than 0.3<br>per cent impurity. Passed over  |
| METHOD:<br>Degassed liquid is flowed in a thin   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Contained less than 0.3  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via  | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via  | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via  | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via  | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via  | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via  | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.  | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.  | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> <li>2. Water. Distilled.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.  | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> <li>2. Water. Distilled.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification of Morrison and<br>Billett(1) apparatus. Degassing as | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> <li>2. Water. Distilled.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification of Morrison and                                       | <ul> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures.</li> <li>2. Water. Distilled.</li> </ul>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification of Morrison and<br>Billett(1) apparatus. Degassing as | <pre>SOURCE AND PURITY OF MATERIALS; 1. Neon. Contained less than 0.3   per cent impurity. Passed over   activated charcoal at liquid air   temperatures. 2. Water. Distilled. ESTIMATED ERROR: REFERENCES:</pre>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification of Morrison and<br>Billett(1) apparatus. Degassing as | <pre>SOURCE AND PURITY OF MATERIALS; 1. Neon. Contained less than 0.3   per cent impurity. Passed over    activated charcoal at liquid air    temperatures. 2. Water. Distilled. ESTIMATED ERROR: REFERENCES: 1. Morrison, T. J.; Billett, F.    J. Chem. Soc. 1948, 2033;</pre>                                       |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification of Morrison and<br>Billett(1) apparatus. Degassing as | <pre>SOURCE AND PURITY OF MATERIALS; 1. Neon. Contained less than 0.3   per cent impurity. Passed over    activated charcoal at liquid air    temperatures. 2. Water. Distilled. ESTIMATED ERROR: REFERENCES: 1. Morrison, T. J.; Billett, F.</pre>  |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification of Morrison and<br>Billett(1) apparatus. Degassing as | <pre>SOURCE AND PURITY OF MATERIALS; 1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures. 2. Water. Distilled.  ESTIMATED ERROR: REFERENCES: 1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid 1952, 3819. 2. Clever, H. L.; Battino, R.;</pre> |
| METHOD:<br>Degassed liquid is flowed in a thin<br>film through a glass spiral contain-<br>ing the gas. Volumes determined via<br>calibrated burets.<br>APPARATUS/PROCEDURE:<br>Used modification of Morrison and<br>Billett(1) apparatus. Degassing as | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Contained less than 0.3 per cent impurity. Passed over activated charcoal at liquid air temperatures. 2. Water. Distilled.  ESTIMATED ERROR: REFERENCES: 1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid 1952, 3819.</pre>                                |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |
|--|---|
|  |   |
| 1. Neon; Ne; 7440-01-9   | Krestov, G.A.; Patsatsiya, G.M.   |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |   |
|  | Izv. Vyssh. Ucheb. Zaved., Khim.  |
|  | Khim. Tekhnol. 1969, 12, 1333 - 1337.   |
| VARIABLES:   | PREPARED BY:  |
| T/K: 283.15 - 313.15   | R. Battino  |
| P/kPa: 101.325 (1 atm)   |   |
| EXPERIMENTAL VALUES:   |   |
| EAFERIMENTAL VALUES:   |   |
| T/K Mol Fraction   | Bunsen Ostwald<br>Coefficient Coefficient   |
| $x_1 \times 10^4$  | $\alpha \times 10^2$ L × 10 <sup>2</sup>  |
| 283.15 0.08779   | 1.092 1.132   |
| 293.15 0.08414*<br>303.15 0.08089  | 1.045 1.122<br>1.002 1.112  |
| 313.15 0.07631   | <u>0.942</u> 1.080  |
|  |   |
| *Solubility value which was used in th<br>recommended solubility values given in | ne final smoothing equation for the the critical evaluation.  |
| The mole fraction solubility values a  | t 101.325 kPa (1 atm) and the Ostwald   |
| coefficients were calculated by the co   | mpiler.   |
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|  | INFORMATION   |
| METHOD: Modification of the apparatus<br>used by Ben-Naim and Baer (1). Also     | SOURCE AND PURITY OF MATERIALS:   |
| measured solubility in ethanol-water   | No information given.   |
| mixtures.  |   |
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| APPARATUS/PROCEDURE:   | ESTIMATED ERROR:  |
|  | $\delta x_1 / x_1 = 0.01$ (Compiler)  |
|  | UX1/X1- 0.01 (COMPTIEL)   |
|  | REFERENCES :  |
|  |   |
|  | <ol> <li>Ben-Naim, A.; Baer, S. <u>Trans</u>.<br/><u>Faraday Soc</u>. 1963, <u>59</u>, 2735.</li> </ol> |
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| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| 1. Neon; Ne; 7440-01-9  | Weiss, R. F.  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |   |
| 2. "acci, "20, 7752 10 5  |   |
|   | <u>J. Chem. Eng. Data</u> 1971, <u>16</u> , 235-241.                                    |
| VARIABLES:  | PREPARED BY:  |
| T/K: 273.80 - 313.29<br>P/kPa: 101.325 (1 atm)  | R. Battino  |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Fraction Bunsen<br>Coefficient<br>$X_1 \times 10^4$ $\alpha \times 10^2$                            | T/K Mol Fraction Bunsen<br>Coefficient<br>$X_1 \times 10^4$ $\alpha \times 10^2$        |
| 273.80 0.09922 1.2343   | 293.31 0.08395 1.0426   |
| 273.80 0.09935 1.2359<br>273.80 0.09892 1.2306  | 293.32 0.08355* 1.0376<br>303.43 0.07908 <u>*</u> 0.9796                                |
| 273.80 0.09974 1.2408   | 303.45 0.07973* 0.9876  |
| 273.79 0.09877 1.2287<br>283.39 0.08993 1.1186  | 303.47 0.07913 <sup>*</sup> 0.9802<br>303.46 0.07869 0.9747                             |
| 283.43 0.09041 1.1245   | 303.46 0.07924 <sup>*</sup> 0.9815  |
| 283.43 0.09014 <sup>*</sup> 1.1212<br>283.39 0.09028 <sup>*</sup> 1.1229                                    | 303.46 0.07890* 0.9773<br>303.45 0.07955* 0.9853  |
| 283.39 0.09013* 1.1210  | 313.27 0.07759* 0.9578<br>313.29 0.07712* 0.9520  |
| 283.39 0.09002* 1.1196<br>293.31 0.08389* 1.0419  | 313-29 0-07766* 0-9587  |
| 293.30 0.08387* 1.0416<br>293.31 0.08418 1.0454   | 313.27         0.07710*         0.9517           313.29         0.07707*         0.9514 |
|   |   |
| AUXILIARY   | INFORMATION   |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:   |
| The Scholander micro-gasometric<br>technique as adapted by Douglas (1)<br>was used. The gas is dissolved in | <ol> <li>Neon. Air Reduction. Better than<br/>99.99 per cent neon.</li> </ol>           |
| previously degassed water over<br>mercury. All volumes are read on a<br>micrometer which displaces mercury. | 2. Water. Distilled.  |
|   |   |
|   | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE:  |   |
|   | δ <b>τ/</b> κ = 0.01  |
|   | REFERENCES:   |
|   | <pre>1. Douglas, E.<br/>J. Phys. Chem. 1964, 68, 169;<br/>ibid. 1965, 69, 2608.</pre>   |
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| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |
|--|---|
| 1. Neon; Ne; 7440-01-9                             | Borina, A. F.; Lyashchenko, A. K.   |
| 2. Water; H <sub>2</sub> O; 7732-18-5              |   |
|  | <u>Zh. Fiz. Khim.</u> 1972, <u>46</u> , 249 - 250.<br><u>Russ. J. Phys. Chem. (Engl. Trans)</u><br>1972, <u>46</u> , 150. |
|  |   |
| VARIABLES:<br>T/K: 293.15                          | PREPARED BY:<br>R. Battino  |
| P/kPa: 101.325 (1 atm)                             | A. Battino  |
| EXPERIMENTAL VALUES:                               |   |
| T/K Mol Fracti<br>X <sub>1</sub> x 10 <sup>4</sup> | Coefficient   |
|  |   |
| 293.15 0.08335                                     | i.111   |
| The neon solubility in water was a<br>Henry's law. | djusted to 101.325 kPa (1 atm) by   |
| ΔΙΙΧΤΙΤΑΡΥ   | INFORMATION   |
|  |   |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Less than 0.1 per cent<br>impurities.   |
|  | 2. Water. Double distilled.   |
|  |   |
| APPARATUS/PROCEDURE:                               | ESTIMATED ERROR:  |

| COMPONENTS:  | ODIOTATIVAL AND AND AND AND AND AND AND AND AND AND  |
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|  | ORIGINAL MEASUREMENTS:<br>Borina, A. F.; Samoilov, O. Ya.  |
| 1. Neon; Ne; 7440-01-9   | borina, A. T., Samoriov, O. Ta.  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |
|  | Zh. Strukt. Khim. 1974, 15, 395-402.   |
|  | J. Struct. Chem. 1974, 15, 336-342.  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 288.15 - 298.15<br>Total P/kPa: 98.659 (740 mmHg)   | R. Battino   |
| 10tal P/KPa: 98.059 (740 hund)   |  |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol Fraction M   | Mol Fraction Ostwald   |
| $X_1 \times 10^9$  | $X_1 \times 10^4$ Coefficient  |
| at 1 mmHg<br>288.15 11.39  | $\frac{\text{at l atm}}{0.08656^*} \frac{\text{L x } 10^2}{1.135}$   |
| 293.15 10.98   | 0.08345* 1.112   |
| 298.15 10.58   | 0.08041 1.089  |
| *Solubility values which were used in<br>recommended solubility values given in<br>The mole fraction solubility at 101.3 | n the critical evaluation.<br>325 kPa (1 atm) and the Ostwald  |
| coefficients were calculated by the co   | ompiler.   |
| The mole fraction solubility values a<br>inverse of Henry's constant from the<br>coefficients by the author. The inver   | experimentally measured Ostwald  |
| at 1 mmHg is K/mmHg = $P/X_1$ .  |  |
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|  | INFORMATION  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:  |
| The apparatus, described in earlier papers (1,2), was based on the design  |  |
| of Ben-Naim and Baer (3). The appa-  | of other gases.  |
| ratus is designed to measure the   |  |
| difference in volume of the gas before<br>dissolution and after dissolution is   | 2. Water. Distilled.   |
| complete, with the gas and solvent in  |  |
| contact at constant pressure. The  |  |
| total pressure of neon + water vapor<br>at its saturation value was always   |  |
| 740 mmHg during the measurement.   |  |
| The author assumed that the gas behaved ideally and that Henry's   |  |
| law is obeyed to convert the experi-   | ESTIMATED ERROR:   |
| mentally measured Ostwald coefficient<br>to the inverse of Henry's constant.   |  |
| co and rundree of neurly a conarant.   | $\delta X_1 / X_1 = 0  0.05  (author)$   |
| - · · · ·  | $\delta X_{1} / X_{1} = 0.005$ (author)  |
| -  |  |
| -  | REFERENCES :   |
| -  | REFERENCES:<br>1. Lyashchenko, A.K.; Borina, A.F.<br>Zh. Strukt. Khim. 1971, 12, 964.  |
| -  | REFERENCES:<br>1. Lyashchenko, A.K.; Borina, A.F.<br><u>Zh. Strukt. Khim.</u> 1971, <u>12</u> , 964.<br>2. Borina, A.F.; Lyashchenko, A.K.   |
| -  | <pre>REFERENCES: 1. Lyashchenko, A.K.; Borina, A.F.     Zh. Strukt. Khim. 1971, 12, 964. 2. Borina, A.F.; Lyashchenko, A.K.     Zh. Fiz. Khim. 1971, 45, 1316. 3. Ben-Naim, A.; Baer, S.</pre> |
| -  | <pre>REFERENCES: 1. Lyashchenko, A.K.; Borina, A.F.     Zh. Strukt. Khim. 1971, 12, 964. 2. Borina, A.F.; Lyashchenko, A.K.     Zh. Fiz. Khim. 1971, 45, 1316.</pre>                           |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
| 1. Neon; Ne; 7440-01-9   | Benson, B. B.; Krause, D.  |
|  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |
|  | J. Chem. Phys. 1976, 64, 689.  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 274.155 - 323.148   | R. Battino   |
| P/kPa: 101.325 (1 atm)   |  |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol F  | raction Bunsen   |
| x <sub>1</sub> :   | $x \ 10^4 \qquad \alpha \ x \ 10^2 \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad$ |
|  | 10088 1.2560   |
| 278.151 0.<br>279.157 0.   | 095785* 1.1926<br>094733* 1.1795   |
| 283.149 0.1  | 091149 1.1347  |
| 288.149 0.   | 087474 1.0883  |
| 288.150 0.<br>293.148 0.   | 087550 <sup>*</sup> 1.0892<br>084488 <sup>*</sup> 1.0502   |
| 293.152 0.   | 084467* 1.0498   |
|  |  |
| 298.158 0.<br>303.150 0.   | 082427 1.0233<br>080360 0.9963   |
| 308.142 0.   | 078771 0.9751  |
|  | 078260 0.9669  |
| 318.151 0.<br>323.148 0.   | 077036, 0.9499<br>077184, 0.9497   |
| recommended solubility values given i  |  |
| AUXILIARY  | INFORMATION  |
| METHOD: Gas-free water and the pure gas  | SOURCE AND PURITY OF MATERIALS:  |
| are equilibrated, and volumetric samp<br>les of the liquid and gaseous phases  | -  |
| are isolated. The gas dissolved in th  |  |
| water is extracted and the number of   | 2. Water. No information given.  |
| moles determined on a special mercury<br>manometer. After removal of water vap   | 1  |
| or, the number of moles of neon in th  | e  |
| gaseous phase sample is measured with<br>the same manometer. The pressure (and   |  |
| fugacity) above the solution may be  |  |
| calculated from the neon analysis.   |  |
|  |  |
| Real gas corrections are made. Predic  |  |
|  | ESTIMATED ERROR: Smoothed data fit to  |
| Real gas corrections are made. Predic<br>ted maximum error is 0.02 per cent.<br>APPARATUS/PROCEDURE:                                     | ESTIMATED ERROR: Smoothed data fit to<br>0.12 per cent rms in the solubility.  |
| Real gas corrections are made. Predic<br>ted maximum error is 0.02 per cent.   | ESTIMATED ERROR: Smoothed data fit to  |
| Real gas corrections are made. Predic<br>ted maximum error is 0.02 per cent.<br>APPARATUS/PROCEDURE:<br>No drawings of the apparatus are | ESTIMATED ERROR: Smoothed data fit to<br>0.12 per cent rms in the solubility.<br>Calculated error from measurements<br>is 0.02 per cent.                                 |
| Real gas corrections are made. Predic<br>ted maximum error is 0.02 per cent.<br>APPARATUS/PROCEDURE:<br>No drawings of the apparatus are | ESTIMATED ERROR: Smoothed data fit to<br>0.12 per cent rms in the solubility.<br>Calculated error from measurements  |
| Real gas corrections are made. Predic<br>ted maximum error is 0.02 per cent.<br>APPARATUS/PROCEDURE:<br>No drawings of the apparatus are | ESTIMATED ERROR: Smoothed data fit to<br>0.12 per cent rms in the solubility.<br>Calculated error from measurements<br>is 0.02 per cent.                                 |
| Real gas corrections are made. Predic<br>ted maximum error is 0.02 per cent.<br>APPARATUS/PROCEDURE:<br>No drawings of the apparatus are | ESTIMATED ERROR: Smoothed data fit to<br>0.12 per cent rms in the solubility.<br>Calculated error from measurements<br>is 0.02 per cent.                                 |
| Real gas corrections are made. Predic<br>ted maximum error is 0.02 per cent.<br>APPARATUS/PROCEDURE:<br>No drawings of the apparatus are | ESTIMATED ERROR: Smoothed data fit to<br>0.12 per cent rms in the solubility.<br>Calculated error from measurements<br>is 0.02 per cent.                                 |
| Real gas corrections are made. Predic<br>ted maximum error is 0.02 per cent.<br>APPARATUS/PROCEDURE:<br>No drawings of the apparatus are | ESTIMATED ERROR: Smoothed data fit to<br>0.12 per cent rms in the solubility.<br>Calculated error from measurements<br>is 0.02 per cent.                                 |

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| COMPONENTS:  |   | ORIGINAL MEASURE                                 | MENTS:   |
|--|---|--|--|
|  |   | Borina, A. F.                                    |  |
| 1. Neon; Ne; 7440-01-9   |   |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |   |  |  |
|  |   |  | 1. 1977, <u>51</u> ,138 - 142<br>5. <u>Chem</u> . 1977, <u>51</u> ,76 - 78 |
| VARIABLES:   |   | PREPARED BY:                                     |  |
| T/K: 288.15 - 30<br>Total P/kPa: 98.659 (74  |   | R.   | Battino  |
| EXPERIMENTAL VALUES:   |   |  |  |
|  | ol Fraction<br>$X_1 \times 10^9$<br>at 1 mmHg   | Mol Fraction<br>X <sub>1</sub> x 104<br>at 1 atm | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>                              |
| 288.15<br>293.15<br>298.15<br>303.15   | 11.39<br>10.98<br>10.58<br>10.54  | 0.08656*<br>0.08345<br>0.08041*<br>0.08010       | 1.135<br>1.112<br>1.089<br>1.101   |
| *Solubility values which<br>recommended solubility va  |   |  |  |
| The mole fraction solub<br>coefficients were calcula   |   |  | n) and the Ostwald   |
| at 1 mmHg is K/mmHg = P/X  | <b>T</b> -  |  |  |
|  | AUXILIARY   | INFORMATION                                      |  |
| METHOD/APPARATUS PROCEDURE   | :   | SOURCE AND PURIT                                 | Y OF MATERIALS:  |
| The apparatus, describe<br>papers (1, 2), was based<br>of Ben-Naim and Baer (3)<br>ratus is designed to mea<br>difference in volume of a<br>dissolution and after dis    | on the design<br>The appa-<br>asure the<br>the gas before<br>ssolution is                   | l. Neon. "Spe<br>Contained<br>of other o         | ecially pure" grade.<br>less than 0.1 per cent<br>gases.                   |
| complete, with the gas and<br>contact at constant press<br>total pressure of neon +<br>at its saturation value v<br>740 mmHg during the measu<br>The author assumed that | water vapor<br>vas always<br>irement.   |  | stilled.   |
| contact at constant press<br>total pressure of neon +<br>at its saturation value v<br>740 mmHg during the measu  | water vapor<br>vas always<br>irement.<br>the gas<br>Henry's<br>the experi-<br>l coefficient | ESTIMATED ERROR:                                 |  |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |
|--|---|
| 1. Neon; Ne; 7440-01-9   | Borina, A. F.   |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |   |
| 2  |   |
|  | <u>Zh. Fiz. Khim</u> . 1977, <u>51</u> , 406 - 409.   |
| VARIABLES:   | Russ. J. Phys. Chem. 1977, 51,235-23<br>PREPARED BY:  |
| т/к: 293.15 - 309.15   | R, Battino  |
| Total P/kPa: 98.659 (740 mmHg)   |   |
| EXPERIMENTAL VALUES:   |   |
| $x_1 \times 10^9 x_1$  | Fraction Ostwald Number of<br>x 10 <sup>4</sup> Coefficient Determinations<br>1 atm L x 10 <sup>2</sup>   |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | 08413 <sup>*</sup> 1.121 5<br>08086 <sup>*</sup> 1.098 5  |
| 305.15 10.40 0.0   | 07904 1.093 4   |
|  | 07866* 1.101 5  |
| "Solubility values which were used in<br>recommended solubility values given :   | n the final smoothing equation for the in the critical evaluation.  |
| The mole fraction solubility at 101 coefficients were calculated by the c  |   |
| The mole fraction solubility values<br>inverse of Henry's constant from the<br>coefficients by the author. The inve<br>at 1 mmHg is K/mmHg = P/X <sub>1</sub> .  | experimentally measured Ostwald   |
|  |   |
| AUXILIARY  | INFORMATION   |
| METHOD:<br>The apparatus, described in earlier<br>papers (1,2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas befor<br>dissolution and after dissolution is<br>complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of neon + water vapor<br>at its saturation value was always<br>740 mmHg during the measurement.<br>The author assumed that the gas<br>behaved ideally and that Henry's | Contained less than 0.1 per cent<br>of other gases.<br>e<br>2. Water. Double distilled.   |
| law is obeyed to convert the experi-<br>mentally measured Ostwald coeffici-  | ESTIMATED ERROR:  |
| ent to the inverse of Henry's con-<br>stant.   | $\delta X_1 / X_1 = 0.005$ (author)   |
|  | REFERENCES: <ol> <li>Lyashchenko, A.K.; Borina, A.F.<br/>Zh. Strukt. Khim. 1971, 12, 964.</li> <li>Borina. A.F.; Lyashchenko, A.K.<br/>Zh. Fiz. Khim. 1971, 45, 1316.</li> <li>Ben-Naim. A.; Baer, S.<br/>Trans. Faraday Soc. 1963, <u>59</u>, 2735.</li> </ol> |

| COMPONENTS:   |                    | INDICINAL MEAC DEVENDE.  |
|---|--------------------|--|
| <pre>1. Neon; Ne; 7440-01-9</pre>   |                    | ORIGINAL MEAS REMENTS:<br>Abrosimov, V.K.; Strakhov, A.N.;             |
|   | i                  | Krestov, G.A.  |
| 2. Water-d <sub>2</sub> ; D <sub>2</sub> O; 7789-20-  | •0                 |  |
|   |                    | Izv. Vyssh. Ucheb. Zaved., Khim.<br>Khim. Tekhnol.1974, 17, 1463-1465. |
| VARIABLES:  | <u></u>            | PREPARED BY:   |
| T/K: 283.38 - 318.<br>P/kPa: 101.325 (1 at  |                    | R. Battino   |
| EXPERIMENTAL VALUES:  |                    |  |
| m/r   | Mal Dua            | - Lion Dun and   |
| T/F   | Mol Frac           | ction Bunsen<br>Coefficient  |
|   | X, x 1             | $10^4$ $\alpha \times 10^2$  |
| <u> </u>  |                    |  |
| 283.3<br>292.7  | 8 0.109<br>2 0.099 |  |
| 298.1   | .5 0.094           | 466 1.170  |
| 308.2<br>318.4  |                    |  |
| 510.4   |                    | 122 1.012  |
|   |                    |  |
|   |                    |  |
|   | AUXILIARY          | INFORMATION  |
| METHOD:   | AUXILIARY          | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:                         |
| METHOD:<br>The authors also measure<br>solubility of neon in pur<br>and mixtures of H <sub>2</sub> O and D <sub>2</sub> O | ed the<br>se water |  |

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| COMPONENTS:                            | EVALUATOR:   |
|--|--|
| 1. Neon; Ne; 7440-01-9<br>2. Sea Water | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322<br>USA<br>February 1978 |

CRITICAL EVALUATION:

There are two reports of the solubility of neon in sea water (1,2). König (1) reports neon solubility values at six temperatures between 273.15 and 298.15 K which he estimates to have an uncertainty of three percent. Weiss (2) reports four to five neon solubility values at each of six temperatures which he estimates to have an accuracy of ± 0.5% and a relative precision of ± 0.3%. The data of König fall consistently about 4 percent below the values of Weiss.

Presented here are the neon Bunsen solubility values of Weiss in water, sea water, and one dilution of sea water. Weiss has fitted his data by the method of least squares to an equation for the natural logarithm of the Bunsen coefficient,  $\alpha$ , which is consistent with both the integrated form of the vant Hoff equation and the Setschenow salt effect equation. The equation, which is valid for the temperature range of 273.15 to 323.15 K and salinity range of 0 to 40 S%, reproduced Weiss' neon Bunsen values with a root-mean-square deviation of 4 x  $10^{-5}$ . The equation is

 $\ln \alpha = -39.1971 + 51.8031(100/T) + 15.7699 \ln (T/100)$ 

+ S% [-0.124695 + 0.078374(T/100) - 0.0127972(T/100)<sup>2</sup>]

Weiss gives equations for the solubility of neon from moist air at one atm total pressure in units of ml Ne (STP)  $dm^{-3}$  sea water and ml Ne (STP) kg<sup>-1</sup> sea water assuming that neon behaves as an ideal gas and has a mol fraction of 1.818 x  $10^{-5}$  (3) in dry air. The equations are

 $\ln[m] Ne(STP) dm^{-3}] = -160.2630 + 211.0969(100/T) + 132.1657 \ln(T/100)$ 

- 21.3165(T/100) + S%.[-0.122883 + 0.077055(T/100) - 0.0125568(T/100)<sup>2</sup>]

and

 $\ln[m1 \text{ Ne}(\text{STP}) \text{ kg}^{-1}] = -170.6018 + 225.1946(100/T) + 140,8863 \ln(T/100)$ 

- 22.6290(T/100) + S%.[-0.127113 + 0.079277(T/100) - 0.0129095(T/100)<sup>2</sup>]

where S%, is the salinity.

The Weiss paper gives extensive tables of neon Bunsen coefficients and of ml Ne(STP) kg<sup>-1</sup> as a function of temperature and salinity as calculated from the above equations.

König, H. Z. <u>Naturforsch</u>. 1963, <u>18a</u>, 363. 1.

- 2.
- Weiss, R. F. J. Chem. Eng. Data 1971, 16, 235. Gluckauf, E. Proc. Roy. Soc. A. 1946, 185, 98; also Compendium of 3. Meteorology, Amer. Meteorological Soc., Boston, MA 1951, 3 - 11.

| COMPONENTS :  |  | ORIGINAL MEASUREMENTS:   |
|---|--|--|
|   |  | Weiss, R. F.   |
| 1. Neon; Ne; 7440-01-9                                  |  | NC155, A. I.   |
| 2. Sea Water  |  |  |
|   |  |  |
|   |  | <u>J. Chem. Eng. Data</u> 1971, <u>16</u> , 235-241.   |
| VARIABLES:  |  | PREPARED BY:   |
| T/K: 273.22 - 313.63                                    | 、  | H. L. Clever, S. A. Johnson  |
| Ne P/kPa: 101.325 (1 atm<br>Salinity: 0 - 36.425 %.     | )  |  |
| EXPERIMENTAL VALUES:                                    | Salini   | Ly %o  |
|   | 18,152   | 36.425   |
| $\frac{0.0}{T/K} = \frac{Bunsen \times 10^3}{T/K}$      | and the second sec | $\times 10^3$ T/K Bunsen x 10 <sup>3</sup>   |
| 273.79 12.287<br>278.80 12.343                          |  | 273.22 9.926<br>273.23 9.971   |
| 273.80 12.359   |  | 273.23 10.003  |
|   | 8.22 10.65<br>8.22 10.60   |  |
| 27  | 8.23 10.55   | 6 276.20 9.705   |
|   | 8.23 10.59   | 7 276.20 9.697<br>276.21 9.754   |
| 283.39 11.229<br>283.39 11.210                          |  | 276.21 9.699   |
| 283.39 11.196   |  | 283.70 9.170   |
| 283.43 11.245<br>283.43 11.212                          |  | 283.70 9.193   |
| 000 00 10 116   |  | 283.71 9.144<br>283.72 9.188   |
| 293.30 10.416<br>293.31 10.419                          |  | 203.72 5.100   |
| 293.31 10.454   | 0 00 0 10  | 293.28 8.763<br>7 293.28 8.744   |
|   | 8.29 9.19<br>8.29 9.20   |  |
| 29  | 8.29 9.21  |  |
| 303.43 9.796 29<br>303.45 9.876                         | 8.30 9.20  | 0 293.29 8.732   |
| 303.45 9.853  |  | 303.29 8.225<br>303.30 8.257   |
| 303.46 9.747<br>303.46 9.815                            |  | 303.30 8.257<br>303.30 8.257   |
| 303.46 9.773  |  | 303.30 8.275   |
| 303.47 9.802<br>Continued on next page.                 |  |  |
| contrinded on next page.                                |  |  |
|   |  | INFORMATION  |
| METHOD: Solubility determin                             | ations by th   | SOURCE AND PURITY OF MATERIALS:  |
| Scholander microgasometri<br>as used by Douglas (1), w  |  | Neon. All Reducation co. specified<br>> 99.99% pure. Gas chromatographic<br>checks showed ≤ 0.01% air. |
| modifications.  |  | checks showed $\leq$ 0.01% air.  |
|   |  | 2. Sea Water. Passed through 0.45 $\mu$  |
|   |  | Millipore filter and poisoned with 1 mg/l of HgCl <sub>2</sub> .                                       |
|   |  | I mg/I OI ngc12.   |
|   |  |  |
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| l   |  |  |
| APPARATUS/PROCEDURE: An equil                           | ibrium cham-   | ESTIMATED ERROR:<br>$\delta T/K = 0.01$  |
| ber, containing pure gas                                | saturated  | $\delta$ salinity = 0.004  |
| with water vapor, is sepa<br>mercury from a closed side | rated by<br>le chamber   |  |
| containing degassed water                               | . The appa-  | REFERENCES :   |
| ratus is tipped on its si<br>degassed water to flow in  | de allowing  |  |
| librium chamber. Dissolu                                | tion is  | 68, 169.   |
| aided by mechanical shaki                               | .ng.   | <u> 15ia</u> . 1965, <u>69</u> , 2608.   |
|   |  |  |
| l   |  |  |
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| COMPONENTS:  | ORIGINAL MEASUREMENTS:                               |
|--|--|
| l. Neon; Ne; 7440-01-9   | Weiss, R. F.   |
| 2. Sea Water   |  |
|  |  |
|  | <u>J. Chem. Eng. Data</u> 1971, <u>16</u> , 235-241. |
| VARIABLES:   | PREPARED BY:   |
| T/K: 273.22 - 313.63<br>Ne P/kPa: 101.325 (1 atm)<br>Salinity: 0 - 36.425 %。   | H. L. Clever, S. A. Johnson                          |
| EXPERIMENTAL VALUES:   |  |
| Salini   | ty %。  |
| 0.0 18.152   | 36.425   |
| T/K Bunsen x 10 <sup>3</sup> T/K Bunsen  | $\frac{x\ 10^3}{313.59}\ \frac{T/K}{7.970}$          |
| 313.27       9.578         313.27       9.517         313.29       9.520         313.29       9.587         313.29       9.514 | 313.59 8.023<br>313.61 8.006<br>313.63 8.066         |
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| AUXILIARY  | INFORMATION  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:                      |
| See previous page.   | See previous page.                                   |
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| APPARATUS/PROCEDURE:   | ESTIMATED ERROR:                                     |
|  | Coo provious page                                    |
| See previous page.   | See previous page.                                   |
|  | REFERENCES :   |
|  |  |
|  | See previous page.                                   |
|  |  |
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COMPONENTS:EVALUATOR:1. Neon; Ne; 7440-01-9H. L. Clever<br/>Chemistry Department2. Water; H20; 7732-18-5Emory University<br/>Atlanta, GA 303223. ElectrolytesU. S. A.<br/>May 1978

CRITICAL EVALUATION:

Until recently the only neon solubility data in aqueous electrolyte solutionswere the 1954 measurements of Morrison and Johnstone (1) in aqueous LiCl, NaCl, and KI solutions. Between 1971 and 1974 Samoilov, Borina, Lyashchenko and Alekseeva (2, 3, 4, 5, 6, 7, 8) of the N. S. Kurnakov Institute of Inorganic Chemistry, Moscow, reported the solubility of neon in 30 different aqueous electrolyte solutions. They investigated the effect of temperature, pressure and electrolyte concentration on the neon solubility.

The Russian workers discuss the neon solubility data in terms of their interest in the structure of water and aqueous electrolyte solutions. They have used three different solubility units in their different papers: units of volume of gas per unit volume of solution, volume of gas per unit weight of solvent, and Henry's law constant. They have not used the Setschenow salt parameter in their calculations or discussions.

In order to be able to compare the neon solubility behavior in aqueous electrolyte solutions with the behavior of other gases in aqueous electrolyte solutions, the results were recalculated as Setschenow salt parameters on a salt molality basis. When necessary aqueous electrolyte density values were interpolated from International Critical Tables(9) density tables. The Setschenow salt effect parameter was fitted by the method of least squares to an equation linear in molality,  $k_s = a + bm$ . The use of a linear function is not intended to imply that the Setschenow parameter is linear in molality. Feillolay and Lucas (10) have presented evidence for a maximum in  $k_s$  as a function of molality. Presently available salt effect data are not of sufficient accuracy to test the Feillolay and Lucas theory at present. The linear equations are collected in Table 1.

The value of  $k_s$  in the limit  $m \rightarrow 0$  would be desirable, but the  $k_s$  values at low salt concentration are difficult to measure accurately. The linear equations do not give as consistent a set of  $k_s$  values in the limit of  $m \rightarrow 0$  as the set of values at unit molality. Thus Table 1 contains  $k_s$  values at unit molality. In addition, values of the Setschenow salt effect parameter  $k_{sx} = (1/m)\log(X^{\circ}/X)$  at unit salt molality are given in Table 1. In the equation m is the salt molality, and the  $X^{\circ}/X$  ratio is the mole fraction gas solubility ratio with respect to gas, water and all salt ions. The definition is discussed in more detail in the discussion of salt effects on helium solubility.

Lyaschchenko and Borina (5) studied the effect of pressure on the solubility of neon in aqueous HCl, Mg(NO<sub>3</sub>)<sub>2</sub>, Ca(NO<sub>3</sub>)<sub>2</sub> and Ba(NO<sub>3</sub>)<sub>2</sub> solutions. In Table 1 two values of  $k_s$  and  $k_{sx}$  are given for these solutions. The first are from the solubility values measured at atmospheric pressure and the second are from the combination of solubility values at all pressures.

The Setschenow parameters reported by Morrison and Johnstone (1) for LiCl, NaCl, and KI solutions were based on only two solubility measurements, water and one molal salt solution, and were stated to have an uncertainty of 0.01. In all three cases the more recent salt effect parameters based on the Kurnakov Institute solubility data agree with the Morrison and Johnstone data within that uncertainty.

Several generalizations about the salt effect parameter can be observed from the data in Table 1. (1) The Setschenow salt parameter decreases as temperature increases; (2) In alkali halide solutions for a given alkali metal cation the Setschenow salt parameter decreases in the order  $Cl^- >$  $Br^- > I^-$ ; (3) For a given halide ion the Setschenow salt parameter decreases in the order Li<sup>+</sup> > Na<sup>+</sup> > K<sup>+</sup> > Rb > Cs<sup>+</sup>; In alkaline earth halide solutions (4) for a given halide ion the Setschenow salt parameter decreases in the order  $Ba^{2+} > Sr^{2+} > Ca^{2+} > Mg^{2+}$ ; (5) For a given alkaline earth cation the pattern is not clear from present data, there is some evidence that the  $Br^-$  ion is more effective at salting out than either the  $Cl^-$  or  $I^-$  ions.

| COMPONENTS:                        |  |   | EVALUATOR:                               |  |                            |
|------------------------------------|--|---|--|--|----------------------------|
| 1. Neon; Ne;                       | 7440-0   | 1-9   | H. L. Clever                             |  |                            |
| 2. Water; H <sub>2</sub>           | 0: 7732  | -18-5   | Chemistry Depar<br>Emory Universit       |  |                            |
| 3. Electroly                       |  |   | Atlanta, GA                              |  |                            |
|                                    |  |   | May 1978                                 |  |                            |
| CRITICAL EVALU                     | ATION:   |   |  |  |                            |
| TABLE 1. Su<br>in                  | mmary o<br>aqueou  | f Setschenow salt e<br>s electrolyte solut  | ffect parameters fo<br>ions.             | or neon dissolv                                    | əd                         |
| Solution<br>Ne + H <sub>2</sub> O  | т/к  | Equation Parameters   | s Setschenow Para<br>one molal elect     |  | Ref-<br>eren               |
| + salt                             |  | k <sub>s</sub> = a + b m  | $k_s =$<br>(1/m) log (S <sup>O</sup> /S) | $k_{eY} =$   | ce                         |
| HCl                                | 293.15   | 0.0602 - 0.0082 m<br>0.0719 - 0.0123 m  | 0.0520<br>0.0596                         | 0.0586<br>0.0662                                   | 5                          |
| NH4C1                              | 293.15   | 0.0748 - 0.0042 m   | 0.0706                                   | 0.0691   | 4                          |
| -                                  |  | 0.2569 - 0.0815 m   |  | 0.189  | 6                          |
| <b>.</b>                           |  | 0.1871 - 0.0056 m   |  | 0.194  | 6                          |
| -                                  | 293.15   | 0.2487 - 0.0181 m   | 0.2306                                   | 0.242  | 2                          |
| $Mg(NO_3)_2$                       | 293.15   |   |  | 0.185  | 5                          |
|                                    | 298.15   | 0.1386 + 0.0417 m<br>0.206 - 0.023 m  |  | 0.183<br>0.185                                     | 7                          |
|                                    | 303.15   |   | 0.1527                                   | 0.154  | 7                          |
| CaCl <sub>2</sub>                  | 293.15   | 0.2073 - 0.0012 m   | 0.2061                                   | 0.218  | 6                          |
| CaBr <sub>2</sub>                  | 293.15   | 0.2208 - 0.0062 m   | 0.2146                                   | 0.219  | 6                          |
| CaI2                               | 293.15   | 0.2135 + 0.0080 m   | 0.2215                                   | 0.215  | 6                          |
| Ca(NO <sub>3</sub> ) <sub>2</sub>  |  | 0.2222 - 0.0088 m   | 0.2084<br>0.2133                         | 0.209<br>0.214                                     | 5                          |
| -                                  |  | 0.2265 - 0.0005 m   | 0.2260                                   | 0.237  | 6                          |
| SrBr <sub>2</sub>                  | 293.15   | 0.2259 - 0.0018 m   | 0.2241                                   | 0.226  | 6                          |
| -                                  |  | 0.2359 + 0.0077 m   |  | 0.251  | 6                          |
| BaBr <sub>2</sub>                  | 293.15   | 0.2227 + 0.0558 m   | 0.2785                                   | 0.276  | 6                          |
| 4                                  |  |   | 0.2620                                   | 0.247  | 6                          |
| Ba (NO <sub>3</sub> ) <sub>2</sub> | 293.15   | 0.1783 + 0.2105 m<br>0.1527 + 0.2590 m  | 0.3889<br>0.4116                         | 0.376<br>0.399                                     | 5                          |
|                                    | 298.15<br>293.15   | 0.0725 - 0.0007 m   | 0.059<br>0.0718                          | 0.074<br>0.0872                                    | 1<br>3                     |
|                                    | 288.15   | 0.0858 - 0.00075 m  | 0.0851                                   | 0.0928   | 8                          |
|                                    | 293.15<br>298.15   | 0.0826 - 0.0022 m<br>0.0774 - 0.0009 m  | 0.0804<br>0.0765                         | 0.0881<br>0.0842                                   | 8<br>8                     |
|                                    | 288.15   | 0.0979 - 0.00445 m  |  | 0.101  | 8                          |
|                                    | 293.15<br>298.15   | 0.1021 - 0.0099 m<br>0.0884 - 0.0078 m  | 0.0922<br>0.0806                         | 0.100<br>0.088                                     | 8<br>8                     |
|                                    | 293.15<br>303.15   | 0.0833 + 0.0055 m<br>0.0822 - 0.0107 m  | 0.0888<br>0.0715                         | 0.0905<br>0.0718                                   | 7<br>7                     |
|                                    | 298.15<br>293.15<br>288.15<br>293.15<br>298.15<br>303.15 | 0.1040 + 0.0003 m<br>0.1265 - 0.00375 m<br>0.1118 + 0.0001 m<br>0.1076 - 0.0020 m<br>0.1036 + 0.00045 m | 0.1119<br>0.1056                         | 0.112<br>0.119<br>0.131<br>0.120<br>0.113<br>0.112 | 1<br>3<br>8<br>8<br>8<br>8 |
| NaBr                               | 293.15   | 0.0985 + 0.0001 m   | 0.0986                                   | 0.114  | 3                          |
| NaI                                | 293.15<br>288.15<br>293.15<br>298.15                     | 0.0965 - 0.0003 m<br>0.1303 - 0.0053 m<br>0.1045 - 0.0005 m<br>0.1014 - 0.0011 m                        | 0.0968<br>0.1250<br>0.1040<br>0.1003     | 0.112<br>0.133<br>0.112<br>0.108                   | 3<br>8<br>8<br>8           |

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|                                   |                        |   | EVALUATOR:   |
|-----------------------------------|------------------------|---|--|
| . Neon; Ne                        | e; 7440-0              | 1-9                                     | H. L. Clever   |
| Water. I                          | I O. 7777              | _10-E                                   | Chemistry Department<br>Emory University                     |
| . Water; H                        | 120; 1132              | -10-5                                   | Atlanta, GA 30322  |
| . Electrol                        | lytes                  |   | USA  |
| _                                 |                        |   | May 1978   |
| RITICAL EVA                       | LUATION:               |   |  |
| TABLE 1. S                        | Summary o<br>In aqueou | f Setschenow salt<br>s electrolyte solu | effect parameters for neon dissolved tions (continued).      |
| Solution<br>Ne + H <sub>2</sub> O | т/к                    | Equation Paramete                       | rs Setschenow Paramters at Ref-<br>One Molal Electrolyte ere |
| + salt                            |                        | k <sub>s</sub> = a + bm                 | $k_{-} = k_{-} = ce$   |
|                                   |                        |   | $(1/m) \log (S^{O}/S)  (1/m) \log (X^{O}/X)$                 |
| NaNO3                             | 293.15                 | 0.1166 - 0.0043 m                       |  |
|                                   | 298.15<br>303.15       |   |  |
|                                   |                        |   |  |
| КОН                               | 293.15                 |   |  |
| KF                                | 293.15                 | 0.1276 - 0.0071 m                       | 0.1205 0.132 2   |
| KCl                               | 293.15                 |   |  |
|                                   | 288.15                 |   |  |
|                                   |                        | 0.1164 - 0.0069 m<br>0.1160 - 0.0074 m  |  |
|                                   | 295.65                 |   |  |
|                                   | 298.15                 |   |  |
| KBr                               | 293.15                 | 0.0853 + 0.0025 m                       | 0.0878 0.103 3   |
| KI                                | 298.15                 |   | 0.080 0.095 1  |
|                                   | 293.15                 |   |  |
|                                   | 288.15                 |   |  |
|                                   | 290.65<br>293.15       |   |  |
|                                   |                        | 0.1001 - 0.00405                        |  |
|                                   | 298.15                 |   |  |
| RbCl                              | 293.15                 | 0.1146 - 0.0097 m                       | 0.1049 0.103 2   |
| CsCl                              | 293.15                 | 0.0791 - 0.0011 m                       | 0.0780 0.0934 3  |
|                                   |                        | 0.1030 + 0.0046 m                       |  |
| CsNO3                             | 202 15                 | 0.0691 + 0.0098 m                       | 0.0789 0.0660 7  |

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   Feillolay, A.; Lucas, M. J. Phys. Chem. 1972, 76, 3068.

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|  |  |   | ORIGINAL MEASUREMENT   | ç.   |
|--|--|---|--|--|
| 1  | Ne; 7440-01-9  |   | Lyashchenko, A.K   |  |
| 2. Water   | не, 7440-01-9<br>; H <sub>2</sub> O; 7732-18-  | · 5   | Jashenenko, K.K  | ,, borina, n.r.  |
|  | =  |   |  |  |
| 3. Hydrod  | chloric Acid; H  | Cl; 7647-01-0   |  | 1072 14 070 001  |
|  |  |   |  | . 1973, <u>14</u> ,978 - 981.  |
| WARTART  |  |   |  | 1973, <u>14</u> , 924 - 927.   |
| VARIABLES:   | T/K: 293.15  |   | PREPARED BY:   |  |
| Total P,   | /kPa: 84.73 (63  | 5.5 mmHg) -<br>25 (739 mmHg)  | T. D. Kitt   | redge, H. L. Clever  |
| HC1/mo1  | <u>kg<sup>-1</sup> H<sub>2</sub>O: 0 -</u>   | 2.935   |  |  |
| EXPERIMENTA  |  | ·····   | · · · · · · · · · · · · · · · · · · ·  |  |
|  | Hydrochloric   | P/mmHg  | Neon Solubility*   | Setschenow   |
|  | Acid   |   | -  | Parameter  |
|  | mol kg <sup>-1</sup> H <sub>2</sub> O  |   | $s/cm^3 dm^{-3}$   | $k_{s} = (1/m) \log(s^{o}/s)$  |
| 293.15   |  | 720   |  |  |
| 293.15   | 0<br>1.72  | 739<br>737  | 11.11<br>9.26  | 0.0460   |
|  | 1.72   | 700.3   | 8.64   | (0.0498)   |
|  | 1.72   | 676.8   | 8.27   | (0.0523)   |
|  | 1.72   | 635.5   | 7.68   | (0.0552)   |
|  | 2.935  | 737   | 8.71   | 0.0360   |
|  | 2.935  | 701.3   | 8.29   | (0.0355)   |
| •  | 2.935  | 671.5   | 7.90   | (0.0363)   |
|  | $k_{c} = 0.060$  | 2 - 0.0082 m (f   | rom the two value  | s at 737 mmHg).  |
|  | -  |   |  |  |
|  | At one molal   | HC1, $k_{s} = 0.052$  | 20 and $k_{sX} = 0.058$  | 6.   |
|  | $k_{-} = 0.071$  | 9 - 0.0123 m (f   | rom all data poin  | ts with S corrected  |
|  |  |   | :0 739 mmHg).  |  |
|  |  |   |  |  |
|  | At one molal   | HC1, $k_{s} = 0.059$  | 96 and $k_{sX} = 0.066$  | 2.   |
|  |  |   | ·······  |  |
| The Set  | tschenow parame  | ter k and key   | as the Ostwald co<br>were calculated b<br>from references  | y the compiler.  |
|  | <u></u>  |   |  |  |
|  |  | AUXILIARY   | INFORMATION  |  |
| METHOD:  |  | AUXILIARY   |  | MATERIALS.   |
| METHOD:  | varatus descri   |   | SOURCE AND PURITY OF   |  |
| The app<br>papers (1   | paratus, descri<br>1,2), was based   | bed in earlier<br>on the design   | SOURCE AND PURITY OF<br>1. Neon. Especia<br>Contained 0.1  |  |
| The app<br>papers (1<br>of Ben-Na  | 1,2), was based<br>aim and Baer (3   | bed in earlier<br>on the design<br>). The appa-   | SOURCE AND PURITY OF<br>1. Neon. Especia   | lly pure grade.  |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>differenc   | 1,2), was based<br>aim and Baer (3<br>designed to me<br>ce in volume of  | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before  | SOURCE AND PURITY OF<br>1. Neon. Especia<br>Contained 0.1<br>gases.  | lly pure grade.<br>per cent of other   |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>differenc<br>dissoluti  | l,2), was based<br>aim and Baer (3<br>designed to me<br>ce in volume of<br>ion and after d   | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is   | SOURCE AND PURITY OF<br>1. Neon. Especia<br>Contained 0.1<br>gases.<br>2. Water. Doubly  | lly pure grade.<br>per cent of other<br>distilled.   |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,  | 1,2), was based<br>aim and Baer (3<br>designed to me<br>ce in volume of  | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in   | <ul> <li>SOURCE AND PURITY OF</li> <li>1. Neon. Especia<br/>Contained 0.1<br/>gases.</li> <li>2. Water. Doubly</li> <li>3. Hydrochloric a</li> </ul>             | lly pure grade.<br>per cent of other   |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre  | 1,2), was based<br>aim and Baer (3<br>designed to me<br>ce in volume of<br>ion and after d<br>, with the gas<br>at constant pre-<br>essure of gas +  | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor  | SOURCE AND PURITY OF<br>1. Neon. Especia<br>Contained 0.1<br>gases.<br>2. Water. Doubly  | lly pure grade.<br>per cent of other<br>distilled.   |
| The app<br>papers (1)<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±   | 1,2), was based<br>aim and Baer (3<br>designed to me-<br>ce in volume of<br>ion and after di<br>, with the gas<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The p   | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial  | <ul> <li>SOURCE AND PURITY OF</li> <li>1. Neon. Especia<br/>Contained 0.1<br/>gases.</li> <li>2. Water. Doubly</li> <li>3. Hydrochloric a</li> </ul>             | lly pure grade.<br>per cent of other<br>distilled.   |
| The app<br>papers (1)<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure   | 1,2), was based<br>aim and Baer (3<br>designed to me-<br>ce in volume of<br>ion and after di<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is  | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.   | <ul> <li>SOURCE AND PURITY OF</li> <li>1. Neon. Especia<br/>Contained 0.1<br/>gases.</li> <li>2. Water. Doubly</li> <li>3. Hydrochloric a<br/>grade.</li> </ul>  | lly pure grade.<br>per cent of other<br>distilled.   |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value   | 1,2), was based<br>aim and Baer (3<br>designed to me-<br>ce in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>of k <sub>sx</sub> was cal   | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the  | <ul> <li>SOURCE AND PURITY OF</li> <li>1. Neon. Especia.<br/>Contained 0.1<br/>gases.</li> <li>2. Water. Doubly</li> <li>3. Hydrochloric a<br/>grade.</li> </ul> | lly pure grade.<br>per cent of other<br>distilled.   |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 <u>±</u><br>pressure<br>The value<br>compiler  | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>assuming that  | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas   | <ul> <li>SOURCE AND PURITY OF</li> <li>1. Neon. Especia.<br/>Contained 0.1<br/>gases.</li> <li>2. Water. Doubly</li> <li>3. Hydrochloric a<br/>grade.</li> </ul> | lly pure grade.<br>per cent of other<br>distilled.   |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 <u>±</u><br>pressure<br>The value<br>compiler  | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>assuming that<br>is ideal and th   | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas   | <ul> <li>SOURCE AND PURITY OF</li> <li>1. Neon. Especia.<br/>Contained 0.1<br/>gases.</li> <li>2. Water. Doubly</li> <li>3. Hydrochloric a<br/>grade.</li> </ul> | lly pure grade.<br>per cent of other<br>distilled.   |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed                        | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>assuming that<br>is ideal and th   | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law                            | <ul> <li>SOURCE AND PURITY OF</li> <li>1. Neon. Especia.<br/>Contained 0.1<br/>gases.</li> <li>2. Water. Doubly</li> <li>3. Hydrochloric a<br/>grade.</li> </ul> | lly pure grade.<br>per cent of other<br>distilled.<br>acid. Chemically pure  |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con             | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>assuming that<br>is ideal and th   | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law                            | <ul> <li>SOURCE AND PURITY OF</li> <li>1. Neon. Especia.<br/>Contained 0.1<br/>gases.</li> <li>2. Water. Doubly</li> <li>3. Hydrochloric a<br/>grade.</li> </ul> | lly pure grade.<br>per cent of other<br>distilled.<br>acid. Chemically pure  |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con<br>solution | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>assuming that<br>is ideal and th<br>d.   | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law<br>HCl in the<br>after the | <pre>SOURCE AND PURITY OF 1. Neon. Especia. Contained 0.1 gases. 2. Water. Doubly 3. Hydrochloric a grade. ESTIMATED ERROR:</pre>                                | lly pure grade.<br>per cent of other<br>distilled.<br>acid. Chemically pure  |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con<br>solution | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>a of $k_{\rm SX}$ was cal<br>assuming that<br>is ideal and th<br>d.<br>centration of H<br>was determined | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law<br>HCl in the<br>after the | <pre>SOURCE AND PURITY OF 1. Neon. Especia. Contained 0.1 gases. 2. Water. Doubly 3. Hydrochloric a grade. ESTIMATED ERROR:</pre>                                | lly pure grade.<br>per cent of other<br>distilled.<br>acid. Chemically pure  |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con<br>solution | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>a of $k_{\rm SX}$ was cal<br>assuming that<br>is ideal and th<br>d.<br>centration of H<br>was determined | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law<br>HCl in the<br>after the | <pre>SOURCE AND PURITY OF 1. Neon. Especia. Contained 0.1 gases. 2. Water. Doubly 3. Hydrochloric a grade. ESTIMATED ERROR:</pre>                                | <pre>lly pure grade.<br/>per cent of other<br/>distilled.<br/>acid. Chemically pure<br/>= 0.0035 - 0.005.<br/>Lyashchenko, A.K.</pre>  |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con<br>solution | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>a of $k_{\rm SX}$ was cal<br>assuming that<br>is ideal and th<br>centration of H<br>was determined       | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law<br>HCl in the<br>after the | <pre>SOURCE AND PURITY OF 1. Neon. Especia. Contained 0.1 gases. 2. Water. Doubly 3. Hydrochloric a grade. ESTIMATED ERROR:</pre>                                | <pre>lly pure grade.<br/>per cent of other<br/>distilled.<br/>acid. Chemically pure<br/>= 0.0035 - 0.005.<br/>Lyashchenko, A.K.<br/>1971, 45, 1316.</pre>  |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con<br>solution | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>a of $k_{\rm SX}$ was cal<br>assuming that<br>is ideal and th<br>centration of H<br>was determined       | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law<br>HCl in the<br>after the | <pre>SOURCE AND PURITY OF 1. Neon. Especia. Contained 0.1 gases. 2. Water. Doubly 3. Hydrochloric a grade. ESTIMATED ERROR:</pre>                                | <pre>lly pure grade.<br/>per cent of other<br/>distilled.<br/>acid. Chemically pure<br/>= 0.0035 - 0.005.<br/>Lyashchenko, A.K.<br/>1971, 45, 1316.<br/>Samoilov, 0.Ya.;</pre>                     |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con<br>solution | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>a of $k_{\rm SX}$ was cal<br>assuming that<br>is ideal and th<br>centration of H<br>was determined       | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law<br>HCl in the<br>after the | <pre>SOURCE AND PURITY OF 1. Neon. Especia. Contained 0.1 gases. 2. Water. Doubly 3. Hydrochloric a grade. ESTIMATED ERROR:</pre>                                | <pre>lly pure grade.<br/>per cent of other<br/>distilled.<br/>acid. Chemically pure<br/>= 0.0035 - 0.005.<br/>Lyashchenko, A.K.<br/>1971, 45, 1316.<br/>Samoilov, O.Ya.;<br/>5.</pre>              |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con<br>solution | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>a of $k_{\rm SX}$ was cal<br>assuming that<br>is ideal and th<br>centration of H<br>was determined       | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law<br>HCl in the<br>after the | <pre>SOURCE AND PURITY OF 1. Neon. Especia. Contained 0.1 gases. 2. Water. Doubly 3. Hydrochloric a grade. ESTIMATED ERROR:</pre>                                | <pre>lly pure grade.<br/>per cent of other<br/>distilled.<br/>acid. Chemically pure<br/>= 0.0035 - 0.005.<br/>Lyashchenko, A.K.<br/>1971, 45, 1316.<br/>Samoilov, O.Ya.;<br/>1971, 45, 2554.</pre> |
| The app<br>papers (1<br>of Ben-Na<br>ratus is<br>difference<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 ±<br>pressure<br>The value<br>compiler<br>behavior<br>is obeyed<br>The con<br>solution | 1,2), was based<br>aim and Baer (3<br>designed to me<br>to in volume of<br>ion and after d<br>, with the gas a<br>at constant pre-<br>essure of gas +<br>1.5 mmHg. The<br>over water is<br>over water is<br>a of $k_{\rm SX}$ was cal<br>assuming that<br>is ideal and th<br>centration of H<br>was determined       | bed in earlier<br>on the design<br>). The appa-<br>asure the<br>the gas before<br>issolution is<br>and solvent in<br>ssure. The<br>water vapor<br>neon partial<br>721.5 mmHg.<br>lculated by the<br>the gas<br>hat Henry's law<br>HCl in the<br>after the | <pre>SOURCE AND PURITY OF 1. Neon. Especia. Contained 0.1 gases. 2. Water. Doubly 3. Hydrochloric a grade. ESTIMATED ERROR:</pre>                                | <pre>lly pure grade.<br/>per cent of other<br/>distilled.<br/>acid. Chemically pure<br/>= 0.0035 - 0.005.<br/>Lyashchenko, A.K.<br/>1971, 45, 1316.<br/>Samoilov, O.Ya.;<br/>1971, 45, 2554.</pre> |

| COMPONENTS:  |  |   |  | L MEASUREMENTS:  |
|--|--|---|--|--|
| 1. Neon; Ne;   |  |   | Borina   | a, A.F.; Lyashchenko, A.K.   |
| 2. Water; H <sub>2</sub> O   | ; 7732-18-5  |   |  |  |
| 3. Ammonium C<br>12125-02-9  | hloride; NH <sub>4</sub> Cl  | ;   |  | <u>iz. Khim</u> . 1972, <u>46</u> , 249 - 250.<br>J. <u>Phys. Chem</u> . 1972, <u>46</u> ,150-151.   |
|  |  |   |  |  |
| VARIABLES:<br>T/K:<br>Total P/kPa:<br>NH <sub>4</sub> Cl/mol kg  | 293.15<br>-1 <sup>98.525</sup> (739<br>H <sub>2</sub> O: 0 - 2.  | mmHg)<br>647  | PREPARE  | D BY:<br>T.D.Kittredge, H.L. Clever  |
| EXPERIMENTAL VAL   | UES:   |   |  |  |
| т/к  | Ammonium<br>Chloride<br>mol kg <sup>-1</sup> H <sub>2</sub> O  | Neon Solub<br>S/cm <sup>3</sup> dm <sup>-3</sup>  | oility*  | Setschenow<br>Parameter<br>k <sub>s</sub> = (1/m) log (S <sup>O</sup> /S)  |
| *The neon sol<br>The neon sol  | 0<br>0.161<br>0.163<br>0.339<br>0.343<br>0.642<br>0.652<br>1.315<br>1.315<br>2.647<br>2.647<br>$k_{s} = 0.0748$<br>molal NH <sub>4</sub> C1,<br>ubility, S, is<br>ubility in wat<br>f $k_{s}$ and $k_{sX}$ w                 | $10.80 10.85 10.41 10.44 10.04 9.98 9.05 9.09 7.56 7.45 - 0.0042 m k_s = 0.0706 the same a er, So, is$                | and k  | Ostwald coefficient x 10 <sup>3</sup> .  |
|  |  | AUXILIARY   | INFORMAT   | TION   |
| METHOD:  | <u> </u>   |   | SOURCE   | AND PURITY OF MATERIALS:   |
| papers (1,2),<br>of Ben-Naim a<br>ratus is desi<br>difference in<br>dissolution a<br>complete, wit<br>contact at co<br>total pressur<br>739 ± 1.5 mmH<br>pressure over | us, described i<br>was based on<br>nd Baer (3). T<br>gned to measur<br>volume of the<br>nd after disso<br>h the gas and<br>nstant pressur<br>e of gas + wat<br>g. The neon pa<br>water is 721.<br>k <sub>sx</sub> was calcul | the design<br>he appa-<br>e the<br>gas before<br>lution is<br>solvent in<br>e. The<br>er vapor is<br>rtial<br>5 mmHg. | 1. Net<br>Cor<br>ga:<br>2. Wa<br>3. Am<br>pu                               | on. Especially pure grade.<br>ntained 0.1 per cent of other<br>ses.<br>ter. Doubly distilled.<br>monium chloride. Chemically<br>re grade.                          |
| compiler assu<br>is ideal and<br>obeyed.<br>The concent<br>solution was  | mĩn̂g that the<br>that Henry's l<br>ration of NH4C<br>determined af<br>titration of  | gas behavic<br>aw is<br>l in the<br>ter the   | REFEREN<br>1. BO<br>Zh   | $\delta S/cm^3 dm^{-3} = 0.04$<br>NCES:<br>rina, A.F.; Lyashchenko, A.K.<br>. Fiz. Khim. 1971, 45, 1316.   |
|  |  |   | $\begin{array}{c c} A1 \\ \underline{Zh} \\ 3. \overline{Bei} \end{array}$ | rina, A.F.; Samoilov, O. Ya.;<br>ekseeva, L.S.<br>. Fiz. Khim. 1971, <u>45</u> , 2554.<br>n-Naim, A.; Baer, S.<br>ans. Faraday <u>Soc</u> . 1963, <u>59</u> ,2735. |

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COMPONENTS: ORIGINAL MEASUREMENTS: Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. 1. Neon; Ne; 7440-01-9 Water; H<sub>2</sub>O; 7732-18-5 2. 3. Iron Chloride; FeCl<sub>z</sub>; 7705-08-0 <u>Zh. Fiz. Khim. 1973, 47</u>, 1748 - 1751. <u>Russ. J. Phys. Chem</u>. 1973, <u>47</u>, 987 - 989. VARIABLES: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) FeCl<sub>3</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 0.735 PREPARED BY: T.D. Kittredge, H.L. Clever **EXPERIMENTAL VALUES:**  $k_{s} = (1/m) \log (S^{o}/S)$ Ferric Chloride T/K Neon solubility\* mol kg<sup>-1</sup>  $H_20$  $S/cm^3 dm^{-3}$ 11.11 (S<sup>o</sup>) 10.30 293.15 0.0 0.080 0.4110 8.56 0.530 0.2137 7.96 0.1970 0.735  $k_{c} = 0.2569 - 0.0815m$  (value at 0.080m omitted) At one molal FeCl<sub>3</sub>,  $k_s = 0.1754$  and  $k_{sX} = 0.189$ . \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The neon solubility in water, S<sup>0</sup>, is from reference 1. The values of  $k_s$  and  $k_{sX}$  were calculated by the compiler. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier papers (1, 2), was based on the design of Ben-Naim and Baer (3). The appa-Specially pure grade. 1. Neon. Contained 0.1 per cent of other gases. ratus is designed to measure the difference in volume of the gas before 2. Water. Distilled. dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The 3. Iron Chloride. Chemically pure. total pressure of gas + water vapor is 739 + 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of  $k_{sx}$  was calculated by the compiler ESTIMATED ERROR: assuming that the gas behavior is ideal and that Henry's law is obeyed. The concentration of FeCl<sub>3</sub> was  $\delta S/S = 0.005$ determined after degassing from the density of the solution. The authors point out that there is evidence the **REFERENCES**: Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 2554. <u>Ben-Naim</u>, A.; Baer, B. <u>Trans. Faraday Soc</u>. 1963, <u>59</u>,2735. iron is in the form of a  $FeC1^{2+}$ 1. complex in the solution. 2. 3.

| COMPONENTS:  |   |  | ORIGINAL MEASUREMENTS:  |    |
|--|---|--|---|----|
| -  | Ne; 7440-01-9   |  | Borina, A.F.; Lyashchenko, A.K.;<br>Alekseeva, L.S.   |    |
| 2. Water;  | H <sub>2</sub> 0; 7732-18-5   |  |   |    |
| 3. Magnes  | <pre>ium Chloride; MgCl<sub>2</sub>;</pre>  |  |   |    |
| 7786-30  | 0-3   |  | <u>Zh. Fiz. Khim. 1973, 47</u> , 1748-1751.<br><u>Russ. J.Phys.Chem</u> . 1973, <u>47</u> , 987-98  | Ð. |
| VARIABLES:   | K: 293.15   |  | PREPARED BY:  |    |
| Total P/kPa  | a: 98.525 (739 mmH<br>kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.26   | g)<br>6  | T.D. Kittredge, H.L. Clever   |    |
| EXPERIMENTAL   | VALUES:   |  |   |    |
| Т/К  | Magnesium N<br>Chloride   | eon solub  | 5   |    |
|  | mo1 kg <sup>-1</sup> H <sub>2</sub> 0   | S/cm <sup>3</sup> d  | m <sup>-3</sup>   |    |
| 293.15   | 0.0   | 11.1   | 1 (S <sup>°</sup> ) -   |    |
|  | 0.272   | 10.2   | 1 0.1349  |    |
|  | 0.476<br>1.017  | 9.1<br>7.0   |   |    |
|  | 1.138   | 6.9  | 7 0.1779  |    |
|  | 2.266   | 4.5  | 2 0.1724  |    |
|  | $k_{s} = 0.1871 - 0$  | .0056m (v  | alue at 0.272m omitted)   |    |
|  | At one molal Mg   | C1 <sub>2</sub> , k <sub>s</sub> =   | 0.1815 and $k_{sX} = 0.194$ .   |    |
| The neon   | solubility in water   | , S <sup>0</sup> , is  | s the Ostwald coefficient x 10 <sup>3</sup> .<br>from reference 1.<br>ted by the compiler.  |    |
| The neon   | solubility in water   | , S <sup>0</sup> , is  | from reference 1.   |    |
| The neon :   | solubility in water   | , S <sup>0</sup> , is<br>e calcula   | from reference 1.<br>ted by the compiler.   |    |
| The neon   | solubility in water   | , S <sup>0</sup> , is<br>e calcula   | from reference 1.<br>ted by the compiler.<br>INFORMATION  |    |
| The neon<br>The value<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain  | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>  | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-  | from reference 1.<br>ted by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS;<br>1. Neon. Specially pure grade.   | -  |
| The neon<br>The value<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nai<br>ratus is d<br>difference   | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g   | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>as before  | from reference 1.<br>ted by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.  |    |
| The neon<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nair<br>ratus is d<br>difference<br>dissolutio<br>complete,  | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so   | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>as before<br>tion is<br>lvent in   | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically</pre>                        | -  |
| The neon<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nair<br>ratus is d<br>difference<br>dissolutio<br>complete,<br>contact at  | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so<br>constant pressure.   | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>as before<br>tion is<br>lvent in<br>The  | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically pure.</pre>                  |    |
| The neon<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nair<br>ratus is d<br>difference<br>dissolutio<br>complete,<br>contact at<br>total pres<br>739 + 1.5 f   | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon par  | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>as before<br>tion is<br>lvent in<br>The<br>vapor is<br>tial  | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically pure.</pre>                  |    |
| The neon<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete,<br>contact at<br>total pres<br>739 + 1.5<br>pressure i  | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon par<br>s 721.5 mmHg. The   | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>the<br>as before<br>tion is<br>lvent in<br>The<br>vapor is<br>tial<br>value of   | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically pure.</pre>                  |    |
| The neon<br>The value<br>The value<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolutio<br>complete,<br>contact at<br>total pres<br>739 + 1.5<br>pressure i<br>k <sub>s</sub> X was ca  | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon par<br>s 721.5 mmHg. The<br>lculated by the com  | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>as before<br>tion is<br>lvent in<br>The<br>vapor is<br>tial<br>value of<br>piler                           | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically pure.</pre>                  |    |
| The neon<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nair<br>ratus is d<br>difference<br>dissolution<br>complete,<br>contact at<br>total press<br>739 + 1.5<br>pressure i<br>k <sub>sX</sub> was ca<br>assuming t<br>ideal and                      | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon par<br>s 721.5 mmHg. The<br>lculated by the com<br>hat the gas behavio<br>that Henry's law is  | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>as before<br>tion is<br>lvent in<br>The<br>vapor is<br>tial<br>value of<br>piler<br>r is<br>obeyed.        | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically pure. ESTIMATED ERROR:</pre> |    |
| The neon<br>The value<br>The value<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolutio<br>complete,<br>contact at<br>total press<br>739 ± 1.5<br>pressure i<br>k <sub>SX</sub> was ca<br>assuming t<br>ideal and<br>The con              | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon par<br>s 721.5 mmHg. The<br>lculated by the com<br>hat the gas behavio<br>that Henry's law is<br>centration of MgCl <sub>2</sub>                       | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>as before<br>tion is<br>lvent in<br>The<br>vapor is<br>tial<br>value of<br>piler<br>r is<br>obeyed.<br>was | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically pure.</pre>                  |    |
| The neon<br>The value<br>The value<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolutio<br>complete,<br>contact at<br>total pres<br>739 ± 1.5<br>pressure i<br>k <sub>SX</sub> was ca<br>assuming t<br>ideal and<br>The con<br>determined | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon par<br>s 721.5 mmHg. The<br>lculated by the com<br>hat the gas behavio<br>that Henry's law is<br>centration of MgCl <sub>2</sub><br>after degassing by | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>tion is<br>lvent in<br>The<br>vapor is<br>tial<br>value of<br>piler<br>r is<br>obeyed.<br>was              | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically pure. ESTIMATED ERROR:</pre> |    |
| The neon<br>The value<br>The value<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolutio<br>complete,<br>contact at<br>total pres<br>739 ± 1.5<br>pressure i<br>k <sub>SX</sub> was ca<br>assuming t<br>ideal and<br>The con<br>determined | solubility in water<br>s of k <sub>s</sub> and k <sub>sX</sub> wer<br>tus, described in e<br>2), was based on t<br>m and Baer (3). Th<br>esigned to measure<br>in volume of the g<br>n and after dissolu<br>with the gas and so<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon par<br>s 721.5 mmHg. The<br>lculated by the com<br>hat the gas behavio<br>that Henry's law is<br>centration of MgCl <sub>2</sub>                       | , S <sup>0</sup> , is<br>e calcula<br>AUXILIARY<br>arlier<br>he design<br>e appa-<br>the<br>tion is<br>lvent in<br>The<br>vapor is<br>tial<br>value of<br>piler<br>r is<br>obeyed.<br>was              | <pre>from reference 1. ted by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Magnesium Chloride. Chemically pure. ESTIMATED ERROR:</pre> |    |

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| COMPONENTS:   | · · · · · · · · · · · · · · · · · · ·   |  | ORIGINAL MEASUREMENTS:  |
|---|---|--|---|
| 1. Neon; N  | e; 7440-01-9  |  | Lyashchenko, A.K.; Borina, A.F.   |
| -   | H <sub>2</sub> O; 7732-18-5   |  |   |
|   | um Sulfate; MgSO <sub>4</sub> ;   |  | <u>Zh. Strukt. Khim</u> . 1971, <u>12</u> , 964-968.<br><u>J. Struct</u> . <u>Chem</u> . 1971, <u>12</u> , 889-891.   |
| VARIABLES:  | K: 293.15   |  | PREPARED BY:  |
| Total P/kPa   | $g^{-1} H_2^{0:} 0 - 1.3^{-1}$  | nmHg)<br>47  | T.D. Kittredge, H.L. Clever   |
| EXPERIMENTAL  | VALUES:   |  |   |
| т/к   | Magnesium<br>Sulfate<br>mol kg <sup>1</sup> H <sub>2</sub> O  | Neon Solu<br>S/cm <sup>3</sup>   | 3   |
| 293.15  | 0   | 11.1   | 1 (S <sup>°</sup> )   |
|   | 0.304<br>0.492<br>0.624<br>1.016<br>1.347   | 9.3<br>8.4<br>7.9<br>6.4<br>5.5  | 2 0.245<br>2 0.236<br>9 0.230   |
|   | k <sub>s</sub>  | = 0.2487   | - 0.0181 m  |
| The neon s  | olubility, S, is<br>olubility in wate   | the same a<br>r, S <sup>O</sup> , is   | 0.2306 and k <sub>SX</sub> = 0.242.<br>s the Ostwald coefficient x 10 <sup>3</sup> .<br>from references 1 and 2.<br>were calculated by the compiler.  |
|   |   | AUXILIARY  | INFORMATION   |
| paper (1),<br>Ben-Naim an<br>is designed<br>in volume o<br>and after d<br>constant pr<br>of gas + wa<br>The neon pa<br>The value o<br>compiler as<br>ideal and t<br>The MgSO<br>degassing w | us, described in<br>was based on the<br>d Baer (3). The<br>to measure the d<br>f the gas before of<br>issolution is com<br>solvent in conta<br>essure. The tota<br>ter vapor is 739<br>rtial pressure is<br>f k <sub>SX</sub> was calcula<br>suming that gas b<br>hat Henry's law i<br>4 concentration a<br>as determined by<br>a chelating agent | design of<br>apparatus<br>ifference<br>dissolutio<br>plete with<br>ct at<br>1 pressure<br>± 1.5 mmHg<br>721.5.<br>ted by the<br>ehavior is<br>s obeyed.<br>fter<br>titration | Contained 0.1 percent of other<br>gases.<br>n2. Water. Doubly distilled.<br>3. Magnesium sulfate. Chemically<br>pure reagent grade.   |
|   |   |  | <ol> <li>Lyashchenko, A.K. <u>Doki. Akad</u>.</li> <li><u>Nauk. SSSR</u> 1974, <u>217</u>, 380.</li> <li>Ben-Naim, A.; Baer, S. <u>Trans.</u><br/><u>Faraday Soc</u>. 1963, <u>59</u>, 2735.</li> </ol> |

| COMPONENTS   |  |  | ORIGINAL MEASUREMEN   | 1770 -   |
|--|--|--|---|--|
|  | Ne; 7440-01-9  |  | Lyashchenko, A.H  |  |
|  | ; н <sub>2</sub> 0; 7732-18-5  |  |   |  |
| 3. Magne   | esium Nitrate; Mg<br>7-60-3  |  | Zh. <u>Strukt</u> . Khin<br>J. <u>Struct</u> . <u>Chem</u> .  | <u>n</u> . 1973, <u>14</u> , 978-981.<br>1973, <u>14</u> , 924-927.  |
| VARIABLES:   |  | (  | PREPARED BY:  |  |
|  | xPa: 89.27 (669.<br>98.525<br>/ mol kg <sup>-1</sup> H <sub>2</sub> O:   | (739 mmHcr)  | T.D. Kitt   | credge, H.L. Clever  |
| EXPERIMENT   | CAL VALUES:  |  |   |  |
| Т/К  | Magnesium<br>Nitrate   | P/mmHg 1   | Neon Solubility*  | Setschenow**<br>Parameter  |
|  | mol kg <sup>-1</sup> H <sub>2</sub> O  |  | s/cm <sup>3</sup> dm <sup>-3</sup>  | $k_{s} = (1/m) \log(s^{o}/s)$  |
| 293.15   | 0.0<br>0.186<br>0.186<br>0.186<br>0.325<br>0.325<br>0.325<br>0.325<br>0.325<br>0.325<br>0.325<br>0.325   | 739<br>739<br>705.8<br>683.5<br>669.6<br>739<br>727<br>692.5<br>679.5<br>739   | 11.11 (S <sup>O</sup> )<br>10.46<br>9.99<br>9.69<br>9.50<br>9.77<br>9.62<br>9.35<br>9.18<br>8.07<br>5.85    | 0.1408<br>(0.1408)<br>(0.1363)<br>(0.1363)<br>0.1717<br>(0.1704)<br>(0.1433)<br>(0.1433)<br>0.1912<br>0.1986 |
| -  |  | 739  | 5.85<br>the four values at  | 0.1886   |
| The neon   | $k_{s} = 0$<br>At one molal M  | .1386 + 0.04   | = 0.1825 and k <sub>sX</sub> =<br>17 m (all values).<br>= 0.1803 and k <sub>sX</sub> =<br>from references 1 | - 0.183.   |
|  |  | AUXILIAR   | INFORMATION   |  |
| METHOD:  |  |  | SOURCE AND PURITY C   | )F MATERIALS.  |
| papers (1<br>of Ben-Na<br>ratus is<br>differenc<br>dissoluti<br>complete,<br>contact a<br>total pre<br>is 739 <u>+</u><br>pressure | pparatus, describ<br>(,2), was based of<br>im and Baer (3).<br>designed to meas<br>e in volume of t<br>on and after dis<br>with the gas and<br>t constant press<br>ssure of gas + was<br>1.5 mmHg. The n-<br>over water is 72<br>of k <sub>SX</sub> was calc | n the design<br>The appa-<br>ure the<br>he gas before<br>solution is<br>d solvent in<br>ure. The<br>ater vapor<br>eon partial<br>1.5 mmHg. | r 1. Neon. Espec<br>Contained 0.<br>gases.<br>e 2. Water. Doub<br>3. Magnesium ni<br>pure grade.            | cially pure grade.<br>I per cent of other<br>oly distilled.<br>Ctrate. Chemically                            |
| behavior<br>is obeyed<br>The co  | ncentration of M   | t Henry's lav<br>g(NO <sub>3</sub> ) <sub>2</sub> in   |   | = 0.0035 - 0.005.  |
| determine<br>ion with<br>*The neo<br>as the O<br>The Set   | ion after degass<br>d by titration o<br>a chelating agen<br>on solubility, S,<br>ostwald coefficient<br>schenow paramete<br>culated by the co  | f the Mg <sup>2+</sup><br>t.<br>is the same<br>nt x 10 <sup>3</sup> .<br>rs k <sub>s</sub> and k <sub>s</sub> ;                            | Zh. Fiz. Khi<br>2. Borina, A.F.<br>Alekseeva, I<br><u>Zh. Fiz. Khi</u><br>3. Ben-Naim, A.                   | <u>m</u> . 1971, <u>45</u> , 2554.   |

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| COMPONENTS:  |   |  | ORIGINAT M   | EASUREMENTS:   |
|--|---|--|--|--|
|  | ; 7440-01-9   |  | Lyashchei  |  |
| 2. Water; H  | 2 <sup>0</sup> ; 7732-18-5  |  |  |  |
| 3. Magnesiu<br>10377-60  | m Nitrate; Mg(NO <sub>3</sub> )<br>-3   | 2'   | 380-382;   | ad. Nauk <u>SSSR</u> 1974, 217 (2),<br><u>Dokl. Phys. Chem. (Engl</u> .<br>1974, <u>217</u> , 645 - 647. |
| VARIABLES:   | 293.15 - 303.15   |  | PREPARED B   | Y:   |
| Total P/kPa:   | 98.525 (739 mmHg<br>-1 H <sub>2</sub> O: 0 - 1.50   | )  | T.D.   | . Kittredge, H.L. Clever   |
| EXPERIMENTAL V   | ALUES:  |  |  |  |
| T/K  | Nitrate   | Neon Sola  |  | Setschenow<br>Parameter  |
|  | mol kg <sup>-1</sup> H <sub>2</sub> O   | s/cm <sup>3</sup>  | dm <sup>-3</sup>   | $k_{s} = (1/m) \log (S^{O}/S)$   |
| 293.15   | 0<br>0.60<br>1.50   | 8  | .11 (S <sup>O</sup> )<br>.52<br>.15  | 0.192<br>0.171   |
|  | k <sub>s</sub>  | = 0.206  | - 0.023 m  |  |
|  | At one molal Mg(NO  | 3 <sup>)</sup> 2′ <sup>k</sup> s   | = 0.183 an   | nd $k_{sX} = 0.185$ .  |
| 303.15   | 0<br>0.70<br>1.45   | 8  | .59 (S <sup>O</sup> )<br>.28<br>.36  | 0.1527<br>0.1527   |
|  |   | $k_{\rm c} = 0.$   | 1 5 7 7  |  |
| The Setsche  | lubility, S, is th<br>now parameters k <sub>S</sub><br>lubility in water,   | and k <sub>sX</sub>  | were calc  | wald coefficient $x  10^3$ .<br>ulated by the compiler.<br>rences 1 and 2.                               |
|  |   | AUXTLTARY  | INFORMATION  | л  |
|  |   |  |  |  |
| papers (1,2)<br>of Ben-Naim<br>ratus is des<br>difference i<br>dissolution<br>complete, wi<br>contact at c<br>total pressu<br>is 739 $\pm$ 1.5<br>pressure ove | atus, described in<br>, was based on the<br>and Baer (3). The<br>igned to measure t<br>n volume of the ga<br>and after dissolut<br>th the gas and sol<br>onstant pressure.<br>re of gas + water<br>mmHg. The neon p<br>r water is 721.5 m | e design<br>e appa-<br>he<br>s before<br>ion is<br>vent in<br>The<br>vapor<br>artial<br>mHg. | <ol> <li>Neon<br/>Conta<br/>gases</li> <li>Wates</li> <li>Magne</li> </ol> | ained 0.1 per cent of other  |
| compiler ass<br>behavior is<br>is obeyed.<br>The Mg(NO   | $k_{sX}$ was calculate<br>uming that the gas<br>ideal and that Hen<br>$3^{2}$ concentration   | iry's law<br>in the  |  | ERROR: $\delta T/K = 0.02$<br>$\delta P/mmHg = 1.5$<br>$5/cm^{3} dm^{-3} = 0.04$<br>$\delta n/m = 0.02$  |
| end of the s<br>determined b   | er degassing and a<br>olubility experime<br>y comparison of th<br>with standard den   | nt was<br>e solu-  | 2. Zh. 1<br>Borin<br>Aleks   |  |
|  |   |  | 3. Ben-I   | Naim, A.; Baer, S.<br>s. Faraday Soc. 1963, <u>59</u> ,2735.   |

| COMPONENTS :   |  | OR   | IGINAL MEASU  | REMENTS .   |  |
|--|--|--|---|---|--|
|  | le; 7440-01-9  |  | orina, A.F  | .; Lyashchenko, A.  | К.;  |
| 2. Water:  | H <sub>2</sub> 0; 7732-18-5  | ļ  | Alekseeva   | a, L.S.   |  |
|  | 2  |  |   |   |  |
| 10043-5  | Chloride; CaCl <sub>2</sub> ;  | 7.   | h. Fiz. Kh  | im. 1973, <u>47</u> , 1748  | -1751.   |
| 10045 5  | μ. τ   | R  | uss. J.Phy  | s. <u>Chem</u> . 1973, <u>47</u> ,  | 987-989.   |
| VARIABLES:   | . 207 15   | PR   | EPARED BY:  |   | <u></u>  |
| Total P/kPa  | : 293,15<br>1: 98.525 (739 mmHg)<br>2g <sup>-1</sup> H <sub>2</sub> O: 0 - 2.580   |  | T.D. K  | ittredge, H.L. Cle  | ver  |
| EXPERIMENTAL   | VALUES:  |  |   |   |  |
| Т/К  | Calcium Chloride   | Neon solu  | bility*   | $k_{s} = (1/m) \log (S^{0})$  | /S)  |
|  | mol kg <sup>-1</sup> $H_2^0$   | S/cm <sup>3</sup>  |   |   |  |
| 293.15   | 0.0<br>0.349   | 11.11<br>9.40<br>7.76  | •   | 0.2080<br>0.2075  |  |
|  | 0.751<br>1.004   | 7.02   |   | 0.1986  |  |
|  | 1.484<br>2.580   | 5.38<br>3.33   |   | 0.2122<br>0.2028  |  |
|  |  | 0.2073 -   |   |   |  |
|  |  |  | 20(1 1 1  | - 0 210   |  |
|  | At one molal CaCl  | $2^{K_{s}} = 0.$   | 2061 and K  | sX = 0.218.   |  |
| The neon s   | solubility, S, is the<br>solubility in water,<br>s of k <sub>s</sub> and k <sub>sX</sub> were  | 5°, 15 fr  | om reieren  | ce I.   | , <sup>3</sup> .                                       |
| The neon s   | solubility in water,   | 5°, 15 fr  | om reieren  | ce I.   | , <sup>3</sup> .                                       |
| The neon s   | solubility in water,<br>s of k <sub>s</sub> and k <sub>sX</sub> were   | 5°, 15 fr  | d by the c  | ce I.   | ) <sup>3</sup> .                                       |
| The neon s   | solubility in water,<br>s of k <sub>s</sub> and k <sub>sX</sub> were   | calculate  | d by the c  | ce I.   | ) <sup>3</sup> .                                       |
| The neon s<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain   | solubility in water,<br>s of k <sub>s</sub> and k <sub>sX</sub> were<br>A<br>tus, described in ea<br>2), was based on the<br>n and Baer (3). The   | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier I<br>e design<br>appa-  | om referen<br>d by the c<br>FORMATION<br>DURCE AND PUR<br>. Neon.   | ompiler.  | nde.   |
| The neon s<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference   | tus, described in eat<br>and Baer (3). The<br>esigned to measure the<br>in volume of the ga  | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier<br>e design<br>appa-<br>he<br>s before 2  | om referen<br>d by the c<br>FORMATION<br>DURCE AND PUR<br>. Neon.<br>Contain<br>gases.  | ompiler.<br>ompiler.<br>RITY OF MATERIALS:<br>Specially pure gra  | nde.   |
| The neon s<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution  | solubility in water,<br>s of k <sub>s</sub> and k <sub>sX</sub> were<br>tus, described in eat<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure the<br>in volume of the gat<br>n and after dissolut   | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier<br>e design<br>appa-<br>he<br>s before 2<br>ion is  | om referen<br>d by the c<br>FORMATION<br>DURCE AND PUR<br>. Neon.<br>Contain<br>gases.<br>C. Water.   | ompiler.<br>ompiler.<br>ITY OF MATERIALS:<br>Specially pure gra<br>led 0.1 per cent of<br>Distilled.  | ide.<br>F other  |
| METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete,<br>contact at   | tus, described in eat<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure ti<br>in volume of the gas<br>n and after dissolut<br>with the gas and solut<br>constant pressure.  | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier<br>e design<br>appa-<br>he<br>s before<br>ion is<br>vent in<br>The  | om referen<br>d by the c<br>FORMATION<br>DURCE AND PUR<br>. Neon.<br>Contain<br>gases.<br>C. Water.   | ompiler.<br>ompiler.<br>NITY OF MATERIALS:<br>Specially pure gra<br>ed 0.1 per cent of  | nde.<br>E other  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete,<br>contact at<br>total press  | tus, described in eat<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure the<br>in volume of the gas<br>n and after dissolut<br>with the gas and solut<br>constant pressure.<br>sure of gas + water  | UXILIARY IN<br>Calculate<br>UXILIARY IN<br>rlier<br>e design<br>appa-<br>he<br>s before 2<br>vent in<br>The<br>vapor is  | om referen<br>d by the c<br>FORMATION<br>DURCE AND PUR<br>. Neon.<br>Contain<br>gases.<br>C. Water.<br>Calcium  | ompiler.<br>ompiler.<br>ITY OF MATERIALS:<br>Specially pure gra<br>led 0.1 per cent of<br>Distilled.  | nde.<br>E other  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete,<br>contact at<br>total press<br>739 ± 1.5 i<br>pressure i   | tus, described in ear<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure the<br>in volume of the ga<br>n and after dissolut<br>with the gas and solut<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon part<br>s 721.5 mmHg. The var   | UXILIARY IN<br>UXILIARY IN<br>UXILIARY IN<br>UXILIARY IN<br>S<br>rlier I<br>e design<br>appa-<br>he<br>s before 2<br>vent in 3<br>The<br>vent in 3<br>The<br>vapor is<br>ial<br>alue of          | om referen<br>d by the c<br>FORMATION<br>DURCE AND PUR<br>. Neon.<br>Contain<br>gases.<br>C. Water.<br>Calcium  | ompiler.<br>ompiler.<br>ITY OF MATERIALS:<br>Specially pure gra<br>led 0.1 per cent of<br>Distilled.  | nde.<br>E other  |
| METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete, y<br>contact at<br>total press<br>739 ± 1.5 m<br>pressure i<br>k <sub>sX</sub> was ca   | A<br>tus, described in east<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure the<br>in volume of the gas<br>n and after dissolut<br>with the gas and solv<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon part<br>s 721.5 mmHg. The volute<br>of the comp   | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier<br>e design<br>appa-<br>he<br>s before 2<br>ion is<br>vent in<br>The<br>vapor is<br>ial<br>alue of<br>iler                                      | om referen<br>d by the c<br>formation<br>purce AND PUR<br>. Neon.<br>Contain<br>gases.<br>. Water.<br>. Calcium<br>pure.  | ompiler.<br>MITY OF MATERIALS:<br>Specially pure gra<br>ed 0.1 per cent of<br>Distilled.<br>Chloride. Chemica   | nde.<br>E other  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete, w<br>contact at<br>total press<br>739 + 1.5<br>pressure i<br>k <sub>s</sub> X was ca<br>assuming t<br>ideal and                             | A<br>tus, described in eat<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure the<br>in volume of the gat<br>n and after dissolut<br>with the gas and solut<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon part<br>s 721.5 mmHg. The value<br>culated by the comp<br>hat the gas behavior<br>that Henry's law is   | UXILIARY IN<br>Calculate<br>UXILIARY IN<br>UXILIARY IN<br>Crlier 1<br>e design<br>appa-<br>he<br>s before 2<br>vent in 3<br>vent in 3<br>The<br>vapor is<br>ial<br>alue of<br>iler<br>is obeyed. | om referen<br>d by the c<br>FORMATION<br>DURCE AND PUR<br>. Neon.<br>Contain<br>gases.<br>C. Water.<br>Calcium  | ompiler.<br>MITY OF MATERIALS:<br>Specially pure gra<br>ed 0.1 per cent of<br>Distilled.<br>Chloride. Chemica   | nde.<br>E other  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete, to<br>contact at<br>total press<br>739 + 1.5 m<br>pressure i<br>k <sub>s</sub> X was ca<br>assuming t<br>ideal and<br>The con<br>determined | A<br>tus, described in eas<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure to<br>in volume of the gas<br>n and after dissolut<br>with the gas and solv<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon part<br>s 721.5 mmHg. The volute<br>to the gas behavior<br>that the gas behavior<br>that the gas behavior<br>that Henry's law is<br>centration of CaCl <sub>2</sub><br>after degassing by | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier<br>e design<br>appa-<br>he<br>s before<br>ion is<br>vent in<br>The<br>vapor is<br>ial<br>alue of<br>iler<br>is<br>obeyed.<br>was                | om referen<br>d by the c<br>formation<br>purce AND PUR<br>. Neon.<br>Contain<br>gases.<br>. Water.<br>. Calcium<br>pure.  | CE I.<br>ompiler.<br>RITY OF MATERIALS:<br>Specially pure gra<br>led 0.1 per cent of<br>Distilled.<br>Distilled.<br>Chloride. Chemica   | nde.<br>E other  |
| METHOD:<br>The value:<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete, y<br>contact at<br>total press<br>739 + 1.5 m<br>pressure i<br>k <sub>sX</sub> was ca<br>assuming t<br>ideal and<br>The con<br>determined<br>titration       | A<br>tus, described in ear<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure the<br>in volume of the gas<br>n and after dissolut<br>with the gas and solut<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon part<br>s 721.5 mmHg. The voluce<br>culated by the comp<br>hat the gas behavior<br>that Henry's law is<br>centration of CaCl <sub>2</sub>   | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier<br>e design<br>appa-<br>he<br>s before<br>ion is<br>vent in<br>The<br>vapor is<br>ial<br>alue of<br>iler<br>is<br>obeyed.<br>was<br>lating      | <ul> <li>om referen</li> <li>d by the c</li> <li>FORMATION</li> <li>FORMATION</li> <li>DURCE AND PUE</li> <li>Neon.<br/>Contain<br/>gases.</li> <li>Water.</li> <li>Calcium<br/>pure.</li> </ul>  | CE I.<br>ompiler.<br>RITY OF MATERIALS:<br>Specially pure gra<br>led 0.1 per cent of<br>Distilled.<br>Distilled.<br>Chloride. Chemica   | nde.<br>E other  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete, to<br>contact at<br>total press<br>739 + 1.5 m<br>pressure i<br>k <sub>s</sub> X was ca<br>assuming t<br>ideal and<br>The con<br>determined | A<br>tus, described in eas<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure to<br>in volume of the gas<br>n and after dissolut<br>with the gas and solv<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon part<br>s 721.5 mmHg. The volute<br>to the gas behavior<br>that the gas behavior<br>that the gas behavior<br>that Henry's law is<br>centration of CaCl <sub>2</sub><br>after degassing by | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier l<br>e design<br>appa-<br>he<br>s before 2<br>ion is<br>vent in 3<br>in 3<br>vent in 3<br>ialue of<br>iler<br>is obeyed.<br>was<br>lating       | <ul> <li>om referen</li> <li>d by the c</li> <li>d by the c</li> <li>FORMATION</li> <li>DURCE AND PUR</li> <li>Neon.<br/>Contain<br/>gases.</li> <li>Water.</li> <li>Calcium<br/>pure.</li> <li>STIMATED ERRO</li> <li>EFERENCES:</li> <li>Borina,<br/>Zh. Fiz</li> <li>Borina,</li> </ul>                                | ompiler.<br>MITY OF MATERIALS:<br>Specially pure graded 0.1 per cent of<br>Distilled.<br>Chloride. Chemica<br>DR:<br>$\delta S/S = 0.005$<br>A.F.; Lyashchenko<br>Mim. 1971, 45,<br>A.F.; Samoilov, C | ade.<br>Fother<br>ally<br>b, A.K.<br>1316.             |
| METHOD:<br>The value:<br>METHOD:<br>The appara<br>papers (1,<br>of Ben-Nain<br>ratus is d<br>difference<br>dissolution<br>complete, y<br>contact at<br>total press<br>739 + 1.5 m<br>pressure i<br>k <sub>sX</sub> was ca<br>assuming t<br>ideal and<br>The con<br>determined<br>titration       | A<br>tus, described in eas<br>2), was based on the<br>n and Baer (3). The<br>esigned to measure to<br>in volume of the gas<br>n and after dissolut<br>with the gas and solv<br>constant pressure.<br>sure of gas + water<br>mmHg. The neon part<br>s 721.5 mmHg. The volute<br>to the gas behavior<br>that the gas behavior<br>that the gas behavior<br>that Henry's law is<br>centration of CaCl <sub>2</sub><br>after degassing by | UXILIARY IN<br>calculate<br>UXILIARY IN<br>rlier l<br>e design<br>appa-<br>he<br>s before 2<br>ion is<br>vent in 3<br>in 3<br>vent in 3<br>ialue of<br>iler<br>is obeyed.<br>was<br>lating       | <ul> <li>om referen</li> <li>d by the c</li> <li>d by the c</li> <li>FORMATION</li> <li>FORMATION</li> <li>DURCE AND PUR</li> <li>Neon.<br/>Contain<br/>gases.</li> <li>Water.</li> <li>Calcium<br/>pure.</li> <li>STIMATED ERRO</li> <li>EFERENCES:</li> <li>Borina,<br/>Zh. Fiz</li> <li>Borina,<br/>Aleksec</li> </ul> | ompiler.<br>MITY OF MATERIALS:<br>Specially pure graded 0.1 per cent of<br>Distilled.<br>Chloride. Chemica<br>DR:<br>$\delta S/S = 0.005$<br>A.F.; Lyashchenko<br>Marking 1971, 45,                   | nde.<br>F other<br>111y<br>0, A.K.<br>1316.<br>0. Ya.; |

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| CONTROLING                  | ······································   |                                 |   |
|-----------------------------|--|---------------------------------|---|
| COMPONENTS:<br>1. Neon: Ne  | ; 7440-01-9  |                                 | INAL MEASUREMENTS:<br>ina, A.F.; Lyashchenko, A.K.;   |
|                             | -  |                                 | Alekseeva, L.S.   |
|                             | 1 <sub>2</sub> 0; 7732-18-5  | _                               |   |
| 3. Calcium                  | Bromide; CaBr <sub>2</sub> ;7789-41-   |                                 | Fig Whim 1073 47 1748-1751  |
|                             |  | $\frac{2\Pi}{Rus}$              | <u>Fiz. Khim</u> . 1973, <u>47</u> , 1748-1751.<br>s. <u>J.Phys</u> . <u>Chem</u> . 1973, <u>47</u> , 987-989.          |
| VARIABLES:<br>T/K:          | 293.15   | PREP                            | ARED BY:  |
| Total P/kPa:                | 98.525 (739 mmHg)<br>g <sup>-1</sup> H <sub>2</sub> O: 0 - 1.831               |                                 | T.D. Kittredge, H.L. Clever   |
| EXPERIMENTAL V              | ALUES:   |                                 |   |
| Т/К                         | Calcium Bromide Neon   | solubil                         | ity* k <sub>s</sub> = (1/m) log (S <sup>0</sup> /S)   |
|                             | mol kg <sup>-1</sup> H <sub>2</sub> 0 S/                                       | cm <sup>3</sup> dm <sup>-</sup> | 3   |
| 293.15                      | 0.0 1  | 1.11 (S                         | °) -  |
|                             |  | 0.21<br>9.46                    | 0.2278<br>0.1716  |
|                             |  | 8.37<br>7.09                    | 0.2128<br>0.2086  |
|                             | 1.161  | 6.33                            | 0.2104  |
|                             | 1.831  | 4.48                            | 0.2154  |
|                             | $k_s = 0.2208 - 0.0062m$   | (value                          | at 0.407m omitted)  |
|                             | At one molal CaBr <sub>2</sub> , k <sub>s</sub>                                | = 0.21                          | 46 and k <sub>sX</sub> = 0.219.   |
|                             |  |                                 |   |
| -                           | AUXILI   | ARY INFOR                       | MATION  |
| METHOD:                     |  | SOUR                            | CE AND PURITY OF MATERIALS:   |
| papers (1, 2                | ns, described in earlier<br>2), was based on the des<br>and Baer (3). The appa | ign                             | Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.  |
| difference i                | signed to measure the<br>In volume of the gas bef                              |                                 | Water. Distilled.   |
|                             | and after dissolution i<br>ith the gas and solvent                             |                                 | Calcium Bromide. Chemically pure.   |
|                             | constant pressure. The<br>are of gas + water vapor                             | is                              |   |
| 739 + 1.5 mm<br>pressure is | Hg. The neon partial<br>721.5 mmHg. The value<br>culated by the compiler       |                                 |   |
| assuming that               | at the gas behavior is   |                                 | MATED ERROR:  |
|                             | nat Henry's law is obeye<br>entration of CaBr, was                             | a.                              | δS/S = 0.005  |
| determined a                | fter degassing by  |                                 |   |
| agent.                      | the $Ca^{2+}$ by a chelatin  |                                 | RENCES:   |
|                             |  | 1.<br>2.                        | Borina, A.F.; Lyashchenko, A.K.<br>Zh. Fiz. Khim. 1971, 45, 1316.<br>Borina, A.F.; Samoilov, O. Ya.;<br>Alekseeva, L.S. |
|                             |  | 3.                              | <u>Zh. Fiz. Khim. 1971, 45, 2554.</u>   |

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|---|--|
| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
| 1. Neon; Ne; 7440-01-9  | Borina, A.F.; Lyashchenko, A.K.;<br>Alekseeva, L.S.  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |  |
| 3. Calcium Iodide; CaI <sub>2</sub> ; 10102-68-8  | Zh. Fiz. Khim. 1973, 47, 1748 - 1751.  |
| VARIABLES:  | Russ. J.Phys.Chem. 1973, 47,987 -989.  |
| T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>Cal2/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.742  | PREPARED BY:<br>T.D.Kittredge, H.L.Clever  |
| EXPERIMENTAL VALUES:  | 1  |
| T/K Calcium Iodide Neon S   | $olubility^* k_s = (1/m) \log (S^0/S)$   |
| $\frac{1}{10000000000000000000000000000000000$  |  |
| 293.15 0 1  | 1.11 (S <sup>O</sup> ) -   |
| 0.162 1   | 0.29 0.2055  |
|   | 8.19 0.2340  |
|   | 6.16 0.2158  |
| 1.742   | 4.45 0.2281  |
| k <sub>s</sub> = 0.21   | 35 + 0.0080 m  |
| At one molal CaI <sub>2</sub> ,   | $k_{s} = 0.2215$ and $k_{sX} = 0.215$  |
| The neon solubility in water, $S^{O}$ , i<br>The values of $k_{S}$ and $k_{SX}$ were calcu  | lated by the compiler.   |
|   | lated by the compiler.   |
| The values of $k_{S}$ and $k_{SX}$ were calcu   | lated by the compiler.   |
| The values of k <sub>s</sub> and k <sub>sX</sub> were calcu<br>AUXILIARY  | INFORMATION  |
| The values of k <sub>s</sub> and k <sub>sX</sub> were calcu<br>AUXILIARY<br>METHOD:   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:   |
| The values of k <sub>s</sub> and k <sub>sX</sub> were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:   |
| The values of k <sub>s</sub> and k <sub>sX</sub> were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.  |
| The values of k <sub>s</sub> and k <sub>sX</sub> were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>difference in volume of the gas before<br>dissolution and after dissolution is<br>complete, with the gas and solvent in  | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>2. Water. Distilled.  |
| The values of k <sub>s</sub> and k <sub>sX</sub> were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>dissolution and after dissolution is   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>2. Water. Distilled.<br>3. Calcium iodide. Chemically pure.             |
| The values of $k_s$ and $k_{sX}$ were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>dissolution and after dissolution is<br>complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor is<br>739 $\pm$ 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>2. Water. Distilled.<br>3. Calcium iodide. Chemically pure.             |
| The values of $k_s$ and $k_{sX}$ were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>dissolution and after dissolution is<br>complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor is<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>$k_{av}$ was calculated by the compiler  | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>2. Water. Distilled.<br>3. Calcium iodide. Chemically pure.             |
| The values of $k_s$ and $k_{sX}$ were calcu-<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>dissolution and after dissolution is<br>complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor is<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>$k_{sX}$ was calculated by the compiler<br>assuming that the gas behavior is  | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>2. Water. Distilled.<br>3. Calcium iodide. Chemically pure.             |
| The values of $k_s$ and $k_{sX}$ were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>dissolution and after dissolution is<br>complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor is<br>739 $\pm$ 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of   | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Calcium iodide. Chemically pure. ESTIMATED ERROR:</pre>   |
| The values of $k_s$ and $k_{sX}$ were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>difference is 721.5 mmHg. The value of is<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>$k_{sx}$ was calculated by the compiler<br>assuming that the gas behavior is<br>ideal and that Henry's law is obeyed.<br>The Ca <sup>2+</sup> concentration was determi-<br>ned after degassing by titration with | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Calcium iodide. Chemically pure. ESTIMATED ERROR:</pre>   |
| The values of $k_s$ and $k_{sX}$ were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>difference is 721.5 mmHg. The value of is<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>$k_{sx}$ was calculated by the compiler<br>assuming that the gas behavior is<br>ideal and that Henry's law is obeyed.<br>The Ca <sup>2+</sup> concentration was determi-<br>ned after degassing by titration with | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Calcium iodide. Chemically pure. ESTIMATED ERROR:</pre>   |
| The values of $k_s$ and $k_{sX}$ were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>difference is 721.5 mmHg. The value of is<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>$k_{sx}$ was calculated by the compiler<br>assuming that the gas behavior is<br>ideal and that Henry's law is obeyed.<br>The Ca <sup>2+</sup> concentration was determi-<br>ned after degassing by titration with | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Calcium iodide. Chemically pure. ESTIMATED ERROR:</pre>   |
| The values of $k_s$ and $k_{sX}$ were calcu<br>AUXILIARY<br>METHOD:<br>The apparatus, described in earlier<br>papers (1, 2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the<br>difference in volume of the gas before<br>difference is 721.5 mmHg. The value of is<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>$k_{sx}$ was calculated by the compiler<br>assuming that the gas behavior is<br>ideal and that Henry's law is obeyed.<br>The Ca <sup>2+</sup> concentration was determi-<br>ned after degassing by titration with | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Specially pure grade. Contained 0.1 per cent of other gases. 2. Water. Distilled. 3. Calcium iodide. Chemically pure. 5 ESTIMATED ERROR:</pre> |

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COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Lyashchenko, A.K.; Borina, A.F. 2. Water; H<sub>2</sub>O; 7732-18-5 Calcium Nitrate; Ca(NO<sub>3</sub>)<sub>2</sub>; <u>Zh. Strukt. Khim</u>. 1973, <u>14</u>, 978-981. <u>J. Struct</u>. <u>Chem</u>. 1973, <u>14</u>, 924-927. 10124-37-5 VARIABLES: T/K: 293.15 PREPARED BY: Total P/kPa: 89.25 (669.4 mmHg) -98.525 (739 mmHg) T.D. Kittredge, H.L. Clever  $Ca(NO_3)_2/mol kg^{-1} H_2O: 0 - 1.85$ EXPERIMENTAL VALUES: T/K Calcium P/mmHg Neon Solubility\* Setschenow Nitrate Parameter mol kg<sup>-1</sup> H<sub>2</sub>O  $k_{s} = (1/m) \log (S^{O}/S)$  $S/cm^3 dm^{-3}$ 11.11 (S<sup>O</sup>) 739 293.15 0.0 0.195 739 10.08 0.2167 669.4 0.195 9.01 (0.2456)739 0.409 9.14 0.2073 739 7.64 0.830 0.1959 1.85 739 4.82 0.1960 1.85 715.9 4.51 (0.2040) 739 1.85 4.24 0.2261  $k_{c} = 0.2082 + 0.0002 \text{ m}$  (from the five values at 739 mmHg) At one molal Ca(NO<sub>3</sub>)<sub>2</sub>,  $k_s = 0.2084$  and  $k_{sX} = 0.209$ .  $k_{g} = 0.2222 - 0.0088 \text{ m}$  (all values) At one molal  $Ca(NO_3)_2$ ,  $k_s = 0.2133$  and  $k_{sx} = 0.214$ . \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The Setschenow parameters  $k_s$  and  $k_{sX}$  were calculated by the compiler. The neon solubility in water, S<sup>o</sup>, is from references 1 and 2. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier 1. Neon. Especially pure grade. papers (1,2), was based on the design Contained 0.1 per cent of other of Ben-Naim and Baer (3). The appagases. ratus is designed to measure the difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is 3. Calcium nitrate. Chemically pure complete, with the gas and solvent in contact at constant pressure. The grade. total pressure of gas + water vapor is 739 + 1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k<sub>sX</sub> was calculated by the compiler assuming that the gas ESTIMATED ERROR: behavior is ideal and that Henry's law is obeyed. The concentration of  $Ca(NO_3)_2$  in  $\delta S/S = 0.0035 - 0.005.$ the solution after degassing was deter-mined by titration of the Ca<sup>2+</sup> ion **REFERENCES:** with a chelating agent. Borina, A.F.; Lyashchenko, A.K. 1. Zh. Fiz. Khim. 1971, 45, 1316. Borina, A.F.; Samoilov, O. Ya.; 2. Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554. Ben-Naim, A.; Baer, S. з. Trans. Faraday Soc. 1963, 59,2735.

| COMPONENTS:  |  |   | ORIGINAI   | MEASUREMENTS:   |
|--|--|---|--|---|
| 1. Neon; Ne; 7440-01-9   |  | Borina, A.F.; Lyashchenko, A.K.;  |  |   |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |   | kseeva, L.S.   |   |
| 3. Stronti   | ium Chloride; S:   | rCl <sub>a</sub> ;  |  |   |
| 10476-85-4   |  | <u>Zh. Fiz. Khim. 1973, 47, 1748 - 1751</u><br><u>Russ. J. Phys. Chem</u> . 1973, 47, 987 - 989   |  |   |
| VARIABLES:   |  |   | PREPAREI   | ) BY:   |
| Total P/kPa<br>SrCl <sub>2</sub> /mol 1  | /K: 293.15<br>a: 98.525 (739<br>kg <sup>-1</sup> H <sub>2</sub> O: 0 -   | mmHg)<br>2.474  | Т  | .D. Kittredge, H.L. Clever  |
| EXPERIMENTAL   | VALUES:  |   |  |   |
| T/K  | Strontium  | Neon solubi   | lity*  | $k_{s} = (1/m) \log (S^{o}/S)$  |
|  | Chloride<br>mol kg <sup>-1</sup> H <sub>2</sub> O  | S/cm <sup>3</sup> dm  | - 3  |   |
|  |  |   |  |   |
| 293.15   | 0.0<br>0.351   | 11.11<br>9.23   | (S <sup>°</sup> )  | 0.2294  |
|  | 0.495  | 8.62  |  | 0.2226  |
|  | $1.029 \\ 1.094$   | 6.59<br>6.10  |  | 0.2204<br>0.2380  |
|  | 2.015  | 4.04  |  | 0.2180  |
|  | 2.474  | 3.01  |  | 0.2292  |
|  |  | $k_{s} = 0.2265$  | - 0.000  | 5M  |
|  | At one molal   | $SrCl_{a}$ , k =  | 0.2260   | and $k_{sX} = 0.237$ .  |
|  |  |   |  |   |
| <u> </u>   |  | AUXILIARY   | INFORMAT   | ION   |
| ÆTHOD:   |  |   | SOURCE A   | ND PURITY OF MATERIALS:   |
| papers (1,<br>of Ben-Naim  | tus, described<br>2), was based<br>m and Baer (3).<br>esigned to meas  | on the design<br>The appa-  | Co   | on. Specially pure grade.   |
| lifference   | in volume of t   |   |  | ntained 0.1 per cent of other ses.  |
| complete, w<br>contact at  |  | he gas before   | 2. Wa  | ntained 0.1 per cent of other   |
| h 1  | with the gas and constant press  | solution is<br>d solvent in<br>ure. The   | 3. St  | ntained 0.1 per cent of other ses.  |
| 739 + 1.5 r  | with the gas an<br>constant press<br>sure of gas + w<br>nmHg. The neon   | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial   | 3. St  | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically  |
| 739 <u>+</u> 1.5 m<br>pressure is  | with the gas and<br>constant press<br>sure of gas + wa<br>nmHg. The neon<br>s 721.5 mmHg.  | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of   | 3. St  | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically  |
| 739 <u>+</u> 1.5 r<br>pressure is<br><sup>k</sup> sX <sup>was</sup> cal  | with the gas and<br>constant press<br>sure of gas + w<br>nmHg. The neon<br>s 721.5 mmHg.<br>lculated by the  | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler   | 3. St<br>pu  | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically<br>re.   |
| 739 <u>+</u> 1.5 r<br>pressure is<br>c <sub>sX</sub> was cal<br>assuming tl<br>ideal and t                           | with the gas and<br>constant press<br>sure of gas + way<br>nmHg. The neon<br>s 721.5 mmHg. '<br>lculated by the<br>hat the gas beh<br>that Henry's la                                    | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler<br>avior is<br>w is obeyed.                                 | 3. St<br>pu  | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically  |
| 739 <u>+</u> 1.5 r<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming th<br>ideal and t<br>The cond<br>determined | with the gas and<br>constant press<br>sure of gas + w<br>nmHg. The neon<br>s 721.5 mmHg. "<br>lculated by the<br>hat the gas beh<br>that Henry's la<br>centration of S<br>after degassin | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler<br>avior is<br>w is obeyed.<br>rCl <sub>2</sub> was<br>g by | 3. St<br>pu  | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically<br>re.   |
| 739 <u>+</u> 1.5 r<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming tl<br>ideal and t<br>The cond<br>determined | with the gas an<br>constant press<br>sure of gas + w<br>nmHg. The neon<br>s 721.5 mmHg.<br>lculated by the<br>hat the gas beh<br>that Henry's la<br>centration of S                      | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler<br>avior is<br>w is obeyed.<br>rCl <sub>2</sub> was<br>g by | 3. St<br>pu  | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically<br>re.<br>ED ERROR:<br>δS/S = 0.005  |
| 739 <u>+</u> 1.5 r<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming tl<br>ideal and t<br>The cond<br>determined | with the gas and<br>constant press<br>sure of gas + w<br>nmHg. The neon<br>s 721.5 mmHg. "<br>lculated by the<br>hat the gas beh<br>that Henry's la<br>centration of S<br>after degassin | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler<br>avior is<br>w is obeyed.<br>rCl <sub>2</sub> was<br>g by | 2. Wa<br>3. St<br>pu<br>ESTIMATI   | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically<br>re.<br>2D ERROR:<br>δS/S = 0.005  |
| 739 <u>+</u> 1.5 r<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming th<br>ideal and t<br>The cond<br>determined | with the gas and<br>constant press<br>sure of gas + w<br>nmHg. The neon<br>s 721.5 mmHg. "<br>lculated by the<br>hat the gas beh<br>that Henry's la<br>centration of S<br>after degassin | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler<br>avior is<br>w is obeyed.<br>rCl <sub>2</sub> was<br>g by | 2. Wa<br>3. St<br>pu<br>ESTIMATI<br>REFEREN<br>1. Bo<br>Zh                         | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically<br>re.<br>$\delta S/S = 0.005$<br>CES:<br>rina, A.F.; Lyashchenko, A.K.<br>. Fiz. Khim. 1971, 45, 1316.  |
| 739 <u>+</u> 1.5 r<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming tl<br>ideal and t<br>The cond<br>determined | with the gas and<br>constant press<br>sure of gas + w<br>nmHg. The neon<br>s 721.5 mmHg. "<br>lculated by the<br>hat the gas beh<br>that Henry's la<br>centration of S<br>after degassin | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler<br>avior is<br>w is obeyed.<br>rCl <sub>2</sub> was<br>g by | 2. Wa<br>3. St<br>pu<br>ESTIMATI<br>REFEREN<br>1. Bo<br>2. Bo                      | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically<br>re.<br>2D ERROR:<br>δS/S = 0.005<br>CES:<br>rina, A.F.; Lyashchenko, A.K.<br>. Fiz. Khim. 1971, 45, 1316.<br>rina, A.F.; Samoilov, O. Ya.;  |
| 739 <u>+</u> 1.5 r<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming th<br>ideal and t<br>The cond<br>determined | with the gas and<br>constant press<br>sure of gas + w<br>nmHg. The neon<br>s 721.5 mmHg. "<br>lculated by the<br>hat the gas beh<br>that Henry's la<br>centration of S<br>after degassin | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler<br>avior is<br>w is obeyed.<br>rCl <sub>2</sub> was<br>g by | 2. WA<br>3. St<br>pu<br>ESTIMATI<br>REFEREN<br>1. Bo<br>2. Bo<br>Al<br>Zh<br>2. Al | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically<br>re.<br>ED ERROR:<br>$\delta S/S = 0.005$<br>CES:<br>rina, A.F.; Lyashchenko, A.K.<br>. Fiz. Khim. 1971, 45, 1316.<br>rina, A.F.; Samoilov, O. Ya.;<br>ekseeva, L.S.<br>. Fiz. Khim. 1971, 45, 2554. |
| 739 <u>+</u> 1.5 r<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming tl<br>ideal and t<br>The cond<br>determined | with the gas and<br>constant press<br>sure of gas + w<br>nmHg. The neon<br>s 721.5 mmHg. "<br>lculated by the<br>hat the gas beh<br>that Henry's la<br>centration of S<br>after degassin | solution is<br>d solvent in<br>ure. The<br>ater vapor is<br>partial<br>The value of<br>compiler<br>avior is<br>w is obeyed.<br>rCl <sub>2</sub> was<br>g by | 2. WA<br>3. St<br>pu<br>ESTIMATI<br>REFEREN<br>1. Bo<br>Zh<br>2. Bo<br>Al<br>3. Be | ntained 0.1 per cent of other<br>ses.<br>ter. Distilled.<br>rontium Chloride. Chemically<br>re.<br>ED ERROR:<br>$\delta S/S = 0.005$<br>CES:<br>rina, A.F.; Lyashchenko, A.K.<br>. Fiz. Khim. 1971, 45, 1316.<br>rina, A.F.; Samoilov, O. Ya.;<br>ekseeva, L.S.                                 |

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COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Borina, A.F.; Lyashchenko, A.K.; Alekseeva, L.S. 2. Water; H<sub>2</sub>O; 7732-18-5 3. Strontium Bromide; SrBr,; <u>Zh. Fiz. Khim. 1973, 47</u>, 1748 - 1751. <u>Russ. J.Phys.Chem</u>. 1973, <u>47</u>, 987-989. 10476-81-0 VARIABLES: PREPARED BY: Т/К: 293.15 Total P/kPa: 98.525 (739 mmHg) SrBr<sub>2</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 1.345 T.D. Kittredge, H.L. Clever EXPERIMENTAL VALUES:  $k_{c} = (1/m) \log (S^{O}/S)$ T/K Strontium Neon solubility\* Bromide mol  $kg^{-1} H_2 O$  $\rm S/cm^3 dm^{-3}$ 11.11 (S<sup>o</sup>) 293.15 0.0 0.340 0.2148 9.39 0.438 8.75 0.2368 0.635 (0.1136)9.41 1.345 5.58 0,2224  $k_{c} = 0.2259 - 0.0018m$ At one molal  $\text{SrBr}_2$ ,  $k_s = 0.2241$  and  $k_{sx} = 0.226$ . \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The neon solubility in water, S<sup>o</sup>, is from reference 1. The values of  $k_s$  and  $k_{sx}$  were calculated by the compiler. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier papers (1, 2), was based on the design Neon. Specially pure grade. Contained 0.1 per cent of other 1. of Ben-Naim and Baer (3). The appagases. ratus is designed to measure the difference in volume of the gas before 2. Water. Distilled. dissolution and after dissolution is complete, with the gas and solvent in 3. Strontium Bromide. Chemically contact at constant pressure. The pure. total pressure of gas + water vapor is 739 + 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of  $k_{sX}$  was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed. The concentration of SrBr<sub>2</sub> was ESTIMATED ERROR:  $\delta S/S = 0.005$ determined gravimetrically as SrSO,, after degassing. REFERENCES : 1. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim.</u> 1971, 45, 1316. Borina, A.F.; Samoilov, O. Ya.; 2. Alekseeva, L.S. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 2554. <u>Ben-Naim, A.;</u> Baer, B. <u>Trans. Faraday Soc</u>. 1963, <u>59</u>,2735. 3.

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|--|--|--|--|--|
| COMPONENTS:<br>1. Neon; Ne; 7440-01-9  |  |  | ORIGINAL MEASUREMENTS:<br>Borina, A.F.; Lyashchenko, A K.;   |  |
| ····, ·  |  |  | ekseeva, L.S.  |  |
|  | H <sub>2</sub> O; 7732-18-5  |  |  |  |
|  | Chloride; BaCl <sub>2</sub> ;  |  |  |  |
| 10361-37-2   |  | $\frac{Zh}{Russ}$  | <u>Zh. Fiz. Khim. 1973, 47, 1748-1751.</u><br>Russ. J.Phys. <u>Chem</u> . 1973, 47, 987-989.   |  |
| VARIABLES:   | ·  | PREPAR   |  |  |
| Total P/kPa  | K: 293.15<br>a: 98.525 (739 mmHg)<br>Kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.214  |  | T.D. Kittredge, H.L. Clever  |  |
| EXPERIMENTAL   | VALUES:  |  |  |  |
| Т/К  | Barium Chloride Nec  | on solubilit   | $y^* k_s = (1/m) \log (S^0/S)$   |  |
|  | mol kg <sup>-1</sup> H <sub>2</sub> 0  | $S/cm^3 dm^{-3}$   | 5  |  |
| 293.15   | 0.0  | 11.11 (S <sup>0</sup> )  |  |  |
|  | 0.319<br>0.599   | 9.34<br>7.94   | 0.2363<br>0.2436   |  |
|  | 0.866  | 6.85   | 0.2425   |  |
|  | 1.214  | 5.61   | 0.2444   |  |
|  | $k_s = 0$ .  | .2359 + 0.00   | 177m   |  |
|  | At one molal BaCl <sub>2</sub> ,   | $k_{s} = 0.2436$   | and $k_{sX} = 0.251$ .   |  |
| The neon s   | solubility, S, is the s<br>solubility in water, S <sup>G</sup><br>s of k <sub>s</sub> and k <sub>sX</sub> were ca  | , is from r  |  |  |
| The neon s   | solubility in water, S <sup>c</sup>  | , is from r  | reference 1.   |  |
| The neon s   | solubility in water, S <sup>α</sup> s of k <sub>s</sub> and k <sub>sχ</sub> were ca  | , is from r  | the compiler.  |  |
| The neon s   | solubility in water, S <sup>α</sup> s of k <sub>s</sub> and k <sub>sχ</sub> were ca  | 1, is from in alculated by   | the compiler.  |  |
| The neon s<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Naim<br>ratus is de   | AUXI<br>AUXI<br>tus, described in earli<br>2), was based on the on<br>and Baer (3). The appendix to measure the  | ILLIARY INFORMA<br>ier<br>design<br>ppa-   | the compiler.  |  |
| The neon s<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Naim<br>ratus is de<br>difference   | solubility in water, S<br>s of k <sub>s</sub> and k <sub>sX</sub> were ca<br>AUXI<br>tus, described in earl:<br>2), was based on the c<br>n and Baer (3). The ap   | ILLIARY INFORMA  | ATION<br>AND PURITY OF MATERIALS:<br>Neon. Specially pure grade.<br>Contained 0.1 per cent of other  |  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Naim<br>ratus is de<br>difference<br>disfolution<br>complete, v<br>contact at<br>total press  | AUXI<br>AUXI<br>AUXI<br>AUXI<br>AUXI<br>AUXI<br>AUXI<br>AUXI   | LLIARY INFORMA<br>ier<br>lesign<br>ppa-<br>before<br>n is<br>nt in<br>por is<br>from r<br>strom r<br>source<br>1. N<br>C<br>Source<br>2. W<br>3. H<br>F  | ATION<br>AND PURITY OF MATERIALS:<br>Jeon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.  |  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Naim<br>ratus is de<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>contact at<br>total press<br>To pressure is de   | AUXI<br>AUXI<br>AUXI<br>AUXI<br>AUXI<br>AUXI<br>tus, described in earli<br>2), was based on the con-<br>mand Baer (3). The appendent<br>in volume of the gas h<br>and after dissolution<br>with the gas and solver<br>constant pressure. The<br>sure of gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van<br>and gas + water van and gas + water van a | ILIARY INFORMA<br>ILIARY INFORMA<br>ier<br>design<br>pa-<br>before<br>1. N<br>C<br>SOURCE<br>1. N<br>C<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S<br>S  | ATION<br>AND PURITY OF MATERIALS:<br>Jeon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>Water. Distilled.<br>Barium Chloride. Chemically  |  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Naim<br>ratus is de<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>difference<br>di<br>differen | AUXI<br>AUXI<br>AUXI<br>tus, described in earling<br>2), was based on the of<br>and Baer (3). The appendent<br>in volume of the gas by<br>and after dissolution<br>with the gas and solver<br>constant pressure. The<br>sure of gas + water var<br>mmHg. The neon partial<br>s 721.5 mmHg. The value<br>compile  | LLIARY INFORMA<br>ier<br>lesign<br>ppa-<br>before<br>n is<br>nt in<br>por is<br>le of<br>er  | ATION<br>AND PURITY OF MATERIALS:<br>Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>Nater. Distilled.<br>Barium Chloride. Chemically<br>Dure.   |  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Nain<br>ratus is de<br>difference<br>dissolution<br>complete, w<br>contact at<br>total press<br>739 + 1.5 m<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming th<br>ideal and t   | AUXI<br>AUXI<br>AUXI<br>AUXI<br>AUXI<br>AUXI<br>tus, described in earli<br>2), was based on the con-<br>mand Baer (3). The appendent<br>in volume of the gas h<br>and after dissolution<br>with the gas and solver<br>constant pressure. The<br>sure of gas + water van<br>and gas + water van<br>and after neon partial<br>sore of gas - The valu   | LLIARY INFORMA<br>ier<br>hesign<br>pa-<br>before<br>n is<br>nt in<br>he<br>por is<br>le of<br>er<br>s ESTIMA   | ATION<br>AND PURITY OF MATERIALS:<br>Jeon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>Water. Distilled.<br>Barium Chloride. Chemically  |  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Nain<br>ratus is de<br>difference<br>disfolution<br>complete, v<br>contact at<br>total press<br>739 ± 1.5 m<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming th<br>ideal and to<br>The cond<br>determined  | AUXI<br>AUXI<br>AUXI<br>tus, described in earl:<br>2), was based on the con-<br>and Baer (3). The appendence<br>in volume of the gas has<br>and after dissolution<br>with the gas and solver<br>constant pressure. The<br>sure of gas + water vapion<br>mHg. The neon partial<br>s 721.5 mmHg. The value<br>culated by the compile<br>hat the gas behavior is<br>that Henry's law is obe<br>centration of BaCl <sub>2</sub> was<br>after degassing by tit  | J, 1S from 1         alculated by         alculated by         ILLARY INFORMA         ier         lesign         pa-         before         1. N         pa-         before         1. N         pa-         before         1. N         before         2. W         3. F         por is         le of         er         s         eyed.  | TED ERROR:   |  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Nain<br>ratus is de<br>difference<br>disfolution<br>complete, v<br>contact at<br>total press<br>739 ± 1.5 m<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming th<br>ideal and to<br>The cond<br>determined  | Auxion Auxion and Auxion Auxio   | LLIARY INFORMA<br>ILIARY INFORMA<br>ier<br>design<br>ppa-<br>before<br>1. N<br>Source<br>1. N<br>C<br>g<br>before<br>1. N<br>C<br>g<br>before<br>1. N<br>C<br>g<br>before<br>1. N<br>C<br>g<br>before<br>1. N<br>C<br>g<br>before<br>1. N<br>C<br>g<br>before<br>1. N<br>C<br>g<br>before<br>1. N<br>C<br>g<br>before<br>1. N<br>C<br>g<br>c<br>c<br>c<br>c<br>c<br>c<br>c<br>c<br>c<br>c<br>c<br>c<br>c                 | TED ERROR:<br>ATTON<br>AND PURITY OF MATERIALS:<br>Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>Nater. Distilled.<br>Barium Chloride. Chemically<br>bure.<br>TED ERROR:<br>6S/S = 0.005<br>ENCES: |  |
| The neon s<br>The values<br>The values<br>METHOD:<br>The apparat<br>papers (1,<br>of Ben-Nain<br>ratus is de<br>difference<br>disfolution<br>complete, v<br>contact at<br>total press<br>739 ± 1.5 m<br>pressure is<br>k <sub>SX</sub> was cal<br>assuming th<br>ideal and to<br>The cond<br>determined  | AUXI<br>AUXI<br>AUXI<br>tus, described in earl:<br>2), was based on the con-<br>and Baer (3). The appendence<br>in volume of the gas has<br>and after dissolution<br>with the gas and solver<br>constant pressure. The<br>sure of gas + water vapion<br>mHg. The neon partial<br>s 721.5 mmHg. The value<br>culated by the compile<br>hat the gas behavior is<br>that Henry's law is obe<br>centration of BaCl <sub>2</sub> was<br>after degassing by tit  | 1. IS from r         alculated by         ILLIARY INFORMA         ier         design         opa-         before         1. Norres         before         1. Norres         before         1. Norres         before         1. Norres         before         2. W         3. Here         before         strandard         REFERE         1. Norres         strandard         REFERE         1. Norres         2. Norres | ATION<br>AND PURITY OF MATERIALS:<br>Neon. Specially pure grade.<br>Contained 0.1 per cent of other<br>gases.<br>Nater. Distilled.<br>Barium Chloride. Chemically<br>oure.<br>TED ERROR:<br>$\delta S/S = 0.005$                 |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Borina, A.F.; Lyashchenko, A.K.; Neon; Ne; 7440-01-9 1. Alekseeva, L.S. 2. Water; H<sub>2</sub>O; 7732-18-5 Barium Bromide; BaBr<sub>2</sub>; 3. <u>Zh. Fiz. Khim. 1973, 47, 1748-1751.</u> <u>Russ. J. Phys. Chem</u>. 1973, <u>47</u>, 987-989. 10553-31-8 VARIABLES: PREPARED BY: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) BaBr<sub>2</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 0.923 T.D. Kittredge, H.L. Clever EXPERIMENTAL VALUES: Neon solubility\*  $k_e = (1/m) \log (S^{o}/S)$ T/K Barium Bromide mol kg<sup>-1</sup> H<sub>2</sub>O  $S/cm^3 dm^{-3}$ 11.11  $(S^{\circ})$ 293.15 0.0 0.189 0.2213 10.09 0.450 8.43 6.29 0.2664 0.2676 0.923  $k_{e} = 0.2227 + 0.0558m$ At one molal BaBr<sub>2</sub>,  $k_s = 0.2785$  and  $k_{sX} = 0.276$ . \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The neon solubility in water, S<sup>o</sup>, is from reference 1. The values of  $k_s$  and  $k_{sX}$  were calculated by the compiler. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier Neon. Specially pure grade. papers (1, 2), was based on the design Contained 0.1 per cent of other of Ben-Naim and Baer (3). The appa-ratus is designed to measure the gases. Water. Distilled. difference in volume of the gas before 2. dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The Barium Chloride. Chemically 3. pure. total pressure of gas + water vapor is 739 + 1.5 mmHg. The neon partial pressure is 721.5 mmHg. The value of k was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed. ESTIMATED ERROR: The concentration of BaBr, was  $\delta S/S = 0.005$ determined gravimetrically as  $BaSO_4$  after degassing. REFERENCES: 1. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316. Borina, A.F.; Samoilov, O. Ya.; 2. Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554. Ben-Naim, A.; Baer, B. Trans. Faraday Soc. 1963, 59,2735 3.

| COMPONENTS:<br>1. Neon: N  | le; 7440-01-9  |                       | L MEASUREMENTS:<br>na, A.F.; Lyashchenko, A.K.;   |
|----------------------------|--|-----------------------|---|
|                            |  |                       | lekseeva, L.S.  |
| 2. Water;                  | H <sub>2</sub> 0; 7732-18-5  |                       |   |
| 3. Barium                  | Iodide; BaI <sub>2</sub> ;13718-50-8   |                       |   |
|                            |  | Zh.<br>Russ           | <u>Fiz. Khim. 1973, 47, 1748-1751.</u><br><u>J.Phys.Chem</u> . 1973, <u>47</u> , 987-989.         |
| VARIABLES:                 | : 293.15   | PREPARE               | D BY:   |
| Total P/kPa                | 98.525 (739 mmHg)<br>1 H <sub>2</sub> O: 0 - 0.995                               |                       | T.D. Kittredge, H.L. Clever   |
| EXPERIMENTAL               | VALUES:  |                       |   |
| Т/К                        | Barium Iodide Neon s   | solubilit             | $y^*$ $k_s = (1/m) \log (S^0/S)$  |
|                            |  | $cm^3 dm^{-3}$        |   |
| 293.15                     | 0.0  | 11.11 (S <sup>o</sup> | ) –   |
|                            | 0.240<br>0.460   | 9.21<br>8.50          | 0.3394<br>0.2528  |
|                            | 0.995  | 5.92                  | 0.2748  |
|                            | $k_{s} = 0.32$   | 24 - 0.06             | 2m  |
|                            | At one molal Bal <sub>2</sub> , k <sub>s</sub> =                                 | • 0.2620              | and k <sub>sx</sub> = 0.247.  |
|                            |  |                       |   |
|                            |  |                       |   |
|                            | A117111  |                       |   |
| METHOD:                    | AUXILIA  | RY INFORMA            |   |
| The apparat<br>papers (1,  | us, described in earlier<br>2), was based on the dest<br>and Baer (3). The appa- | l. N<br>ign C         | AND PURITY OF MATERIALS;<br>eon. Specially pure grade.<br>ontained 0.1 per cent of other<br>ases. |
| ratus is de<br>difference  | signed to measure the<br>in volume of the gas befo                               | ore 2. W              | ater. Distilled.  |
| complete, w                | and after dissolution is ith the gas and solvent i                               |                       | arium Iodide. Chemically pure.  |
|                            | constant pressure. The<br>ure of gas + water vapor                               | is                    |   |
| 739 + 1.5 m<br>pressure is | mHg. The neon partial<br>721.5 mmHg. The value of<br>culated by the compiler     |                       |   |
| assuming th<br>ideal and t | at the gas behavior is<br>hat Henry's law is obeyed                              |                       | ED ERROR:   |
| _                          | entration of Bal <sub>2</sub> was<br>gravimetrically as BaSO <sub>4</sub>        |                       | $\delta S/S = 0.005$  |
| after degas                | 7  | BEEEBEN               | 010.  |
|                            | - · · • • • •  | REFEREN               | CES:<br>orina, A.F.; Lyashchenko, A.K.  |
|                            |  | Z                     | h. <u>Fiz. Khim</u> . 1971, <u>45</u> , 1316.<br>Drina, A.F.; Samoilov, O. Ya.;                   |
|                            |  | A                     | lekseeva, L.S.<br>h. <u>Fiz. Khim</u> . 1971, <u>45</u> , 2554.                                   |
|                            |  | <b>3.</b> B           | en-Naim, A.; Baer, B.<br>rans. Faraday Soc. 1963, 59,2735.  |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Lyashchenko, A.K.; Borina, A.F. 2. Water; H<sub>2</sub>O; 7732-18-5 Barium Nitrate; Ba(NO<sub>2</sub>); <u>zh. Strukt. Khim</u>. 1973, <u>14</u>, 978-981. <u>J</u>. <u>struct</u>. <u>Chem</u>. 1973, <u>14</u>, 924-927. 10022-31-8 VARIABLES: T/K: 293.15 PREPARED BY: Total P/kPa: 91.12 (683.9 mmHg) -98.525 (739 mmHg)Ba(NO<sub>3</sub>)<sub>2</sub>/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 0.354 T.D. Kittredge, H.L. Clever **EXPERIMENTAL VALUES:** T/K Barium P/mmHg Neon Solubility\* Setschenow Nitrate Parameter s/cm<sup>3</sup> dm<sup>-3</sup> mol kg<sup>-1</sup> H<sub>2</sub>O  $k_{s} = (1/m) \log(S^{O}/S)$ 11.11 (S<sup>O</sup>) 293.15 0.0 739 0.111 0.2061 739 10.54 0.232 10.00 0.1970 739 0.232 9.85 (0.1747)719 0.232 9.61 (0.1747)701.9 0.232 683.9 9.37 (0.1747)0.252 0.2572 9.57 739 0.252 693.6 8.89 (0.2753)0.354 0.2530 739 9.04  $k_{c} = 0.1783 + 0.2105 \text{ m}$  (from the four values at 739 mmHg) At one molal Ba(NO<sub>3</sub>)<sub>3</sub>,  $k_s = 0.3889$  and  $k_{sX} = 0.376$ .  $k_{c} = 0.1527 + 0.2590 \text{ m}$  (all values) At one molal Ba(NO<sub>3</sub>)<sub>3</sub>,  $k_s = 0.4116$  and  $k_{sX} = 0.399$ . The neon solubility in water, So, is from references 1 and 2. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier 1. Neon. Especially pure grade. papers (1,2), was based on the design Contained 0.1 per cent of other of Ben-Naim and Baer (3). The appagases. ratus is designed to measure the difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in 3. Barium nitrate. Chemically pure contact at constant pressure. The grade. total pressure of gas + water vapor is 739  $\pm$  1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of k<sub>sX</sub> was calculated by the compiler assuming that the gas ESTIMATED ERROR: behavior is ideal and that Henry's law  $\delta S/S = 0.0035 - 0.005.$ is obeyed. The concentration of the Ba(NO3), in the solution after degassing was **REFERENCES:** determined gravimetrically as BaSO,. Borina, A.F.; Lyashchenko, A.K. <u>Zh. Fiz. Khim</u>. 1971, <u>45</u>, 1316.
 Borina, A.F.; Samoilov, O. Ya.; \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The Setschenow parameters ks and ksx Alekseeva, L.S. <u>Zh. Fiz. Khim. 1971, 45, 2554.</u> Ben-Naim, A.; Baer, S. <u>Trans. Faraday</u> Soc. 1963, <u>59</u>, 2735. were calculated by the compiler. з.

|                                       |  |  | ORIGINAL MEASUREMEN                   | ТЅ•  |
|---------------------------------------|--|--|---------------------------------------|--|
| 2. Water                              | Ne; 7440-01-   | -9   | _                                     | amoilov, O. Ya.;   |
| 2. Water; H <sub>2</sub> O; 7732-18-5 |  | Alekseeva, L.  | s.                                    |  |
| 3. Lith:                              | Lum Chloride;  | LiCl; 7447-41-8  |                                       |  |
|                                       |  |  |                                       | 971, <u>45</u> ,2554 - 2558.<br>em.1971, <u>45</u> ,1445-1447.             |
| VARIABLES                             | T/K 293.19   | 5  | PREPARED BY:                          |  |
| Total<br>LiCl/r                       | P/kPa: 98.529<br>nol kg <sup>-1</sup> H <sub>2</sub> O:      | 5 (739 mmHg)   | T.D.K                                 | ittredge, H.L.Clever   |
| EXPERIMENT                            | TAL VALUES:  |  |                                       | · · · · · · · · · · · · · · · · · · ·                                      |
| т/к                                   | Lithium<br>Chloride<br>mol kg <sup>-1</sup> H <sub>2</sub> O | Neon Solubility <sup>*</sup><br>S/cm <sup>3</sup> dm <sup>-3</sup> |                                       | Setschenow<br>Parameter<br>k <sub>S</sub> := (1/m)log(S <sup>'O</sup> /S') |
| 293.15                                | 0<br>0.483<br>0.864<br>1.162<br>1.288<br>2.138               | 8.95<br>8.77<br>7.56   | 10.30<br>9.53<br>9.16<br>9.00<br>7.88 | 0.0681<br>0.0771<br>0.0721<br>0.0710<br>0.0698                             |
|                                       | k,   | s' = 0.0725 - 0.000  | 97 m                                  |  |
|                                       | At one mo  | blal LiCl, $k_{s'} = 0$ .  | 0718 and $k_{sX} = 0$                 | .0872.   |
|                                       |  |  |                                       |  |
|                                       |  |  |                                       |  |
|                                       |  | AUXILIARY  | INFORMATION                           | ·····  |

COMPONENTS: ORIGINAL MEASUREMENTS: Lyashchenko, A. K. 1. Neon; Ne; 7440-01-9 2. Water; H<sub>2</sub>O; 7732-18-5 3. Lithium Nitrate; LiNO<sub>3</sub>; 7790-69-4 Dok1. Akad. Nauk SSSR 1974, 217 (2), 380 - 382; Dok1. Phys. Chem. (Engl. trans.) 1974, 217, 645 - 647. VARIABLES: PREPARED BY: T/K: 293.15 - 303.15 Total P/kPa: 98.525 (739 mmHg)  $LiNO_3/mol kg^{-1} H_2O: 0 - 2.40$ T. D. Kittredge, H. L. Clever **EXPERIMENTAL VALUES:** Neon Solubility\* T/K Lithium Setschenow Nitrate mol kg<sup>-1</sup> H<sub>2</sub>O Parameter s/cm<sup>3</sup> dm<sup>-3</sup>  $k_{s} = (1/m) \log (S^{O}/S)$ 293.15 0 11.11 (S<sup>O</sup>) 0.0842 0.84 9.44 1.21 8.53 0.0948 2.40 6.56 0.0953  $k_{\rm s} = 0.0833 + 0.0055 \,\mathrm{m}$ At one molal LiNO<sub>3</sub>,  $k_s = 0.0888$  and  $k_{sX} = 0.0905$ 10.59 (S<sup>O</sup>) 303.15 0 1.23 8.71 0.0690 1.80 8.16 0.0629  $k_{s} = 0.0822 - 0.0107 m$ At one molal LiNO<sub>3</sub>,  $k_s = 0.0715$  and  $k_{sx} = 0.0718$ \*The neon solubility, S, is the same as the Ostwald coefficient x 10<sup>3</sup>. The Setschenow parameters  $\boldsymbol{k}_{S}$  and  $\boldsymbol{k}_{SX}$  were calculated by the compiler. The neon solubility in water, S<sup>o</sup>, is from references 1 and 2. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in earlier 1. Neon. Especially pure grade. papers (1,2), was based on the design Contained 0.1 per cent of other of Ben-Naim and Baer (3). The appa-ratus is designed to measure the gases. difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in 3. Lithium nitrate. Chemically pure contact at constant pressure. The grade. total pressure of gas + water vapor is 739  $\pm$  1.5 mmHg. The neon partial pressure over water is 721.5 mmHg. The value of  $k_{SX}$  was calculated by the compiler assuming that the gas ESTIMATED ERROR: behavior is ideal and that Henry's law  $\delta T/K = 0.02$ is obeyed.  $\delta P/mmHg = 1.5$  $\delta S/cm^3 dm^{-3} = 0.04$ The concentration of LiNO3 in the = 0.04 solution was determined after the = 0.02 δm/m experiment by comparison of the solution density with tabulated **REFERENCES**: density data. 1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316. 2. Borina, A.F.; Samoilov, O.Ya.; Alekseeva, L.S. Zh. Fiz. Khim. 1971, 45, 2554. 3. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, <u>59</u>,2735.

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| COMPONENTS:<br>1. Neon; Ne; 7440-01-9  | ORIGINAL MEASUREMENTS:<br>Borina, A.F.; Samoilov, O. Ya.;  |  |  |
|  | Alekseeva, L.S.  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |  |  |
| 3. Sodium Chloride; NaCl; 7647-14-5  | <u>Zh. Fiz. Khim. 1971, 45, 2554-2558.</u><br><u>Russ.J.Phys.Chem</u> . 1971, <u>45</u> , 1445-1447.   |  |  |
| VARIABLES:   | PREPARED BY:   |  |  |
| T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>NaCl/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.188   | T.D. Kittredge, H.L. Clever  |  |  |
| EXPERIMENTAL VALUES:   |  |  |  |
| Chloride   | Jeon Solubility Setschenow<br>Parameter  |  |  |
| $\qquad \qquad $  | $s'/cm^{3} kg^{-1} H_{2}^{0} k_{s}^{*} = (1/m) \log(s'^{0}/s')$  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | 9.44       0.1075         8.72       0.0988         7.25       0.1090         6.66       0.1016  |  |  |
| k <sub>s</sub> , = 0.1040  | + 0.0003 m   |  |  |
| At one molal NaCl, k <sub>s</sub> ,  | = 0.1043 and $k_{sX} = 0.119$ .  |  |  |
| -  |  |  |  |
| of k <sub>s</sub> , are based on the neon solubil:<br>The neon solubility in water, S <sup>O</sup> , is  | -  |  |  |
| AUXILIARY  | INFORMATION  |  |  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS;  |  |  |
| The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The apparatus is designed to measure the difference in volume of the gas before dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is $739 \pm 1.5$ mmHg. The neon partial | <ol> <li>Neon. Especially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> <li>Water. Doubly distilled.</li> <li>Sodium chloride. Chemically<br/>pure grade.</li> </ol> |  |  |
| pressure is 721.5 mmHg. The value of $k_{sx}$ was calculated by the compiler   |  |  |  |
| assuming that the gas behavior is idea.  | ESTIMATED ERROR:   |  |  |
| and that Henry's law is obeyed.<br>The concentration of NaCl in the<br>solution after the solubility experi-   | \$S∕S = 0.005  |  |  |
| ment was determined by titration of the Cl <sup>-</sup> with $Hg(NO_3)_2$ .  | REFERENCES:<br>1. Borina, A.F.; Lyashchenko, A.K.<br><u>Zh. Fiz. Khim</u> . 1971, <u>45</u> , 1316.  |  |  |
|  | <ol> <li>Ben-Naim, A.; Baer, S.<br/><u>Trans. Faraday Soc</u>. 1963, <u>59</u>,2735.</li> </ol>  |  |  |
|  |  |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 1. Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Water; H<sub>2</sub>O; 7732-18-5 2. 3. Sodium Bromide; NaBr; 7647-15-6 Zh. Fiz. Khim. 1971, 45, 2554-2558. Russ.J.Phys.Chem. 1971, 45, 1445-1447. VARIABLES: PREPARED BY: T/K: 293.15 KPa: 98.525 (739 mmHg) Total P/kPa: 98.525 (739 mm NaBr/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 2.010 T.D. Kittredge, H.L. Clever EXPERIMENTAL VALUES: T/K Sodium Neon Solubility\* Neon Solubility Setschenow Bromide Parameter  $s/cm^3 dm^{-3}$  $s'/cm^3 kg^{-1} H_2 O k_s = (1/m) \log (s'^0/s')$ mol  $kg^{-1} H_0$ 11.11 (s<sup>o</sup>) 11.13 (S'<sup>O</sup>) 293.15 0 0.630 9.43 9.59 0.1027 0.894 8.89 9.11 0.0973 1.253 8.13 8.41 0.0971 0.1017 2.010 6.60 6.95  $k_{c}$ , = 0.0985 + 0.0001 m At one molal NaBr,  $k_{g}$ , = 0.0986 and  $k_{gX}$  = 0.114. \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The values of  $k_{s}$ , and  $k_{sX}$  were calculated by the compiler. The values of k, are based on the neon solubility ratio per kg H<sub>2</sub>O. The neon solubility in water, S<sup>O</sup>, is from reference 1. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: 1. Neon. Especially pure grade. Contained 0.1 per cent of other The apparatus, described in an earlier paper (1), was based on the design of Ben-Naim and Baer (2). The gases. apparatus is designed to measure the difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in 3. Sodium bromide. Chemically pure contact at constant pressure. The grade. total pressure of gas + water vapor is  $739 \pm 1.5$  mmHg. The neon partial pressure is 721.5 mmHg. The value of k was calculated by the compiler assuming that the gas behavior is ideal and that Henry's law is obeyed. The concentration of NaBr in the ESTIMATED ERROR:  $\delta S/S = 0.005$ solution after the solubility experiment was determined gravimetrically as AgBr. **REFERENCES**: 1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316. 2. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963, 59, 2735.

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| COMPONENTS:<br>1. Neon; Ne; 7440-01-9   | ORIGINAL MEASUREMENTS:<br>Borina, A.F.; Samoilov, O. Ya.;   |
|---|---|
| ·····   | Alekseeva, L.S.   |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |   |
| 3. Sodium Iodide; NaI; 7681-82-5  | <u>Zh. Fiz. Khim. 1971, 45, 2554-2558.</u><br><u>Russ.J.Phys.Chem</u> . 1971, <u>45</u> , 1445-1447.                    |
| VARIABLES:<br>T/K: 293.15   | PREPARED BY:  |
| Total P/kPa: 98.525 (739 mmHg)<br>NaI/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.023  | T.D. Kittredge, H.L. Clever   |
| EXPERIMENTAL VALUES:  |   |
| Iodide  | * Neon Solubility Setschenow<br>Parameter   |
| $\qquad \qquad $   | $\frac{S'/cm^{3} kg^{-1} H_{2}O}{m} k_{s} = (1/m) \log(S'^{O}/S')$  |
| 293.15       0.0       11.11 (S <sup>0</sup> )         0.327       10.18         0.651       9.51         1.038       8.39         1.549       7.51         2.023       6.61  | 11.13 (S'°)- $10.32$ $0.1004$ $9.76$ $0.0876$ $8.71$ $0.1026$ $7.94$ $0.0947$ $7.11$ $0.0962$                           |
| k <sub>s</sub> , = 0.09   | 965 - 0.0003 m  |
| At one molal NaI, k <sub>s</sub>  | = 0.0962 and $k_{sX} = 0.112$ .   |
| _   |   |
| of k <sub>s</sub> , are based on the neon solub<br>The neon solubility in water, S <sup>O</sup> ,   | _   |
| AUXILI  | LARY INFORMATION  |
| METHOD:<br>The apparatus, described in an<br>earlier paper (1), was based on the<br>design of Ben-Naim and Baer (2). The<br>apparatus is designed to measure the<br>difference in volume of the gas before<br>dissolution and after dissolution is<br>complete, with the gas and solvent<br>contact at constant pressure. The<br>total pressure of gas + water vapors<br>739 $\pm$ 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value<br>$k_{SX}$ was calculated by the compiler<br>assuming that the gas behavior is identified<br>The part of the second seco | The gases.<br>The gases.<br>The gases.<br>2. Water. Doubly distilled.<br>3. Sodium iodide. Chemically pure grade.<br>of |
| and that Henry's law is obeyed.<br>The concentration of NaI in the<br>solution after the solubility exper<br>ment was determined gravimetrically<br>as AgI.   | δS/S = 0.005  |

| COMPONENTS:   |   |   | OPTOTNAT   |  |  |  |
|---|---|---|--|--|--|--|
| 1. Neon; Ne;  | 7440-01-9   |   | ORIGINAL MEASUREMENTS:<br>Lyashchenko, A.K.  |  |  |  |
| 2. Water; H <sub>2</sub> 0  |   |   | Bydshenenko, A.K.  |  |  |  |
| -   | rate; NaNO <sub>3</sub> ; 76  | 31-99-4   | 330-382;   | ad. <u>Nauk SSSR</u> 1974, <u>217</u> (2),<br>Dokl. Phys. Chem. (Engl.trans.<br>7, 645 - 647.  |  |  |
| VARIABLES:  |   |   | PREPARED   | BY:  |  |  |
| Total P/kPa:  | 293.15 - 303.1<br>98.525 (739 mm<br>1 H <sub>2</sub> 0: 0 - 3.1   | lHg)  | т.   | D. Kittredge, H.L. Clever  |  |  |
| EXPERIMENTAL VAL  | UES:  |   |  |  |  |  |
|   | Nitrate   | Neon Soluk  |  | Setschenow<br>Parameter  |  |  |
|   | mol kg <sup>-1</sup> H <sub>2</sub> O   | S/cm c  | lm   | $\frac{k_{s} = (1/m) \log (S^{O}/S)}{2}$   |  |  |
| 293.15  | 0.80<br>1.25<br>1.82<br>3.10  | 11.1<br>9.0<br>8.0<br>7.0<br>5.3  | )3<br>)6<br>)2<br>}3   | 0.1125<br>0.1115<br>0.1095<br>0.1029   |  |  |
| At  | <sup>k</sup> s<br>one molal NaNC  | = 0.1166 - 0.1166 - 0.1166  |  |  |  |  |
|   |   |   | )0 (s <sup>o</sup> )   | - sx   |  |  |
| 298.15  | 0<br>1.05<br>3.10   | 8.6   | 57<br>11   | 0.09467<br>0.09814   |  |  |
|   | k <sub>s</sub>  | = 0.0929 +  | 0.0017   | m  |  |  |
| A   | t one molal NaN   |   |  | ad $k_{sX} = 0.0952$ .   |  |  |
| 303.15       0       10.5         0.56       9.5         1.67       7.5         2.72       5.5  |   | 50  | 0.0793<br>0.0897<br>0.0918   |  |  |  |
| At  | $k_s = 0.0773 + 0.0058 \text{ m}$<br>At one molal NaNO <sub>3</sub> , $k_s = 0.0831$ and $k_{sX} = 0.0827$ .  |   |  |  |  |  |
|   | · · · · · · · · · · · · · · · · · · ·   | AUXILIARY   | INFORMATIO   | NC   |  |  |
| METHOD:   |   |   | SOURCE AN  | D PURITY OF MATERIALS;   |  |  |
| The apparatus, described in earlier<br>papers (1,2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the   |   | <ol> <li>Neon. Especially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> </ol> |  |  |  |  |
|   | volume of the g<br>d after dissolu  |   | 2. Water. Doubly distilled.  |  |  |  |
| complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor<br>is 739 $\pm$ 1.5 mmHg. The neon partial<br>pressure over water is 721.5 mmHg.<br>The value of $k_{sx}$ was calculated by the |   |   | <ol> <li>Sodium nitrate. Chemically pure<br/>grade.</li> </ol>   |  |  |  |
| compiler assuming that the gas<br>behavior is ideal and that Henry's law  |   |   | $\begin{array}{rcl} & & & \\ & & & & \\ & & & \\ & & & \\ & & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ &$ |  |  |  |
| tion after deg  | oncentration ir<br>assing and at t<br>experiment was  | he end of   |  | $\delta S/cm^3 dm^{-3} = 0.04$<br>$\delta m/m = 0.02$  |  |  |
| mined by compa  | rison of the so<br>tandard density  | olution   | 2. $\frac{Zh}{Bor}$  | ina, A.F.; Lyashchenko, A.K.<br><u>Fiz. Khim</u> . 1971, <u>45</u> , 1316.<br>ina, A.F.; Samoilov, O. Ya.;                           |  |  |
| as the Ostwal<br>The Setschence   | e neon solubility, S, is the same<br>the Ostwald coefficient $x \ 10^3$ .<br>e Setschenow parameters $k_s$ and $k_{sX}$<br>re calculated by the compiler. |   | $\frac{Zh}{Ben}$   | kseeva, L.S.<br><u>Fiz. Khim</u> . 1971, <u>45</u> , 2554.<br>-Naim, A.; Baer, S.<br>ns. Faraday <u>Soc</u> . 1963, <u>59</u> ,2735. |  |  |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
| 1. Neon; Ne; 7440-01-9   | Lyashchenko, A.K.; Borina, A.F.  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |  |
| 3. Potassium hydroxide; KOH;<br>1310-58-3  | <u>Zh. Strukt. Khim. 1971, 12, 964-968.</u><br>J. <u>Struct. Chem.</u> 1971, <u>12</u> , 889-891.  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>KOH/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.905  | T.D. Kittredge, H.L. Clever  |
| EXPERIMENTAL VALUES:   | • • • • • • • • • • • • • • • • • • •  |
| T/K Potassium hydroxide Neon S   | Colubility* k <sub>s</sub> = (1/m) log (S <sup>O</sup> /S)   |
|  | m <sup>3</sup> dm <sup>-3</sup>  |
| 0.259 1  | 1.11 (S <sup>O</sup> ) -<br>0.02 0.1732  |
|  | 9.01 0.1795<br>7.51 0.1781   |
| 1.790  | 5.91 0.1531  |
| 2.905  | 3.79 0.1608  |
| k <sub>s</sub> = 0.1791  | - 0.0079 m   |
| At one molal KOH, $k_s = 0$  | 1712 and $k = 0.193$   |
| s out mound out, is  | SX SSE   |
|  |  |
| AUXILIARY  | INFORMATION  |
| ME THOD:   | SOURCE AND PURITY OF MATERIALS:  |
| The apparatus, described in an earlier<br>paper (1), was based on the design of<br>Ben-Naim and Baer (3). The apparatus<br>is designed to measure the difference   |  |
| in volume of the gas before dissolution<br>and after dissolution is complete with  |  |
| the gas and solvent in contact at<br>constant pressure. The total pressure<br>of gas + water vapor is 739 $\pm$ 1.5 mmHg<br>The neon partial pressure is 721.5.<br>The value of $k_{SX}$ was calculated by the | <ol> <li>Potassium hydroxide. Chemically<br/>pure reagent grade.</li> </ol>  |
| compiler assuming that gas behavior is<br>ideal and that Henry's law is obeyed.  | ESTIMATED ERROR:   |
| The KOH concentration after<br>degassing was determined by titration<br>with HCl.  | δs/s = 0.005   |
|  | REFERENCES:  |
|  | <ol> <li>Borina, A.F.; Lyashchenko, A.K.<br/><u>Zh. Fiz. Khim.</u> 1971, 45, 1316.</li> <li>Lyashchenko, A.K. <u>Dokl. Akad</u>.</li> </ol>  |
|  | Nauk.         SSSR 1974,         217,         380.           3.         Ben-Naim,         A.;         Baer,         S.         Trans.           Faraday         Soc.         1963,         59,         2735. |
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| 201/20120122  | ······   |  | OPTOTA                                | -  |   |                                      |
|---|--|--|---------------------------------------|--|---|--------------------------------------|
|   | IPONENTS:<br>Neon; Ne; 7440-01-9   |  |                                       | ORIGINAL MEASUREMENTS:<br>Borina, A.F.; Lyashchenko, A.K.  |   |                                      |
|   |  |  | 20111                                 | л,, ш <u>у</u>   |   |                                      |
|   | ium Chloride; KCl; 7   | 447-40-7   | $\frac{Zh}{Russ}$                     | Zh. <u>Fiz. Khim.</u> 1972, <u>46</u> , 249-250.<br><u>Russ.J.Phys.Chem</u> . 1972, <u>46</u> , 150-151. |   | 49-250.<br>, 150-151.                |
| VARIABLES:  |  |  | PREPAI                                |  |   |                                      |
| T/<br>Total P/kP<br>KCl/mol kg  | (K: 293.15<br>Pa: 98.525 (739 mmH<br>1 H <sub>2</sub> O: 0 − 1.892   | g)   |                                       | T.D. Kittre  | edge, H.L.  | Clever                               |
| EXPERIMENTAL  | L VALUES:  |  |                                       |  |   |                                      |
| т/к   | T/K Potassium Neon Solu<br>Chloride  |  | ubilit                                | ability* Setschenow<br>Parameter   |   |                                      |
|   |  | S/cm <sup>3</sup>  | dm <sup>-3</sup>                      | k_=  | (l/m) log   | (S <sup>O</sup> /S)                  |
| 293.15  | 0.0<br>0.121<br>0.225<br>0.223<br>0.431<br>0.437<br>0.915<br>0.915<br>1.890<br>1.892   | 11.12<br>10.68<br>10.44<br>10.49<br>9.99<br>9.8<br>8.82<br>8.79<br>7.00<br>7.00          | 4<br>0<br>4<br>7<br>2<br>8<br>8       |  | -<br>0.1417<br>0.1201<br>0.1286<br>0.1121<br>0.1176<br>0.1096<br>0.1117<br>0.1035<br>0.1050 |                                      |
|   | k <sub>c</sub> =   | 0.1276   | - 0.03                                | 40 m   |   |                                      |
| The value   | At one molal KCl<br>solubility, S, is th<br>es of k <sub>s</sub> and k <sub>SX</sub> were<br>solubility in water,  | e same a<br>calcula  | s the<br>ted by                       | Ostwald coe<br>the compil  | efficient ×<br>ler.   | 10 <sup>3</sup> .                    |
|   | · · · · · · · · · · · · · · · · · · ·  | AUXILIARY  | INFORM                                | TION   |   |                                      |
| METHOD  |  |  | · · · · · · · · · · · · · · · · · · · |  |   |                                      |
| papers (1,<br>of Ben-Nai<br>ratus is d<br>difference<br>dissolutic<br>complete,<br>contact at<br>total pres<br>739 ± 1.5<br>pressure c                            | paratus, described in<br>(2), was based on the<br>im and Baer (3). The<br>designed to measure t<br>in volume of the ga<br>on and after dissolut<br>with the gas and sol<br>constant pressure.<br>ssure of gas + water<br>mmHg. The neon part<br>over water is 721.5 m<br>of k <sub>sx</sub> was calculated | design<br>appa-<br>he<br>s before<br>ion is<br>vent in<br>The<br>vapor is<br>ial<br>mHg. | 1. 1<br>2. 1<br>3. 1                  | AND PURITY (<br>eon. Espec<br>ontained 0<br>ases.<br>ater. Doul<br>otassium ch<br>ure grade.             | cially pure<br>l per cent   | grade.<br>of other<br>ed.            |
| compiler assuming that the gas behavior<br>is ideal and that Henry's law is<br>obeyed.<br>The concentration of KCl in the<br>solutions after degassing was deter- |  | $\delta s/cm^3 dm^{-3} = 0.04$   |                                       |  | 0.04  |                                      |
|   | citrating the Cl- ion  |  | 2.                                    | orina, A.F<br>h. Fiz. Kh:<br>orina, A.F<br>lekseeva, J<br>h. Fiz. Kh:<br>en-Naim, A                      | im. 1971, 4<br>; Samoilov<br>L.S.<br>im. 1971, 4<br>; Baer, S.                              | 15, 1316.<br>7, O. Ya.;<br>15, 2554. |

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|---|--|
| COMPONENTED   |  |
| COMPONENTS:<br>1. Neon: Ne: $7440-01-9$   | ORIGINAL MEASUREMENTS:   |
| l. Neon; Ne; 7440-01-9<br>2. Water; H <sub>2</sub> O; 7732-18-5   | Borina, A.F.; Samoilov, O. Ya.;<br>Alekseeva, L.S.   |
| 3. Potassium Bromide; KBr; 7758-0   | 2-3<br>Zh. <u>Fiz. Khim. 1971, 45, 2554-2558.</u><br><u>Russ.J.Phys.Chem</u> . 1971, <u>45</u> , 1445-144  |
| VARIABLES:  | PREPARED BY:   |
| T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>KBr/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.971   | T.D. Kittredge, H.L. Clever  |
| EXPERIMENTAL VALUES:  |  |
| Bromide   | y* Neon Solubility Setschenow<br>Parameter   |
| $\frac{\text{mol kg}^{-1} \text{H}_2 \text{O} \text{S/cm}^3 \text{dm}^{-3}}{2}$   | $\frac{S'/cm^3 kg^{-1} H_2 O}{k_{s'}} = (1/m) \log(S'^{O}/S')$   |
| 293.15         0.0         11.11(S <sup>O</sup> )           0.222         10.59           0.668         9.43           0.887         8.89           1.697         7.47           1.971         6.93   | $\begin{array}{cccc} 11.13 & (5'^{\circ}) & - \\ 10.69 & 0.0789 \\ 9.67 & 0.0914 \\ 9.18 & 0.0943 \\ 7.93 & 0.0868 \\ 7.43 & 0.0890 \end{array}$                         |
| $k_{c} = 0.0$   | 0853 + 0.0025 m  |
| At one molal KBr, k <sub>s</sub>  | = 0.0878 and $k_{sX} = 0.103$ .  |
| The neon solubility in water, S <sup>O</sup>  | is from reference 1.   |
| AUXI  | LIARY INFORMATION  |
| METHOD:<br>The apparatus, described in an<br>earlier paper (1), was based on the<br>design of Ben-Naim and Baer (2).<br>apparatus is designed to measure<br>difference in volume of the gas be<br>dissolution and after dissolution<br>complete, with the gas and solven<br>contact at constant pressure. The<br>total pressure of gas + water vape<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value<br>k <sub>sx</sub> was calculated by the compile | The gases.<br>the gases.<br>the gases.<br>2. Water. Doubly distilled.<br>is 3. Potassium bromide. Chemically pure grade.<br>br is 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. |
| assuming that the gas behavior is id<br>and that Henry's law is obeyed.<br>The concentration of KBr in the<br>solution after the solubility exp<br>ment was determined gravimetrical.   | leal ESTIMATED ERROR:<br>$\delta S/S = 0.005$ eri-   |
| as AgBr.  | REFERENCES:<br>1. Borina, A.F.; Lyashchenko, A.K.<br><u>Zh. Fiz</u> . <u>Khim</u> . 1971, <u>45</u> , 1316.  |
|   | 2. Ben-Naim, A.; Baer, S.  |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Borina, A.F.; Samoilov, O. Ya.; Alekseeva, L.S. Water; H<sub>2</sub>O; 7732-18-5 2. 3. Potassium Iodide; KI; 7681-11-0 <u>Zh. Fiz. Khim. 1971, 45, 2554-2558.</u> <u>Russ.J.Phys.Chem</u>. 1971, <u>45</u>, 1445-1447. VARIABLES: PREPARED BY: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) KI/mol kg<sup>-1</sup> H<sub>2</sub>O: 0 - 2.682 T.D. Kittredge, H.L. Clever EXPERIMENTAL VALUES: T/K Potassium Neon Solubility\* Neon Solubility Setschenow Iodide Parameter mol kg<sup>-1</sup> H<sub>2</sub>O  $s/cm^3 dm^{-3}$   $s'/cm^3 kg^{-1} H_2 0 k_{s'} = (1/m) \log(s'^0/s')$ 11.13 (s'<sup>0</sup>) 11.11 (s<sup>o</sup>) 293.15 0.0 0.398 9.93 10.13 0.1027 0.763 9.21 9.56 0.0865 1.081 8.52 8.96 0.0871 1.534 7.70 8.27 0.0841 2.682 5.88 6.64 0.0836  $k_{c} = 0.0968 - 0.0062 \text{ m}$ At one molal KI,  $k_{g}$ , = 0.906 and  $k_{gX}$  = 0.106. \*The neon solubility, S, is the same as the Ostwald coefficient x  $10^3$ . The values of  $k_s$ , and  $k_{sx}$  were calculated by the compiler. The values of k<sub>c</sub>, are based on the neon solubility ratio per kg H<sub>2</sub>O. The neon solubility in water, S<sup>o</sup>, is from reference 1. AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Especially pure grade. METHOD: The apparatus, described in an earlier paper (1), was based on the Contained 0.1 per cent of other design of Ben-Naim and Baer (2). The apparatus is designed to measure the qases. difference in volume of the gas before 2. Water. Doubly distilled. dissolution and after dissolution is complete, with the gas and solvent in contact at constant pressure. The 3. Potassium iodide. Chemically pure grade. total pressure of gas + water vapor is  $739 \pm 1.5$  mmHg. The neon partial pressure is 721.5 mmHg. The value of k<sub>sX</sub> was calculated by the compiler assuming that the gas behavior is ideal ESTIMATED ERROR: and that Henry's law is obeyed. The concentration of KI in the solution after the solubility experi- $\delta S/S = 0.005$ ment was determined gravimetrically as AgI. **REFERENCES:** 1. Borina, A.F.; Lyashchenko, A.K. Zh. Fiz. Khim. 1971, 45, 1316. Ben-Naim, A.; Baer, S. Trans. Faraday Soc. 1963,<u>59</u>, 2735. 2.

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|--|---|
| COMPONENTS:<br>1. Neon: Ne: 7440-01-9  | ORIGINAL MEASUREMENTS:<br>Borina, A.F.; Samoilov, O. Ya.;   |
|  | Alekseeva, L.S.   |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |   |
| 3. Cesium Chloride; CsCl; 7647-17-8  | Zh. <u>Fiz</u> . <u>Khim</u> . 1971, <u>45</u> , 2554-2558.<br><u>Russ.J.Phys.Chem</u> . 1971, <u>45</u> , 1445-1447.   |
| VARIABLES:   | PREPARED BY:  |
| T/K: 293.15<br>Total P/kPa: 98.525 (739 mmHg)<br>CsCl/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 2.612   | T.D. Kittredge, H.L. Clever   |
| EXPERIMENTAL VALUES:   |   |
| T/K Cesium Neon Solubility*  | Neon Solubility Setschenow  |
| $\frac{\text{Chloride}}{\text{mol kg}^{-1} \text{ H}_2 \text{ S/cm}^3 \text{ dm}^{-3}}$  | $\frac{\text{Parameter}}{\text{S'/cm}^3 \text{ kg}^{-1} \text{ H}_2 \text{O}} \qquad \frac{\text{k}_{\text{S'}} = (1/\text{m})\log(\text{S'}^{\circ}/\text{S'})}{\text{k}_{\text{S'}} = (1/\text{m})\log(\text{S'}^{\circ}/\text{S'})}$ |
| $\begin{array}{cccccccc} 293.15 & 0.0 & 11.11 & (S^{O}) \\ 0.428 & 10.13 \\ 0.559 & 9.81 \\ 0.669 & 9.50 \\ 1.066 & 8.88 \\ 1.269 & 8.33 \\ 2.612 & 6.26 \end{array}$  | $\begin{array}{cccc} 11.13 & (5'^{\circ}) & - \\ 10.32 & 0.0767 \\ 10.04 & 0.0801 \\ 9.77 & 0.0846 \\ 9.28 & 0.0741 \\ 8.77 & 0.0781 \\ 6.96 \end{array}$   |
| k <sub>s</sub> , = 0.0791  | - 0.0011 m  |
| At one molal CsCl, k <sub>s</sub> , = 0  | .0780 and $k_{sX} = 0.0934$ .   |
| *The neon solubility, S, is the same a<br>The values of $k_s$ , and $k_{sX}$ were calcul<br>of $k_s$ , are based on the neon solubili<br>The neon solubility in water, S <sup>O</sup> , is   | ated by the compiler. The values .<br>ty ratio per kg H <sub>2</sub> O.   |
| AUXILIARY  | INFORMATION   |
| METHOD:<br>The apparatus, described in an<br>earlier paper (1), was based on the<br>design of Ben-Naim and Baer (2). The<br>apparatus is designed to measure the<br>difference in volume of the gas before<br>dissolution and after dissolution is<br>complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor is<br>739 ± 1.5 mmHg. The neon partial<br>pressure is 721.5 mmHg. The value of<br>k was calculated by the compiler | <ol> <li>Cesium chloride. Chemically<br/>pure grade.</li> </ol>   |
| assuming that the gas behavior is ideal<br>and that Henry's law is obeyed.   | ESTIMATED ERROR:  |
| The concentration of CsCl in the solution after the solubility experi-   | $\delta S/S = 0.005$  |
| ment was determined by titration of the $C1^-$ by Hg(NO <sub>3</sub> ) <sub>2</sub> .  |   |
|  | REFERENCES:<br>1. Borina, A.F.; Lyashchenko, A.K.<br><u>Zh. Fiz. Khim</u> . 1971, <u>45</u> , 1316.   |
|  | 2. Ben-Naim, A.; Baer, S.<br>Trans. Faraday Soc. 1963, <u>59</u> , 2735.  |
|  | ļ   |

| COMPONENTS :   |   |  |  |  |  |
|--|---|--|--|--|--|
| 1. Neon; Ne; 7440-01-9   | ORIGINAL MEASUREMENTS:<br>Lyashchenko, A.K.   |  |  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5  |   |  |  |  |  |
| 3. Cesium Nitrate; CsNO <sub>3</sub> ; 7789-18-6   | Dokl. Akad. Nauk SSSR 1974, 217 (2),<br>380-382; Dokl. Phys. Chem. (Engl.<br>trans.) 1974, 217, 645 - 647.  |  |  |  |  |
| VARIABLES:   | PREPARED BY:  |  |  |  |  |
| T/K: 293.15 - 303.15<br>Total P/kPa: 98.525 (739 mmHg)<br>CsNO <sub>3</sub> /mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 1.15   | T.D. Kittredge, H.L. Clever   |  |  |  |  |
| EXPERIMENTAL VALUES:   |   |  |  |  |  |
| T/K Cesium Neon Soluk<br>Nitrate   | Parameter   |  |  |  |  |
| $\frac{\text{mol kg}^{-1} \text{H}_2 \text{O}}{2} \frac{\text{S/cm}^3 \text{ of } \text{S/cm}^3 \text$ | $dm^{-3}$ $k_s = (1/m) \log (S^{\circ}/S)$  |  |  |  |  |
| 293.15 0 11.11<br>0.48 9.89<br>1.15 8.34   | (S <sup>O</sup> )<br>0.1052<br>0.1083   |  |  |  |  |
| $k_{s} = 0.1030 + 1000$  | + 0.0046 m  |  |  |  |  |
| At one molal $CsNO_3$ , $k_s = 0$ .  | .1076 and k <sub>sX</sub> = 0.0961.   |  |  |  |  |
| 303.15 0 10.59<br>0.48 9.76<br>1.10 8.65   | (S <sup>O</sup> ) –<br>0.0738<br>0.0799   |  |  |  |  |
| $k_{z} = 0.0691 + 1000$  | + 0.0098 m  |  |  |  |  |
|  |   |  |  |  |  |
| At one molal $CsNO_3$ , $k_s = 0$ .  | sx - 0.0000.  |  |  |  |  |
| *The neon solubility, S, is the same as the Ostwald coefficient x $10^3$ .<br>The Setschenow parameters $k_s$ and $k_{sX}$ were calculated by the compiler.<br>The neon solubility in water, S <sup>O</sup> , is from references 1 and 2.  |   |  |  |  |  |
| AUXILIARY  | INFORMATION   |  |  |  |  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:   |  |  |  |  |
| The apparatus, described in earlier<br>papers (1,2), was based on the design<br>of Ben-Naim and Baer (3). The appa-<br>ratus is designed to measure the  | <ol> <li>Neon. Especially pure grade.<br/>Contained 0.1 per cent of other<br/>gases.</li> </ol>   |  |  |  |  |
| difference in volume of the gas before<br>dissolution and after dissolution is   | 2. Water. Doubly distilled.   |  |  |  |  |
| complete, with the gas and solvent in<br>contact at constant pressure. The<br>total pressure of gas + water vapor<br>is 739 $\pm$ 1.5 mmHg. The neon partial<br>pressure over water is 721.5 mmHg.   | <ol> <li>Cesium nitrate. Chemically pure<br/>grade.</li> </ol>  |  |  |  |  |
| The value of k <sub>SX</sub> was calculated by the compiler assuming that the gas  | ESTIMATED ERROR: An A   |  |  |  |  |
| behavior is ideal and that Henry's law<br>is obeyed.<br>The CsNO <sub>3</sub> concentration in the   | $\delta T/K = 0.02$<br>$\delta P/mmHg = 1.5$<br>$\delta S/cm^3 dm^{-3} = 0.04$  |  |  |  |  |
| solution after degassing and at the  | $\frac{\delta m/m}{\delta m/m} = 0.02$  |  |  |  |  |
| end of the solubility experiment was<br>determined by comparison of the solu-<br>tion density with standard density<br>tabulations.  | REFERENCES:<br>1. Borina, A.F.; Lyashchenko, A.K.<br><u>Zh. Fiz. Khim.</u> 1971, <u>45</u> , 1316.<br>2. Borina, A.F.; Samoilov, O. Ya.;            |  |  |  |  |
|  | Alekseeva, L.S.<br><u>Zh. Fiz. Khim.</u> 1971, <u>45</u> , 2554.<br>3. Ben-Naim, A.; Baer, S.<br><u>Trans. Faraday Soc</u> . 1963, <u>59</u> ,2735. |  |  |  |  |
|  |   |  |  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |  |  |
|---|--|--|--|
| 1. Neon; Ne; 7440-01-9  | Morrison, T.J.; Johnstone, N.B.B.  |  |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |  |  |  |
| 3. Alkali Halides   | <u>J. Chem. Soc</u> . 1955, 3655 - 3659.   |  |  |
|   |  |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)   | T.D.Kittredge  |  |  |
| EXPERIMENTAL VALUES:  |  |  |  |
| $T/K  k_{S} = (1/m) \log (S^{O}/S)$   | $k_{SX} = (1/m) \log (X^{0}/X)$  |  |  |
| Lithium Chloride; LiCl; 7447  | -41-8  |  |  |
| 298.15 0.059  | 0.074  |  |  |
| Sodium Chloride; NaCl; 7647-  | ·14-5  |  |  |
| 298.15 0.097  | 0.112  |  |  |
| Potassium Iodide; KI; 7681-1  | .1-0   |  |  |
| 298.15 0.080  | 0.095  |  |  |
| of water. The compiler calculated the<br>the mole fraction solubility ratio X°/<br>100 per cent dissociated and both cati<br>fraction calculation.                  | X. The electrolytes were assumed to be   |  |  |
| AUXILIARY   | INFORMATION  |  |  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:  |  |  |
| Gas absorption in a flow system.  | l. Neon. British Oxygen Co. Ltd.   |  |  |
|   | 2. Water. No information given.  |  |  |
|   | 3. Electrolyte. No information given.  |  |  |
|   |  |  |  |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR:   |  |  |
|   | $\delta k_{\rm S} = 0.010$   |  |  |
| The previously degassed solvent flows<br>in a thin film down an absorption  | 0. ng = 0. 010   |  |  |
| spiral containing neon gas plus<br>solvent vapor at a total pressure of<br>one atm. The volume of gas absorbed<br>is measured in attached calibrated<br>burets (1). | REFERENCES:<br>1. Morrison, T.J.; Billett, F.<br><u>J. Chem</u> . <u>Soc</u> . 1952, 3819. |  |  |
|   |  |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Lvashchenko, A.K.; Borina, A.F. 1. Neon; Ne; 7440-01-9 2. Water; H<sub>2</sub>O; 7732-18-5 3. Alkali Halides <u>Zh. Strukt</u>. <u>Khim</u>. 1971, <u>12</u>, 964 - 968. J. Struct. Chem. 1971, 12, 889 - 891. VARIABLES: PREPARED BY: T/K: 293.15 Total P/kPa: 98.525 (739 mmHg) T.D.Kittredge, H.L.Clever **EXPERIMENTAL VALUES:** Alkali Halide Neon Solubility  $k_s = (1/m) \log (S^{O}/S)$ т/к mol kg<sup>-1</sup> H<sub>2</sub>O  $S/cm^3 dm^{-3}$ Potassium Fluoride; KF; 7789-23-3 293.15 0 11.11 0.57 9.36 0.1306 1.39 7.66 0.1162 1.57 7.33 0.1050 1.72 7.00 0.1166 3.07 5.10 0.1101  $k_{\rm S} = 0.1276 - 0.0071 \,\mathrm{m}$ At one molal KF,  $k_s = 0.121$  and  $k_{sX} = 0.132$ . Rubidium Chloride; RbCl; 7791-11-9 293.15 0 11.11 0.172 10.62 0.1139 0.474 9.82 0.1131 0.577 9.69 0.1029 1.018 8.61 0.1088 1.14 8.51 0.1017  $k_s = 0.1146 - 0.0097 m$ At one molal RbCl,  $k_s = 0.105$  and  $k_{sX} = 0.103$ <sup>\*</sup>The neon solubility, S, is the same as the Ostwald coefficient  $x \ 10^3$ . The neon solubility in water, S<sup>o</sup>, is from references 1 and 2. AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus, described in an earlier paper (1), was based on the design of 1. Neon.Especially pure grade. Contained 0.1 percent of other Ben-Naim and Baer (3). The apparatus gases. is designed to measure the difference in volume of the gas before dissolution 2. Alkali halides. Chemical pure and after dissolution is complete with reagent grade. the gas and solvent in contact at constant pressure. The total pressure of gas + water vapor is 739 ± 1.5 mmHg. The neon partial pressure is 721.5. The value of k<sub>sX</sub> was calculated by the compiler assuming that gas behavior is ideal and that Henry's law is obeyed. ESTIMATED ERROR: The KF concentration was determined after degassing by titration of the F  $\delta S/S = 0.005$ with Al(NO3)3. The RbCl concentration was determined after degassing by titration with  $Hg(NO_3)_2$ . **REFERENCES**: The Setschenow parameters ks and ksx 1. Borina, A.F.; Lyashchenko, A.K. were calculated by the compiler. Zh. Fiz. Khim. 1971, 45, 1316. 2. Lyashchenko, A.K. 3. Ben-Naim, A.; Baer, S. Dokl. Akad. Nauk. SSSR 1974, 217, Trans. Faraday Soc. 1963, 59, 2735. 380.

| COMPONENTS:   |   |                       | ORIGINAL MEASUREMENTS:                 |  |  |
|---|---|-----------------------|--|--|--|
| 1. Noone N  | . Neon; Ne; 7440-01-9                           |                       | Borina, A.F.; Samoilov, O. Ya.         |  |  |
|   |   |                       |  |  |  |
|   | H <sub>2</sub> O; 7732-18-5                     |                       |  |  |  |
| 3. Alkali   | Halides   |                       |  | <u>him</u> . 1974, <u>15</u> , 395 - 402<br><u>em</u> . 1974, <u>15</u> , 336 - 342. |  |
| VARIABLES:  |   |                       | PREPARED BY:                           |  |  |
| T/K: 288.15 - 298.15<br>Total P/kPa: 98.659 (740 mmHg)<br>Salt/mol kg <sup>-1</sup> H <sub>2</sub> O: 0 - 4.377 |   |                       | H. L. Clever<br>T. D. Kittredge        |  |  |
| EXPERIMENTAL  | VALUES:   |                       |  |  |  |
| T/K   | Alkali  | Mol Fraction          | Mol Fraction                           | Setschenow Salt<br>Parameter   |  |
|   | Halide<br>mol kg <sup>-1</sup> H <sub>2</sub> O | at 1 mmHg             | $x_1 \times 10^4$ at 1 atm             | $k_s = (1/m) \log (X^O/X)$   |  |
| Lithium   | Chloride; LiCl                                  | : 7447-41-8           | <u> </u>                               |  |  |
| 288.15  | 0   | 11.39                 | 0.0866                                 |  |  |
|   | 0.426   | 10.24                 | 0.0778                                 | 0.1085   |  |
|   | 0.800<br>1.155                                  | 9.74<br>9.07          | 0.0740                                 | 0.0850<br>0.0856   |  |
|   | 1.489   | 9.07                  | 0.0689<br>0.0650                       | 0.0837   |  |
|   | 1.589   | 8.34                  | 0.0634                                 | 0.0852   |  |
|   | 3.088   | 6.29                  | 0.0478                                 | 0.0835   |  |
| 293.15  | 0   | 10.98                 | 0.08345                                | -  |  |
|   | 0.483<br>0.864                                  | 10.08<br>9.25         | 0.0766<br>0.0703                       | 0.0769<br>0.0862   |  |
|   | 1.162   | 8.86                  | 0.0673                                 | 0.0802   |  |
|   | 1.288   | 8.67                  | 0.0659                                 | 0.0796   |  |
|   | 2.138<br>2.987                                  | 7.49                  | 0.0569                                 | 0.0777<br>0.0753   |  |
|   |   | 6.54                  | 0.0497                                 |  |  |
| 298.15  | 0<br>0.330                                      | 10.58<br>10.06        | 0.0804<br>0.0765                       | 0.0663   |  |
|   | 0.935   | 8.97                  | 0.0682                                 | 0.0767   |  |
|   | 1.270   | 8.52                  | 0.0648                                 | 0.0741   |  |
|   | 1.590<br>3.277                                  | 7.94<br>6.05          | 0.0603<br>0.0460                       | 0.0784<br>0.0741   |  |
| Table con   | ntinued on next                                 | page.                 |  |  |  |
|   |   | AUXILIARY             | INFORMATION                            |  |  |
| METHOD/APPA   | ARATUS/PROCEDURE                                | 5:                    | SOURCE AND PURIT                       | Y OF MATERIALS:  |  |
| The appa  | aratus, describe                                | ed in earlier         | 1. Neon. Spec                          | ially pure grade.  |  |
| of Ben-Nai  | ,2), was based o<br>im and Baer (3),            | The appa-             | Contained 0.1 per cent of other gases. |  |  |
| ratus is d<br>difference  | lesigned to meas<br>a in volume of t            | sure the              | -                                      | tilled.  |  |
| dissolutio  | on and after dis                                | solution is           |  |  |  |
| complete w  | vith the gas and                                | l solvent in          | 3. Salts. No information given.        |  |  |
| contact at  | constant press                                  | sure.The total        |  |  |  |
| always 740  | of neon + water<br>) mmHg during th             | vapor was             |  |  |  |
| The auth  | ors assume idea                                 | al gas                | 1                                      |  |  |
| pehavior a  | and that Henry's                                | alaw is               |  |  |  |
| obeyed to convert the experimentally<br>measured Ostwald coefficient to the                                     |   | ESTIMATED ERROR:      |  |  |  |
| inverse of  | Henry's consta                                  | int.                  |  | $5x_1/x_1 = 0.0035$  |  |
| See the   | last page of th                                 | e compilation         |  |  |  |
| or data f   | rom this paper                                  | for the               |  |  |  |
| one molal   | 'values of k <sub>s</sub> a<br>electrolyte co   | na K <sub>sX</sub> at | REFERENCES:                            | D, A.K.; Borina, A.F.  |  |
|   |   | meentration.          | Zh. Strukt.                            | . Khim. 1971, 12, 964.   |  |
|   |   |                       | 2. Borina, A.I                         | F.; Lyashchenko, A.K.  |  |
|   |   |                       | Zh. Fiz. Kl                            | him. 1971, 45, 1316.   |  |
|   |   |                       | 3. Ben-Naim, 7<br>Trans, Fara          | A.; Baer, S.<br>aday <u>Soc</u> . 1963, <u>59</u> ,2735.                             |  |
|   |   |                       | rate                                   | <u></u>  |  |
|   |   |                       | 1                                      |  |  |

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| COMPONENTS:                           | - <u></u>                             |                                | ORIGINAL MEASUR                 | EMENTS:                                |
|---------------------------------------|---------------------------------------|--------------------------------|---------------------------------|--|
| 1. Neon; Ne; 7440-01-9                |                                       | Borina, A.F.; Samoilov, O. Ya. |                                 |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5 |                                       | Zh. Strukt. Khi                | m. 1974, <u>15</u> , 395 - 402. |  |
|                                       | -                                     |                                | Continued from                  | previous page.                         |
| 3. Alkali H                           | alides                                |                                | 001121111011 12011              | previous pager                         |
| T/K                                   |                                       | $x_1 \times 10^9$              | $x_{1} \times 10^{4}$           | Setschenow Salt<br>Parameter           |
|                                       | $\frac{\text{mol } kg^{-1} H_2 O}{2}$ |                                | at l atm                        | $k_{\rm S} = (1/m) \log (X^{\rm O}/X)$ |
| 288.15                                | Iodide; LiI;<br>0                     | 103/7-51-2                     | 0.0966                          | _                                      |
| 208.15                                | 0.533                                 | 10.20                          | 0.0866<br>0.0775                | 0.0899                                 |
|                                       | 0.654                                 | 9.82                           | 0.0746                          | 0.0985                                 |
|                                       | 0.955<br>1.233                        | 9.18<br>8.80                   | 0.0698<br>0.0669                | 0.0981<br>0.0909                       |
|                                       | 2.358                                 | 7.11                           | 0.0540                          | 0.0868                                 |
| 293.15                                | 0                                     | 10.98                          |                                 | _                                      |
|                                       | 1.083                                 | 8.78                           | 0.0667                          | 0.0897                                 |
|                                       | 1.346                                 | 8.19                           | 0.0622                          | 0.0946                                 |
|                                       | 1.701<br>2.350                        | 7.77<br>7.23                   | 0.0591<br>0.0550                | 0.0883<br>0.0772                       |
| 298.15                                | 0                                     | 10.58                          | 0.0330                          | -                                      |
| 298.15                                | 0.433                                 | 9.72                           | 0.0739                          | 0.0850                                 |
|                                       | 0.433                                 | 9.67                           | 0.0735                          | 0.0902                                 |
|                                       | 0.695                                 | 9.31                           | 0.0708                          | 0.0799                                 |
|                                       | 1.020<br>2.330                        | 8.84<br>7.20                   | 0.0672<br>0.0547                | 0.0765<br>0.0717                       |
| Sodium                                | Chloride; NaCl;                       |                                | 0.0347                          | 0.0717                                 |
| 288.15                                | 0                                     | 11.39                          | 0.0866                          | _                                      |
| 200.15                                | 0.349                                 | 10.28                          | 0.0781                          | 0.1276                                 |
|                                       | 0.715                                 | 9.33                           | 0.0709                          | 0.1211                                 |
|                                       | 1.952                                 | 6.67                           | 0.0507                          | 0.1190<br>0.1183                       |
|                                       | 2.341<br>4.377                        | 6.02<br>3.75                   | 0.0458<br>0.0285                | 0.1102                                 |
| 293.15                                | 0                                     | 10.98                          |                                 | _                                      |
|                                       | 0.248                                 | 10.31                          | 0.0784                          | 0.1103                                 |
|                                       | 0.658                                 | 9.20                           | 0.0699                          | 0.1167                                 |
|                                       | 1.065<br>1.701                        | 8.47<br>6.93                   | 0.0644<br>0.0527                | 0.1058<br>0.1175                       |
|                                       | 2.188                                 | 6.32                           | 0.0480                          | 0.1096                                 |
| 298.15                                | 0                                     | 10.58                          | 0.0804                          | -                                      |
|                                       | 0.530                                 | 9.37                           | 0.0712                          | 0.0995                                 |
|                                       | 0.590                                 | 9.19                           | 0.0698                          | 0.1036<br>0.1030                       |
|                                       | 1.075<br>1.465                        | 8.20<br>7.28                   | 0.0623<br>0.0553                | 0.1108                                 |
|                                       | 2.070                                 | 6.40                           | 0.0486                          | 0.1055                                 |
|                                       | 3.070                                 | 5.27                           | 0.0401                          | 0.0986                                 |
| 303.15                                | 0                                     | 10.54                          | 0.0801                          | -                                      |
|                                       | 1.184<br>1.616                        | 7.68<br>7.14                   | 0.0584<br>0.0543                | 0.1161<br>0.1047                       |
|                                       | 2.519                                 | 5.79                           | 0.0343                          | 0.1032                                 |
|                                       | 2.824                                 | 5.29                           | 0.0402                          | 0.1060                                 |
| Sodium                                | Iodide; NaI;                          | 7681-82-5                      |                                 |  |
| 288.15                                | 0                                     | 11.39                          | 0.0866                          | -                                      |
|                                       | 0.578                                 | 9.51<br>9.36                   | 0.0723<br>0.0711                | 0.1355<br>0.1280                       |
|                                       | 0.666<br>1.117                        | 9.36                           | 0.0630                          | 0.1235                                 |
|                                       | 2.430                                 | 5.98                           | 0.0455                          | 0.1152                                 |
|                                       | 2.879                                 | 5.24                           | 0.0398                          | 0.1171                                 |
| 293.15                                | 0                                     | 10.98                          | 0.08345                         | -                                      |
|                                       | 0.327                                 | 10.12<br>9.52                  | 0.0769<br>0.0724                | 0.1083<br>0.0952                       |
|                                       | 0.651<br>1.038                        | 9.52                           | 0.0641                          | 0.1101                                 |
|                                       | 1.550                                 | 7.62                           | 0.0579                          | 0.1024                                 |
|                                       | 2.023                                 | 6.78                           | 0.0515                          | 0.1035                                 |
| Table co                              | ntinued on next                       | t page.                        |                                 |  |

| COMPONENTS:                           |                                       |                                | ORIGINAL MEASUREMENTS:                  |   |  |
|---------------------------------------|---------------------------------------|--------------------------------|---|---|--|
| l. Neon; Ne; 7440-01-9                |                                       | Borina, A.F.; Samoilov, O. Ya. |   |   |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5 |                                       | Zh. Strukt. Khi                | <u>im</u> . 1974, <u>15</u> , 395 - 402 |   |  |
| 3. Alkali H                           | Halides                               |                                | Continued from                          | previous page.                          |  |
| т/к                                   |                                       | 0                              |   | Setschenow Salt                         |  |
|                                       | mol kg <sup>-1</sup> H <sub>2</sub> O | at 1 mmHg                      | $X_1 \times 10^4$ at 1 atm              | Parameter<br>$k_s = (1/m) \log (X^O/X)$ |  |
| Sodium                                | Iodide; NaI; 76                       |                                |   |   |  |
| 298.15                                | 0                                     | 10.58                          | 0.0804                                  | _                                       |  |
|                                       | 0.540                                 | 9.34                           | 0.0710                                  | 0.1003                                  |  |
|                                       | 0.890                                 | 8.61                           | 0.0654                                  | 0.1005                                  |  |
|                                       | 1.255                                 | 7.88                           |   | 0.1020                                  |  |
|                                       | 1.500<br>3.200                        | 7.53<br>5.14                   | 0.0572<br>0.0391                        | 0.0985<br>0.0980                        |  |
| Detago                                |                                       |                                |   | 0.0900                                  |  |
|                                       | ium Chloride; KC                      |                                |   |   |  |
| 288.15                                | 0 535                                 | 11.39                          | 0.0866                                  | - 1091                                  |  |
|                                       | 0.535<br>1.010                        | 9.97<br>8.73                   | 0.0758<br>0.0664                        | 0.1091<br>0.1144                        |  |
|                                       | 1.556                                 | 7.89                           | 0.0600                                  | 0.1025                                  |  |
|                                       | 2.300                                 | 6.47                           | 0.0492                                  | 0.1068                                  |  |
|                                       | 2.934                                 | 5.71                           | 0.0434                                  | 0.1022                                  |  |
|                                       | 3.369                                 | 5.44                           | 0.0413                                  | 0.0953                                  |  |
| 290.65                                | 0                                     | 11.19                          | 0.0850                                  | -                                       |  |
|                                       | 1.234<br>2.227                        | 8.22<br>6.71                   | 0.0625<br>0.0510                        | 0.1085<br>0.0997                        |  |
|                                       | 3.031                                 | 5.72                           | 0.0435                                  | 0.0962                                  |  |
| 293.15                                |                                       | 10.98                          | 0.08345                                 | -                                       |  |
|                                       | 0.122                                 | 10.57                          | 0.0803                                  | 0.1355                                  |  |
|                                       | 0.225                                 | 10.33                          | 0.0785                                  | 0.1178                                  |  |
|                                       | 0.439                                 | 9.79                           | 0.0744                                  | 0.1135                                  |  |
|                                       | 0.915                                 | 8.80                           | 0.0669                                  | 0.1050<br>0.1004                        |  |
|                                       | 1.892<br>3.485                        | 7.09<br>5.25                   | 0.0539<br>0.0399                        | 0.0919                                  |  |
| 295.65                                | 0                                     | 10.78                          | 0.0819                                  | -                                       |  |
| 295.05                                | 1.255                                 | 8.06                           | 0.0613                                  | 0.1006                                  |  |
|                                       | 1.971                                 | 6.96                           | 0.0529                                  | 0.0964                                  |  |
|                                       | 2.430                                 | 6.26                           | 0.0476                                  | 0.0971                                  |  |
| 298.15                                |                                       | 10.58                          | 0.0804                                  | -                                       |  |
|                                       | 0.500                                 | 9.57                           | 0.0727                                  | 0.0871                                  |  |
|                                       | 0.965<br>1.455                        | 8.71<br>7.82                   | 0.0662<br>0.0594                        | 0.0875<br>0.0902                        |  |
|                                       | 1.865                                 | 7.17                           | 0.0545                                  | 0.0906                                  |  |
|                                       | 3.182                                 | 5.58                           | 0.0424                                  | 0.0873                                  |  |
|                                       | 4.051                                 | 4.77                           | 0.0363                                  | 0.0854                                  |  |
| Potass                                | ium Iodide; KI;                       | 7681-11-0                      |   |   |  |
| 288.15                                | 0                                     | 11.39                          | 0.0866                                  | -                                       |  |
|                                       | 0.573                                 | 9.66                           | 0.0734                                  | 0.1249                                  |  |
|                                       | 0.981                                 | 8.77                           | 0.0667                                  | 0.1157                                  |  |
|                                       | 1.870<br>2.828                        | 7.27<br>5.67                   | 0.0553<br>0.0431                        | 0.1043<br>0.1071                        |  |
| 290.65                                | 0                                     | 11.19                          | 0.0850                                  |   |  |
| 290.05                                | 1.630                                 | 7.62                           | 0.0579                                  | 0.1024                                  |  |
|                                       | 2.350                                 | 6.52                           | 0.0496                                  | 0.0998                                  |  |
|                                       | 3.200                                 | 5.58                           | 0.0424                                  | 0.0944                                  |  |
| 293.15                                | 0                                     | 10.98                          | 0.08345                                 | -                                       |  |
|                                       | 0.398                                 | 9.93                           | 0.0755                                  | 0.1097                                  |  |
|                                       | 0.763                                 | 9.30                           | 0.0707                                  | 0.0945                                  |  |
|                                       | 1.534                                 | 7.93                           | 0.0603                                  | 0.0921                                  |  |

Table continued on next page.

| COMPONENTS:  |  |   |  |  |   |  |  |
|--|--|---|--|--|---|--|--|
| 1. Neon; Ne; 7440-01-9   |  |   |  | Bori   | Borina, A.F.; Samoilov, O.Ya.   |  |  |
| 2. Water; H <sub>2</sub> O;7732-18-5                                 |  |   |  | $\underline{\mathbf{Zh}}$ .  | Zh. Strukt. Khim. 1974, 15, 395 - 402   |  |  |
| 3. Alkali Halides  |  |   |  | Cont   | inued from p  | previous page.   |  |
| т/к  | Alkali   | Halide  | Mol Fract  | jon M  | ol Fraction $X_1 \times 10^4$   | Setschenow Salt<br>Parameter   |  |
|  | mol kg <sup></sup>   | 1 н <sub>2</sub> о  | at 1 mmH   |  | at 1 atm  | $k_s = (1/m) \log (X^O/X)$   |  |
| Potass   | ium Iodid  | e; KI;  | 7681-11-0  | (conti   | nued)   |  |  |
| 295.65   |  |   | 10.78  |  | 0.0819  | -  |  |
|  | 1.25<br>1.77   | 2<br>7  | 8.02<br>7.37   |  | 0.0610<br>0.0560  | 0.1026<br>0.0929   |  |
|  | 2.88   | 7   | 5.99   |  | 0.0455  | 0.0884   |  |
| 298.15   | 0.55   | 5   | 10.58<br>9.43  |  | 0.0804<br>0.0717  | 0.0900   |  |
|  | 0.84   |   | 8.74<br>7.53   |  | 0.0664<br>0.0572  | 0.0982<br>0.0968   |  |
|  | 1.90   |   | 7.02   |  | 0.0534  | 0.0938   |  |
|  | 3.27   |   | 5.55   |  | 0.0422  | 0.0857   |  |
|  |  |   |  |  |   |  |  |
| Solution<br>Ne + H <sub>2</sub> O<br>+ salt                          | т/к  | Equation k <sub>s</sub> =   | n Paramete:<br>a + b m   | c<br>]   | one molal e:<br>Ka =  | $k_{ev}$ =   |  |
| Ne + $H_2O$  | т/к  | Equation<br>k <sub>s</sub> =  | n Paramete:<br>a + b m   | c<br>]   | one molal e:<br>Ka =  |  |  |
| Ne + $H_2O$  | 288.15   | k <sub>s</sub> =  | a + b m<br>- 0.00375   |  | one molal e:<br>(s =<br>(1/m)log(S <sup>O</sup> ,<br>0.123  | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131   |  |
| Ne + $H_2O$<br>+ salt  | 288.15<br>293.15   | k <sub>s</sub> =<br>0.1265<br>0.1118  | a + b m<br>- 0.00375<br>+ 0.0001   |  | one molal e:<br>(s =<br>(1/m) log(S <sup>O</sup> ,<br>0.123<br>0.112  | lectrolyte   |  |
| Ne + $H_2O$<br>+ salt  | 288.15<br>293.15<br>298.15   | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076  | a + b m<br>- 0.00375   |  | one molal e:<br>(s =<br>(1/m)log(S <sup>O</sup> ,<br>0.123  | lectrolyte<br>$k_{SX} = (1/m) \log (x^{O}/x)$<br>0.131   |  |
| Ne + $H_2O$<br>+ salt  | 288.15<br>293.15<br>298.15<br>303.15<br>288.15   | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303  | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.0053  |  | one molal e:<br>(1/m)log(S <sup>O</sup> ,<br>0.123<br>0.112<br>0.106  | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113   |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl                              | 288.15<br>293.15<br>298.15<br>303.15<br>288.15   | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val   | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045  | m<br>m<br>m<br>m<br>m<br>8 m)  | one molal e:<br>(1/m)log(S <sup>O</sup> ,<br>0.123<br>0.112<br>0.106<br>0.104   | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112  |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl                              | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>(omit  | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045   | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.0053<br>ue at 0.57  | m<br>m<br>m<br>m<br>m<br>8 m)<br>m   | <pre>cne molal e:<br/>cs =<br/>(1/m) log(S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250</pre>  | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133   |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl                              | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>(omit<br>293.15<br>298.15<br>288.15  | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858   | a + b m<br>- 0.00375<br>+ 0.0001 m<br>- 0.0020 m<br>+ 0.00045<br>- 0.0053 m<br>ue at 0.57<br>- 0.0005 m<br>- 0.00011 m<br>- 0.00075  | m<br>m<br>m<br>m<br>m<br>m<br>8 m)<br>m<br>m<br>m  | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851</pre>   | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928   |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI                       | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>(omit<br>293.15<br>298.15<br>288.15<br>293.15  | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826   | a + b m<br>- 0.00375<br>+ 0.0001 m<br>- 0.0020 m<br>+ 0.00045<br>- 0.0053 m<br>ue at 0.57<br>- 0.0001 m<br>- 0.00011 m<br>- 0.00075<br>- 0.0022 m  | <br>m<br>m<br>m<br>m<br>m<br>8 m)<br>m<br>m<br>m<br>m  | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804</pre>  | lectrolyte<br>$k_{SX} = (1/m) \log (X^{0}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881   |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI                       | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>(omit<br>293.15<br>298.15<br>288.15<br>293.15<br>298.15  | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774   | a + b m<br>- 0.00375<br>+ 0.0001 m<br>- 0.0020 m<br>+ 0.00045<br>- 0.0053 m<br>ue at 0.57<br>- 0.0005 m<br>- 0.00011 m<br>- 0.00075  | <br>m<br>m<br>m<br>m<br>8 m)<br>m<br>m<br>m<br>m<br>m  | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765</pre>   | lectrolyte<br>$k_{SX} = (1/m) \log (x^{O}/x)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928   |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI                       | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>(omit<br>293.15<br>298.15<br>298.15<br>298.15<br>(omit<br>288.15   | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979   | - 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.0053<br>ue at 0.57<br>- 0.0005<br>- 0.00011<br>- 0.00075<br>- 0.0022<br>- 0.0009<br>value at 0<br>- 0.00445  | m<br>m<br>m<br>m<br>8 m)<br>m<br>m<br>.330 m<br>m  | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934</pre>  | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101  |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl               | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>(omit<br>293.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15  | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979<br>0.1021   | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.0053<br>ue at 0.57<br>- 0.00053<br>- 0.00053<br>- 0.00011<br>- 0.00075<br>- 0.00022<br>- 0.0009 f<br>value at 0<br>- 0.00445<br>- 0.0099 f  | m<br>m<br>m<br>m<br>m<br>m<br>8 m)<br>m<br>m<br>.330 m   | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922</pre>   | lectrolyte<br>$k_{SX} =$<br>$(1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842  |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl               | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>(omit<br>293.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15  | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979<br>0.1021<br>ted k <sub>s</sub>   | - 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.0053<br>ue at 0.57<br>- 0.0005<br>- 0.00011<br>- 0.00075<br>- 0.0022<br>- 0.0009<br>value at 0<br>- 0.00445  | m<br>m<br>m<br>m<br>m<br>m<br>8 m)<br>m<br>m<br>.330 m<br>.330 m   | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922</pre>   | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101  |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl               | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>(omit<br>293.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>(omit<br>288.15<br>293.15<br>(omit  | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979<br>0.1021<br>ted k <sub>s</sub><br>0.0884<br>0.0884   | a + b m<br>- 0.00375<br>+ 0.0001 f<br>- 0.0020 f<br>+ 0.00045<br>- 0.0053 f<br>ue at 0.57<br>- 0.00055<br>- 0.0001 f<br>- 0.0001 f<br>- 0.0009 f<br>value at 0<br>- 0.0009 f<br>value at 1<br>- 0.0078 f<br>- 0.0078 f<br>- 0.0078 f<br>- 0.0048 f<br>- 0.0048 f   | m<br>m<br>m<br>m<br>m<br>m<br>m<br>.330 m<br>.330 m<br>m<br>.346 m<br>m<br>m   | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922<br/>)<br/>0.0806<br/>0.1096</pre>   | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101<br>0.100<br>0.088<br>0.117   |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl<br>LiI        | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15   | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979<br>0.1021<br>ted k <sub>s</sub><br>0.0884<br>0.0884<br>0.1144<br>0.1164   | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.0053<br>ue at 0.57<br>- 0.0005<br>- 0.0005<br>- 0.00011<br>- 0.00075<br>- 0.00025<br>- 0.00025<br>- 0.00095<br>value at 0<br>- 0.00095<br>value at 0<br>- 0.00095<br>- 0.0005<br>- 0.0005        | m<br>m<br>m<br>8 m)<br>m<br>330 m<br>.346 m<br>m<br>m<br>m<br>m  | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922<br/>)<br/>0.0806<br/>0.1096<br/>0.1095</pre>  | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101<br>0.100<br>0.088<br>0.117<br>0.117  |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl<br>LiI        | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>298.15<br>293.15<br>293.15<br>298.15<br>293.15   | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979<br>0.1021<br>ted k <sub>s</sub><br>0.0884<br>0.1144<br>0.1160<br>ted k <sub>s</sub>   | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.0053<br>ue at 0.57<br>- 0.00053<br>- 0.00053<br>- 0.00011<br>- 0.00075<br>- 0.0009<br>value at 0<br>- 0.0009<br>value at 1<br>- 0.0078<br>- 0.0078<br>- 0.0069<br>- 0.0069<br>- 0.0074<br>- 0.0075<br>- 0.0075<br>- 0.0075<br>- 0.0075<br>- 0.0075<br>- 0.0009<br>- 0.0075<br>- 0.0075<br>- 0.0075<br>- 0.0009<br>- 0.0075<br>- 0.0075<br>- 0.0075<br>- 0.0009<br>- 0.0075<br>- 0.0077<br>- 0.0 | m<br>m<br>m<br>m<br>8 m)<br>m<br>m<br>.330 m<br>.330 m<br>m<br>m<br>.346 m<br>m<br>m<br>.346 m<br>m<br>m<br>.326 m   | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922<br/>)<br/>0.0806<br/>0.1096<br/>0.1095<br/>0.1086<br/>)</pre>   | lectrolyte<br>$k_{SX} = \frac{(1/m) \log (X^{0}/X)}{(1/m) \log (X^{0}/X)}$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101<br>0.100<br>0.088<br>0.117<br>0.117<br>0.116                                      |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl<br>LiI        | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>(omit<br>298.15<br>293.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>(omit<br>298.15             | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted ks<br>0.0979<br>0.1021<br>ted ks<br>0.0884<br>0.1144<br>0.1160<br>ted ks<br>0.1041   | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.00053<br>ue at 0.57<br>- 0.00053<br>ue at 0.57<br>- 0.00011<br>- 0.00075<br>- 0.0009 p<br>value at 0<br>- 0.00445<br>- 0.0099 p<br>value at 1<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0048 p<br>- 0.0069 p<br>value at 0<br>- 0.0074 p<br>- 0.0078 p<br>- 0.0074 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078   | m<br>m<br>m<br>m<br>m<br>m<br>m<br>.330 m<br>m<br>.330 m<br>m<br>m<br>.346 m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922<br/>)<br/>0.0806<br/>0.1096<br/>0.1095<br/>0.1086<br/>)<br/>0.1009</pre>  | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101<br>0.100<br>0.088<br>0.117<br>0.117  |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl<br>LII<br>KCl | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>(omit<br>298.15<br>298.15<br>288.15<br>293.15<br>288.15<br>293.15<br>(omit<br>298.15<br>293.15<br>(omit<br>295.65<br>298.15                                  | k <sub>s</sub> =<br>0.1265<br>0.118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979<br>0.1021<br>ted k <sub>s</sub><br>0.0884<br>0.1164<br>0.1164<br>0.1164<br>0.0893  | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.0020<br>+ 0.00045<br>- 0.00053<br>- 0.00053<br>- 0.00053<br>- 0.00011<br>- 0.00022<br>- 0.00095<br>- 0.00095<br>value at 0<br>- 0.00445<br>- 0.0099<br>value at 1<br>- 0.00485<br>- 0.00785<br>- 0.00785<br>- 0.00745<br>- 0.00745<br>- 0.00745<br>- 0.00745<br>- 0.00745<br>- 0.00745<br>- 0.00745<br>- 0.00745<br>- 0.00745<br>- 0.000745<br>- 0.00075<br>- 0.000   | m<br>m<br>m<br>m<br>m<br>m<br>m<br>.330 m<br>.330 m<br>.330 m<br>.346 m<br>m<br>.122 m<br>m<br>m   | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922<br/>)<br/>0.0806<br/>0.1096<br/>0.1095<br/>0.1086<br/>)<br/>0.1009<br/>0.0887</pre>   | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101<br>0.100<br>0.088<br>0.117<br>0.116<br>0.109<br>0.0964                                       |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl<br>LiI        | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>(omit<br>298.15<br>293.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>(omit<br>298.15             | k <sub>s</sub> =<br>0.1265<br>0.118<br>0.1076<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979<br>0.1021<br>ted k <sub>s</sub><br>0.0884<br>0.1164<br>0.1164<br>0.1164<br>0.0893<br>0.1252  | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.00053<br>ue at 0.57<br>- 0.00053<br>ue at 0.57<br>- 0.00011<br>- 0.00075<br>- 0.0009 p<br>value at 0<br>- 0.00445<br>- 0.0099 p<br>value at 1<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0048 p<br>- 0.0069 p<br>value at 0<br>- 0.0074 p<br>- 0.0078 p<br>- 0.0074 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078 p<br>- 0.0078   | m<br>m<br>m<br>m<br>m<br>m<br>m<br>.330 m<br>.330 m<br>m<br>.346 m<br>m<br>.122 m<br>m<br>m<br>m<br>m<br>m<br>m<br>m   | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922<br/>)<br/>0.0806<br/>0.1096<br/>0.1095<br/>0.1086<br/>)<br/>0.1009</pre>  | lectrolyte<br>$k_{SX} = \frac{(1/m) \log (X^{0}/X)}{(1/m) \log (X^{0}/X)}$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101<br>0.100<br>0.088<br>0.117<br>0.117<br>0.116<br>0.109           |  |
| Ne + H <sub>2</sub> O<br>+ salt<br>NaCl<br>NaI<br>LiCl<br>LiI<br>KCl | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>293.15<br>(omit<br>298.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15<br>293.15            | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0826<br>0.0774<br>ted k <sub>s</sub><br>0.0979<br>0.1021<br>ted k <sub>s</sub><br>0.0884<br>0.1144<br>0.1160<br>ted k <sub>s</sub><br>0.1041<br>0.0893<br>0.1252<br>0.1122<br>0.1053                       | - 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.00045<br>- 0.0053<br>ue at 0.57<br>- 0.0005<br>- 0.00011<br>- 0.0005<br>- 0.00011<br>- 0.00075<br>- 0.0022<br>- 0.0009<br>value at 0<br>- 0.0009<br>value at 1<br>- 0.0078<br>- 0.0078<br>- 0.0078<br>- 0.0078<br>- 0.0078<br>- 0.00063   | m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>.330 m<br>.346 m<br>m<br>m<br>.122 m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>m                                    | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.103<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922<br/>)<br/>0.0806<br/>0.1096<br/>0.1095<br/>0.1086<br/>)<br/>0.1009<br/>0.0887<br/>0.1174<br/>0.0991</pre>                        | lectrolyte<br>$k_{SX} = \frac{(1/m) \log (X^{O}/X)}{(1/m) \log (X^{O}/X)}$<br>0.131<br>0.120<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101<br>0.100<br>0.088<br>0.117<br>0.116<br>0.109<br>0.0964<br>0.125<br>0.114<br>0.107 |  |
| + salt<br>NaCl<br>NaI<br>LiCl<br>LII<br>KCl                          | 288.15<br>293.15<br>298.15<br>303.15<br>288.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>293.15<br>298.15<br>298.15<br>298.15<br>298.15<br>288.15<br>293.15<br>293.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15<br>298.15 | k <sub>s</sub> =<br>0.1265<br>0.1118<br>0.1076<br>0.1036<br>0.1036<br>0.1303<br>ted val<br>0.1045<br>0.1014<br>0.0858<br>0.0979<br>0.1021<br>ted k <sub>s</sub><br>0.0979<br>0.1021<br>ted k <sub>s</sub><br>0.0884<br>0.1144<br>0.1160<br>ted k <sub>s</sub><br>0.1041<br>0.0893<br>0.1252<br>0.1053<br>0.1001<br>ted k <sub>s</sub> | a + b m<br>- 0.00375<br>+ 0.0001<br>- 0.0020<br>+ 0.0020<br>+ 0.00045<br>- 0.00053<br>- 0.00053<br>- 0.00075<br>- 0.00022<br>- 0.00099<br>value at 0<br>- 0.00445<br>- 0.0099<br>value at 1<br>- 0.0048<br>- 0.0078<br>- 0.0032<br>- 0.0006<br>- 0.0006<br>- 0.0078<br>- 0.0051  | m<br>m<br>m<br>m<br>m<br>m<br>m<br>m<br>.330 m<br>m<br>.330 m<br>m<br>m<br>.336 m<br>m<br>m<br>.122 m<br>m<br>m<br>m<br>.252 m   | <pre>cne molal e:<br/>(1/m) log (S<sup>O</sup>,<br/>0.123<br/>0.112<br/>0.106<br/>0.104<br/>0.1250<br/>0.1040<br/>0.1003<br/>0.0851<br/>0.0804<br/>0.0765<br/>)<br/>0.0934<br/>0.0922<br/>)<br/>0.0806<br/>0.1096<br/>0.1095<br/>0.1086<br/>)<br/>0.1009<br/>0.0887<br/>0.1174<br/>0.1061<br/>0.0991<br/>0.0960</pre> | lectrolyte<br>$k_{SX} = (1/m) \log (X^{O}/X)$<br>0.131<br>0.120<br>0.113<br>0.112<br>0.133<br>0.112<br>0.133<br>0.112<br>0.108<br>0.0928<br>0.0881<br>0.0842<br>0.101<br>0.100<br>0.088<br>0.117<br>0.117<br>0.116<br>0.109<br>0.0964<br>0.125<br>0.114            |  |

| COMPONENTS:   |  | OPICINAL MELOW  | ENENDO -  |  |
|---|--|---|---|--|
|   |  | ORIGINAL MEASUREMENTS:  |   |  |
| 1. Neon; Ne; 7440-01-9  |  | LIESTOV, G.A  | .; Patsatsiya, K.M.   |  |
| 2. Water; H <sub>2</sub> O; 7732-18-5   |  |   |   |  |
| 3. Methanol (Methyl Alcoho<br>67-56-1   | ol); CH <sub>4</sub> O;  | <u>Zh. Fiz. Khim. 1971, 45, 1768 - 1770.</u><br><u>Russ. J. Phys. Chem. (Engl. Transl.)</u><br>1971, 45, 1000 - 1001. |   |  |
| VARIABLES:  |  | PREPARED BY:  | ·····   |  |
| T/K: 283.15 - 313.<br>Total P/kPa: 101.325 ()   | 15<br>1 atm)   | P.  | . L. Long   |  |
|   | l Fraction<br>thanol<br>X <sub>3</sub>   | Bunsen<br>Coefficient<br>at 1 atm<br>Total<br>Pressure<br>$\alpha \times 10^2$  | Bunsen<br>Coefficient<br>at 1 atm Ne<br>Pressure<br>$\alpha \times 10^2$  |  |
| 283.15  | 0.00<br>0.05<br>0.10<br>0.20<br>0.40<br>0.60<br>0.80   | 1.092<br>1.162<br>1.118<br>1.074<br>1.360<br>2.000<br>2.778   | 1.105<br>1.190<br>1.138<br>1.100<br>1.409<br>2.086<br>2.920   |  |
| 293.15  | 0.00<br>0.05<br>0.10<br>0.20<br>0.40<br>0.60<br>0.80   | 1.045<br>1.100<br>1.084<br>1.075<br>1.377<br>2.035<br>2.812   | 1.085<br>1.132<br>1.124<br>1.127<br>1.470<br>2.205<br>3.085   |  |
| 303.15  | 0.00<br>0.05<br>0.10<br>0.20<br>0.40<br>0.60<br>0.80   | 1.002<br>1.050<br>1.048<br>1.075<br>1.406<br>2.074<br>2.850   | 1.044<br>1.110<br>1.125<br>1.170<br>1.582<br>2.395<br>3.410   |  |
| <u>Continued on</u>   |  | THEODUCATION  | ·····   |  |
|   | AUXILIARY  | INFORMATION   |   |  |
| METHOD:<br>The apparatus (1) is a m<br>of the apparatus of Ben-Na<br>(2). Modifications include<br>a larger water thermostat,<br>dition of an attached dega<br>device, and a bubbler to p<br>the gas with solvent vapor   | im and Baer<br>the use of<br>the ad-<br>ssing<br>resaturate  | No informat:  | ITY OF MATERIALS:   |  |
| The authors label their<br>values as Ostwald coeffici<br>However, comparison of the<br>with the results of other<br>for water, and the careful<br>of other papers from the I<br>Laboratory convince the Ev<br>that the solubility values<br>coefficients measured at a<br>pressure of gas + solvent<br>pressure of one atm.<br>The authors do not quote<br>ence for the vapor pressur<br>water + methanol mixtures.<br>could not check the conver<br>the Bunsen coefficent from<br>pressure of one atm to one | ents, $\gamma^{0}$ .<br>ir results<br>authors<br>reading<br>vanovo<br>aluator<br>are Bunsen<br>total<br>vapor<br>a refer-<br>e of the<br>Thus we<br>sion of<br>a total | REFERENCES:<br>1. Patsatsiy<br><u>Zh. Fiz</u> .<br>2. Ben-Naim,   | <pre>R:<br/>δα/α = 0.01 (Compiler)<br/>a, K.M.; Krestov, G.A.<br/><u>Khim</u>. 1970, <u>44</u>, 1835.<br/>A.; Baer, S.<br/><u>raday Soc</u>. 1963, <u>59</u>, 2735.</pre> |  |

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| COMPONENTS:   | · · · · · · · · · · · · · · · · · · ·                | ORIGINAL MEAC   | IIDEMENTS .   |  |
|---|--|---|---|--|
| 1. Neon; Ne; 7440-01-                               | .9   | ORIGINAL MEASUREMENTS:<br>Krestov, G.A.; Patsatsiya, K.M.   |   |  |
| 2. Water; H <sub>2</sub> O; 7732-1                  |  |   | -   |  |
| 3. Methanol (Methyl A<br>67-56-1                    |  | Zh. Fiz. Khim. 1971, <u>45</u> , 1768-1770.<br>Russ. J. Phys. Chem. (Engl. Transl.)<br>1971, <u>45</u> , 1000-1001. |   |  |
| VARIABLES:<br>T/K: 283.15 -<br>Total P/kPa: 101.325 | · 313.15<br>(1 atm)                                  | PREPARED BY:<br>P.L. Long   |   |  |
| EXPERIMENTAL VALUES:                                |  |   |   |  |
| T/K   | Mol Fraction<br>Methanol<br>X <sub>3</sub>           | Coefficient<br>at 1 atm<br>Total<br>Pressure  | Bunsen<br>Coefficient<br>at 1 atm Ne<br>Pressure            |  |
|   |  | α x 10 <sup>2</sup>   | $\alpha \times 10^2$  |  |
| 313.15  | 0.00<br>0.05<br>0.10<br>0.20<br>0.40<br>0.60<br>0.80 | 0.942<br>0.995<br>1.017<br>1.077<br>1.438<br>2.122<br>2.895   | 1.011<br>1.088<br>1.177<br>1.244<br>1.737<br>2.650<br>3.743 |  |
|   | AUXILIAR   | INFORMATION   |   |  |
| METHOD:   |  |   | RITY OF MATERIALS:  |  |
| See preceding page.                                 |  | See precedi   | -   |  |
|   | <u> </u>   | ESTIMATED ERF   | ROR:  |  |
| APPARATUS/PROCEDURE:<br>See preceding page.         |  | See precedi   | ng page.  |  |
|   |  | REFERENCES:   |   |  |
|   |  | See precedi   | ng page.  |  |
|   |  |   |   |  |

|   |  | ORIGINAL.  | MEASUREMENTS :   |  |  |  |
|---|--|--|--|--|--|--|
| 7440-01-  | 9  | Krestov, G.A.; Patsatsiya, K.M.  |  |  |  |  |
|   |  |  |  |  |  |  |
| <pre>3. Ethanol (Ethyl Alcohol); C<sub>2</sub>H<sub>6</sub>O;<br/>64-17-5</pre>   |  |  | Izv. Vyssh. Uchebn. Zaved., Khim.<br>Khim Tekhnol. 1969, 12, 1333-1337.  |  |  |  |
|   |  | PREPARED   | BY:  |  |  |  |
| VARIABLES:<br>T/K: 283.15 - 313.15<br>Total P/kPa: 101.325 (1 atm)  |  |  | P. L. Long   |  |  |  |
| LUES:   |  |  | ······································   |  |  |  |
|   |  | T/K  | Mol Fraction<br>Ethanol<br>X3  | Bunsen<br>Coefficient<br>at 1 atm<br>Total<br>Pressure<br>$\alpha \times 10^2$   |  |  |
| 0.00<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00  | 1.092<br>1.140<br>1.138<br>1.113<br>1.072<br>1.043<br>1.021<br>1.076<br>1.195<br>1.334<br>1.476<br>1.630<br>1.791<br>1.950<br>2.282<br>2.624<br>2.984<br>3.355<br>3.726  | 293.15   | 0.00<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00   | 1.045<br>1.091<br>1.092<br>1.062<br>1.029<br>1.008<br>1.027<br>1.074<br>1.216<br>1.362<br>1.507<br>1.662<br>1.826<br>1.994<br>2.335<br>2.675<br>3.035<br>3.402<br>3.772  |  |  |
| <u> </u>  | AUXILIARY  | INFORMATI  | ON   |  |  |  |
| ·   |  | SOURCE A   | ND PURITY OF MATE  | RIALS:   |  |  |
| atus of Be<br>ifications<br>ger water<br>a degassin<br>resaturate   | en-Naim and Baer<br>s include the<br>thermostat, the<br>ng device, and a   |  |  |  |  |  |
| solvent vapor.<br>The authors label their solubility<br>values as Ostwald coefficients, $\gamma^0$ .<br>However, comparison of their results<br>with the results of other workers for<br>water and ethanol, and the careful<br>reading of other papers from the<br>Ivanovo Laboratory convince the<br>Evaluator that the solubility values<br>are Bunsen coefficients measured at a<br>total pressure of gas + solvent vapor<br>pressure of one atm. A knowledge of<br>the solvent vapor pressure is required<br>to convert the above solubility<br>values to Bunsen coefficents at one<br>atm Ne pressure. |  |  | δα/α =<br>ES:<br>atsiya, K.M.;<br>rt on the Seco<br>erence on Theo<br>-Ata, 1968.<br>Naim, A.; Baer  | ond All-Union<br>ory of Solution,"   |  |  |
|   | C; 7732-1<br>(Ethyl Al<br>(Ethyl Al<br>2: 283.15<br>a: 101.32<br>(UUES:<br>Fraction<br>nol<br>3<br>0.00<br>0.02<br>0.04<br>0.06<br>0.02<br>0.04<br>0.06<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.35<br>0.40<br>0.45<br>0.50<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00<br>(Complete the second<br>complete | $\frac{1}{2} \cdot 283.15 - 313.15$ a: 101.325 (1 atm)<br>LUES:<br>Fraction Bunsen<br>nol Coefficient<br>3 at 1 atm<br>Total<br>Pressure<br>a x 10 <sup>2</sup><br>0.00 1.092<br>0.02 1.140<br>0.00 1.092<br>0.02 1.140<br>0.04 1.138<br>0.06 1.113<br>0.08 1.072<br>0.10 1.043<br>0.15 1.021<br>0.20 1.076<br>0.25 1.195<br>0.30 1.334<br>0.35 1.476<br>0.40 1.630<br>0.45 1.791<br>0.50 1.950<br>0.60 2.282<br>0.70 2.624<br>0.80 2.984<br>0.90 3.355<br>1.00 3.726<br>AUXILIARY<br>tus (1) is a modification<br>atus of Ben-Naim and Baer<br>ifications include the<br>ger water thermostat, the<br>a degassing device, and a<br>resaturate the gas with<br>r.<br>s label their solubility<br>twald coefficients, $\gamma^{0}$ .<br>parison of their results<br>ults of other workers for<br>hanol, and the careful<br>ther papers from the<br>ratory convince the<br>at the solubility values<br>oefficients measured at a<br>re of gas + solvent vapor<br>one atm. A knowledge of<br>vapor pressure is required<br>he above solubility<br>nsen coefficents at one | 0; 7732-18-5<br>(Ethyl Alcohol); $C_{2}H_{6}O$ ; $Izv. Vy$<br>Khim Te<br>: 283.15 - 313.15<br>a: 101.325 (1 atm)<br>LUES:<br>Fraction Bunsen T/K<br>nol Coefficient<br>3 at 1 atm<br>Total<br>Pressure<br>a x 10 <sup>2</sup><br>0.00 1.092 293.15<br>0.02 1.140<br>0.04 1.138<br>0.06 1.113<br>0.08 1.072<br>0.10 1.043<br>0.15 1.021<br>0.20 1.076<br>0.25 1.195<br>0.30 1.334<br>0.35 1.476<br>0.40 1.630<br>0.45 1.791<br>0.50 1.950<br>0.60 2.282<br>0.70 2.624<br>0.70 2.624<br>0.80 2.984<br>0.90 3.355<br>1.00 3.726<br>AUXILIARY INFORMATI<br>AUXILIARY INFORMATI<br>AUXILIARY INFORMATI<br>S label their solubility<br>twald coefficients, $\gamma^{0}$ .<br>parison of their results<br>ults of other workers for<br>haol, and the careful<br>ther papers from the<br>ratory convince the<br>at the solubility values<br>oefficients measured at a<br>re of gas + solvent vapor<br>ne atm. A knowledge of<br>vapor pressure is required<br>1. Pats<br>"Repo<br>REFERENC<br>REFERENC<br>Conf<br>Alma | 0; 7732-18-5<br>(Ethyl Alcohol); $C_2H_6O$ ;<br>Izv. Vyssh. Uchebn. Z Khim Tekhnol. 1969, I $Khim Tekhnol. 1969, IPREPARED BY:PREPARED BY:P. L. LongPREPARED BY:TotalPressurea x 1020.00 1.092 293.15 0.000.02 1.140 0.020.04 1.138 0.040.06 1.113 0.060.08 1.072 0.080.10 1.043 0.100.15 1.021 0.150.25 1.195 0.250.30 1.334 0.300.35 1.476 0.350.40 1.630 0.400.45 1.791 0.450.50 2.282 0.600.70 2.624 0.700.60 2.282 0.600.70 2.624 0.700.60 2.984 0.800.90 3.355 0.901.00 3.726 1.00AUXILIARY INFORMATIONAUXILIARY INFORMATIONAUXILIARY INFORMATIONAUXILIARY INFORMATIONREFERENCES:TIMATED ERROR:\delta \alpha / \alpha =REFERENCES:REFERENCES:REFERENCES:REFERENCES:REFERENCES:REFERENCES:REFERENCES:REFERENCES:REFERENCES:REFERENCES:REFERENCES:AUXILIARY INFORMATIONAUXILIARY INFORMATIONREFERENCES:REFERENCES:AUXILIARY INFORMATIONREFERENCES:REFE$ |  |  |

|  |   | ORIGINAL ME  | ASUPEMENTS .   |   |  |  |
|--|---|--|--|---|--|--|
| 7440-01-9  |   | Krestov, G.A.; Patsatsiya, K.M.  |  |   |  |  |
| D; 7732-18-  | 5   |  |  |   |  |  |
| <ol> <li>Water; H<sub>2</sub>O; 7732-18-5</li> <li>Ethanol (Ethyl Alcohol); C<sub>2</sub>H<sub>6</sub>O;<br/>64-17-5</li> </ol>              |   |  | Izv. Vyssh. Uchebn. Zaved., Khim.<br>Khim Tekhnol. 1969, 12, 1333-1337.  |   |  |  |
| ARIABLES:<br>T/K: 283.15 - 313.15<br>otal P/kPa: 101.325 (1 atm)   |   | PREPARED BY  | •  |   |  |  |
|  |   | PREPARED BY:<br>P.L. Long  |  |   |  |  |
| ES:  |   | l  |  |   |  |  |
| l Fraction<br>hanol<br>X <sub>3</sub>  | Bunsen<br>Coefficient<br>at 1 atm<br>Total<br>Pressure<br>$\alpha \times 10^2$  | T/K  | Mol Fraction<br>Ethanol<br>X <sub>3</sub>  | Bunsen<br>Coefficient<br>at 1 atm<br>Total<br>Pressure<br>$\alpha \times 10^2$  |  |  |
| 0.00<br>0.02<br>0.04<br>0.06<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00 | 1.002<br>1.024<br>1.023<br>1.005<br>0.975<br>C.966<br>0.983<br>1.072<br>1.234<br>1.387<br>1.556<br>1.716<br>1.860<br>2.047<br>2.397<br>2.746<br>3.102<br>3.471<br>3.826   | 313.15   | 0.00<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00   | 0.942<br>0.950<br>0.946<br>0.935<br>0.924<br>0.923<br>0.968<br>1.070<br>1.252<br>1.440<br>1.593<br>1.762<br>1.933<br>2.109<br>2.466<br>2.823<br>3.161<br>3.544<br>3.906 |  |  |
|  | AUXILIARY   | INFORMATION  |  |   |  |  |
|  |   |  |  | AT C .  |  |  |
| 2200   |   |  |  | ALD;  |  |  |
| £~7~.  |   |  |  |   |  |  |
|  |   | ESTIMATED H  | ERROR:   |   |  |  |
| JRE:<br>page.  |   | See preceding page.  |  |   |  |  |
|  |   | REFERENCES   | :  |   |  |  |
|  |   | See prece  | ding page.   |   |  |  |
|  | D; 7732-18-<br>Ethyl Alcoho<br>283.15 - 3<br>101.325 (1<br>ES:<br>L Fraction<br>anol<br>X <sub>3</sub><br>0.00<br>0.02<br>0.04<br>0.06<br>0.08<br>0.10<br>0.15<br>0.20<br>0.25<br>0.30<br>0.35<br>0.40<br>0.45<br>0.50<br>0.60<br>0.70<br>0.80<br>0.90<br>1.00<br>Page. | D; 7732-18-5<br>Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O;<br>283.15 - 313.15<br>101.325 (1 atm)<br>ES:<br>I Fraction Bunsen<br>hanol Coefficient<br>X <sub>3</sub> at 1 atm<br>Total<br>Pressure<br>a x 10 <sup>2</sup><br>0.00 1.002<br>0.02 1.024<br>0.04 1.023<br>0.06 1.005<br>0.08 0.975<br>0.10 C.966<br>0.15 0.983<br>0.20 1.072<br>0.25 1.234<br>0.30 1.387<br>0.35 1.556<br>0.40 1.716<br>0.45 1.860<br>0.50 2.047<br>0.60 2.397<br>0.70 2.746<br>0.80 3.102<br>0.90 3.471<br>1.00 3.826<br>AUXILIARY<br>page. | 7440-01-9       Krestov,         D; 7732-18-5       Izv. Vyss         Sthyl Alcohol); C2H60;       Izv. Vyss         283.15 - 313.15       PREPARED BY         101.325 (1 atm)       PREPARED BY         ES:       Traction Bunsen to at 1 atm Total Pressure a x 102         0.00       1.002       313.15         0.00       1.002       313.15         0.00       1.002       313.15         0.00       1.023       313.15         0.00       1.023       313.15         0.00       1.023       313.15         0.00       1.024       313.15         0.01       0.983       30.20         0.10       0.983       30.20         0.10       0.983       30.20         0.30       1.387       35         0.30       1.870       3.826         AUXILLARY INFORMATION         Page.         AUXILLARY INFORMATION         See prece         See prece         REFERENCES | $\begin{array}{c c c c c c c c c c c c c c c c c c c $  |  |  |

| COMPONENTS :                                      |  | ORIGINAL MEASUREMENTS:   |
|---|--|--|
|   |  | Borina, A.F.   |
| 1. Neon; Ne; 7440-01-                             | 9  |  |
| 2. Water; H <sub>2</sub> O; 7732-1                | 8-5  |  |
| 3. Urea; $CH_4N_2O$ ((NH <sub>2</sub> )           | ) <sub>2</sub> CO); 57-13-6                      | <u>Zh. Fiz. Khim</u> . 1977, <u>51</u> , 138 - 142.<br><u>Russ</u> . J. <u>Phys</u> . <u>Chem</u> . 1977, <u>51</u> , 76-78. |
| VARIABLES:<br>T/K: 288.15 -                       | 303.15   | PREPARED BY:   |
| Total P/kPa: 98.659                               |  | H. L. Clever   |
| Urea/mol kg <sup>-1</sup> H <sub>2</sub> O: 0     | - 11   |  |
| EXPERIMENTAL VALUES:                              |  |  |
| T/K Urea<br>mol kg <sup>-1</sup> H <sub>2</sub> O | Mol Fraction N<br>$X_1 \times 10^9$<br>at 1 mmHg | Nol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup><br>at 1 atm   |
| 288.15 0  | 11.39  | 0.0866   |
| 0.603   | 10.80  | 0.0821   |
| 1.125   | 10.53<br>10.38                                   | 0.0800   |
| 1.200<br>1.850                                    | 10.38  | 0.0789<br>0.0772   |
| 2.120   | 9.82   | 0.0746   |
| 2.910   | 9.29   | 0.0706   |
| 4.810   | 8.45   | 0.0642   |
| 5.040<br>7.670                                    | 8.37<br>7.78                                     | 0.0636<br>0.0591   |
| 9.080   | 7.40   | 0.0562   |
| 10.960  | 7.17   | 0.0545   |
| 293.15 0  | 10.98  | 0.0835   |
| 0.612   | 10.51  | 0.0799   |
| 1.191   | 10.34  | 0.0786   |
| 1.695<br>2.370                                    | 9.92<br>9.36                                     | 0.0754<br>0.0711   |
| 3.785   | 8.90   | 0.0676   |
| 4.950   | 8.25   | 0.0627   |
| 5.555   | 8.18<br>7.67                                     | 0.0622<br>0.0583   |
| 6.950<br>7.580                                    | 7.55   | 0.0574   |
| 9.080   | 7.35   | 0.0559   |
| Table continued on nex                            | xt page.   |  |
|   | AUXILIARY  | INFORMATION  |
| METHOD /APPARATUS/PROCE                           | DURE :   | SOURCE AND PURITY OF MATERIALS:  |
| The apparatus, describ                            |  | 11. Aconspectatly pare grade.  |
| papers (1,2), was base<br>of Ben-Naim and Baer (  |  | Contained 0.1 per cent of other  |
| ratus is designed to m                            |  | gases.   |
| ence in volume of the                             | gas before disso                                 |  |
| lution and after disso                            |  | 3. Urea. Analytical reagent grade.   |
| plete with the gas and<br>contact at constant pr  |  |  |
| The calculation of t                              | he inverse Henry                                 |  |
| constant was described                            | by Borina and                                    |  |
| Samoilov (4).<br>The concentration of             | the urea so-                                     |  |
| lution was checked on                             |  | ESTIMATED ERROR:   |
| density after each exp                            | erimentThe cali-                                 | ESTIMIED BARON.  |
| bration curves were pr                            |  |  |
| density data from the from the authors'own m      |  |  |
| The solubility measu                              | rement was                                       | $\delta x_1 / x_1 = 0.0035 - 0.0050$   |
| carried out at a total                            | pressure of                                      | REFERENCES:  |
| neon + water vapor of<br>solubility values in t   | 740 mmHg. The                                    | <ol> <li>Lyashchenko, A.K.; Borina, A.F.<br/>Zh. Strukt. Khim. 1971, 12, 964.</li> </ol>                                     |
| were calculated for ei                            | ther 1 mmHg or                                   | 2. Borina, A.F.; Lyashchenko, A.K.   |
| l atm partial pressure                            | of neon.   | Zh. Fiz. Khim. 1971, 45, 1316.   |
| 1   |  | 3. Ben-Naim, A.; Baer, S.<br>Trans. Faraday Soc. 1963, <u>59</u> ,2735.  |
|   |  | 4. Borina, A.F.; Samoilov, O. Ya.  |
| L   |  | Zh. Strukt. Khim. 1974, 15, 395.   |

| COMPONENTS :   | ORIGINAL MEASUREMENTS:  |
|--|---|
| 1. Neon; Ne; 7440-01-9   | Borina, A. F.   |
| 2. Water; H <sub>2</sub> O; 7732-18-5                            | <u>Zh</u> . <u>Fiz</u> . <u>Khim</u> . 1977, <u>51</u> , 138 - 142. |
| 3. Urea; $CH_4N_2O$ ((NH <sub>2</sub> ) <sub>2</sub> CO);57-13-6 | Continued from previous page.                                       |
|  |   |

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EXPERIMENTAL DATA:
```

| т/к    | Urea                                  | Mol Fraction                   | Mol Fraction   |
|--------|---------------------------------------|--------------------------------|--|
|        | mol kg <sup>-1</sup> H <sub>2</sub> O | $X_1 \times 10^9$<br>at 1 mmHg | $\begin{array}{c} x_1 \times 10^4 \\ at 1 atm \end{array}$ |
| 298.15 | 0                                     | 10.58                          | 0.0804   |
|        | 0.897                                 | 9.92                           | 0.0754   |
|        | 1.465                                 | 9.76                           | 0.0742   |
|        | 2.172                                 | 9.51                           | 0.0723   |
|        | 3.047                                 | 9.09                           | 0.0691   |
|        | 4.500                                 | 8.41                           | 0.0639   |
|        | 5.805                                 | 7.96                           | 0.0605   |
|        | 6.000                                 | 7.88                           | 0.0599   |
|        | 7.420                                 | 7.78                           | 0.0591   |
|        | 8.350                                 | 7.67                           | 0.0583   |
|        | 10.220                                | 7.15                           | 0.0543   |
| 303.15 | 0                                     | 10.54                          | 0.0801   |
|        | 0.425                                 | 10.26                          | 0.0780   |
|        | 1.080                                 | 9.96                           | 0.0757   |
|        | 1.980                                 | 9.48                           | 0.0720   |
|        | 2.917                                 | 9.10                           | 0.0692   |
|        | 3.310                                 | 8.94                           | 0.0679   |
|        | 4.225                                 | 8.58                           | 0.0652   |
|        | 6.460                                 | 7.97                           | 0.0606   |
|        | 7.740                                 | 7.76                           | 0.0590   |
|        | 8.100                                 | 7.72                           | 0.0587   |
|        | 10.420                                | 7.05                           | 0.0536   |
|        | 11.070                                | 7.05                           | 0.0536   |

The inverse of the mole fraction solubility at 1 mmHg is the Henry constant K/mmHg =  $P/X_1$ 

The inverse of the mole fraction solubility at 1 atm pressure is the Henry constant K/atm =  $P/X_1$ .

The mole fraction solubility at 101.325 kPa (1 atm) was calculated by the compiler.

The original paper presents graphs of the enthalpy change and entropy change as a function of urea molality for the transfer on neon gas at a pressure of 101.325 kPa (l atm) to the hypothetical solution of unit neon mole fraction.

| COMPONENTS:  |  | ORIGINAL MEAS   | UREMENTS :  |   |
|--|--|---|---|---|
| l. Neon; Ne; 7440-01-9   |  | Makranczy, J.; Megyery-Balog, K.;   |   |   |
| 2. Pentane; C <sub>5</sub> H <sub>12</sub> ; 109-66              | Rusz, L.;                              | Patyi, L.   |   |   |
| 5 12   |  |   |   |   |
|  |  | Hung, J. In   | d. Chem. 1976   | , <u>4</u> , 269-280.   |
| VARIABLES:   |  | PREPARED BY:  |   |   |
| т/к: 298.15  |  |   |   |   |
| P/kPa: 101.325 (1  | atm)                                   |   | S. A. Johnson   | L   |
| EXPERIMENTAL VALUES:   | ······································ |   |   |   |
|  |  |   |   |   |
| T/K Mol  | Fraction                               | Bunsen  | Ostwald   | -   |
| x  | (1 × 10 <sup>4</sup>                   | Coefficient<br>a x 10 <sup>2</sup>  | Coefficient<br>L x 10 <sup>2</sup>  |   |
| 298.15   | 4.1                                    | 8.0   | 8.7   |   |
| The mole fraction and Buns                                       |  | ont word and  | oulstod hu th   | -<br>compiler   |
| The more fraction and build                                      | JOCTIECE                               | Life here out   |   |   |
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|  | AUXILIARY                              | INFORMATION   |   |   |
|  | AUXILIARY                              | INFORMATION   |   |   |
| METHOD:  |  | SOURCE AND PU   | URITY OF MATERIA  |   |
| Volumetric method. The ap  | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r   | as and liquid<br>reagents of Hu   | were analyti-<br>Ingarian or  |
|  | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori  |   | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip          | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r   | as and liquid<br>reagents of Hu   | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip          | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori  | as and liquid<br>reagents of Hu   | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip          | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori  | as and liquid<br>reagents of Hu   | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip          | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori  | as and liquid<br>reagents of Hu   | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip          | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori  | as and liquid<br>reagents of Hu   | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip          | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori  | as and liquid<br>reagents of Hu   | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip          | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.   | as and liquid<br>reagents of Hu<br>Lgin. No furt  | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori  | as and liquid<br>reagents of Hu<br>Lgin. No furt  | were analyti-<br>Ingarian or  |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip          | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.   | as and liquid<br>reagents of Hu<br>Lgin. No furt<br>ROR:  | were analyti-<br>ingarian or<br>ther informa-   |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.   | as and liquid<br>reagents of Hu<br>Lgin. No furt  | were analyti-<br>ingarian or<br>ther informa-   |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.   | as and liquid<br>reagents of Hu<br>Lgin. No furt<br>ROR:  | were analyti-<br>ingarian or<br>ther informa-   |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.<br>ESTIMATED ERF  | as and liquid<br>reagents of Hu<br>Igin. No furt<br>ROR:<br>$\delta X_1/X_1 = 0.$   | were analyti-<br>ingarian or<br>ther informa-   |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.<br>ESTIMATED ERF<br>REFERENCES:<br>1. Bodor,                                | As and liquid<br>reagents of Hu<br>Lgin. No furt<br>ROR:<br>$\delta X_1/X_1 = 0.$<br>E.; Bor, Gy.;  | were analyti-<br>ingarian or<br>ther informa-   |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.<br>ESTIMATED ERF<br>REFERENCES:<br>1. Bodor,<br>Sipos<br>Veszpre            | as and liquid<br>reagents of Hu<br>Igin. No furt<br>ROR:<br>$\delta X_1/X_1 = 0$<br>E.; Bor, Gy.;<br>s, G.<br>emi Vegyip. Eg              | were analyti-<br>ingarian or<br>ther informa-   |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.<br>ESTIMATED ERF<br>REFERENCES:<br>1. Bodor,<br>Sipos<br>Veszpre<br>1957, 1 | as and liquid<br>reagents of Hu<br>Igin. No furt<br>ROR:<br>$\delta X_1/X_1 = 0$ .<br>E.; Bor, Gy.;<br>s, G.<br>emi Vegyip. Eq.<br>L, 55; | were analyti-<br>ingarian or<br>ther informa-<br>.03<br>; Mohai, B.;<br>gy. <u>Kozl</u> . |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.<br>ESTIMATED ERF<br>REFERENCES:<br>1. Bodor,<br>Sipos<br>Veszpre<br>1957, 1 | as and liquid<br>reagents of Hu<br>Igin. No furt<br>ROR:<br>$\delta X_1/X_1 = 0$<br>E.; Bor, Gy.;<br>s, G.<br>emi Vegyip. Eg              | were analyti-<br>ingarian or<br>ther informa-<br>.03<br>; Mohai, B.;<br>gy. <u>Kozl</u> . |
| Volumetric method. The ap<br>Bodor, Bor, Mohai, and Sip<br>used. | pparatus of                            | SOURCE AND PU<br>Both the ga<br>cal grade r<br>foreign ori<br>tion.<br>ESTIMATED ERF<br>REFERENCES:<br>1. Bodor,<br>Sipos<br>Veszpre<br>1957, 1 | as and liquid<br>reagents of Hu<br>Igin. No furt<br>ROR:<br>$\delta X_1/X_1 = 0$ .<br>E.; Bor, Gy.;<br>s, G.<br>emi Vegyip. Eq.<br>L, 55; | were analyti-<br>ingarian or<br>ther informa-<br>.03<br>; Mohai, B.;<br>gy. <u>Kozl</u> . |

| COMPONENTS:  |  |   | ORIGINAL MEASUREMENTS:   |   |  |
|--|--|---|--|---|--|
|  |  |   | Clever, H.L.; Battino, R.;<br>Saylor, J.H.; Gross, P.M.                |   |  |
| 1. Neon; Ne; 74  |  |   | Saytor, J  | .n.; Gross, P   | • 141 •  |
| 2. Hexane; C <sub>6</sub> H <sub>1</sub>   | <b>4; 110-5</b> 4  | 1-3   |  |   |  |
|  |  | į   | J. Phys. Ch  | <u>em</u> . 1957, <u>61</u> ,   | 1078-1083.   |
| VARIABLES:   |  |   | PREPARED BY:   | ·····   |  |
| т/к: 28  | 7.15 - 3   | 1.85  | р  | .L.Long   |  |
| P/kPa: 1   |  |   |  |   |  |
| EXPERIMENTAL VALUES  |  |   | ·····  |   |  |
|  | T/K  | Mol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup>  | Bunsen<br>Coefficient<br>∝ x 10 <sup>2</sup>                           | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>                         |  |
|  | 287.15   | 3.36  | 5,77   | 6.07  |  |
|  | 298.15   | 3.80  | 6.48   | 7.07  |  |
|  | 311.85   | 4.04  | 6.75   | 7.71  |  |
| Smoothed Data:   | Std. Dev   | $AG^{O} = 53.1,$<br>$D1^{-1} = 5,443.6,$  | Coef. Corr.<br>$\Delta S^O/J K^{-1}$                                   | = 0.9959  | 25   |
|  | т/к  | Mol Fraction $X_1 \times 10^4$  | ⊿G <sup>O</sup> /J mol <sup>-1</sup>                                   |   |  |
|  | 288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15   | 3.44<br>3.57<br>3.71<br>3.84<br>3.98<br>4.12  | 19,109<br>19,346<br>19,583<br>19,821<br>20,058<br>20,295               |   |  |
| The solubility<br>101.325 kPa (1<br>The Bunsen coef  | atm) by H  | lenry's law.  |  |   | on of  |
|  | <u> </u>   | AUXILIARY   | INFORMATION  |   |  |
| METHOD: Volumetri<br>urated with the<br>an 8 mm x 180 c<br>tached to a gas<br>pressure of sol<br>vapor pressure<br>as the gas is a<br>ADDED NOTE. Mak:<br>Balog, K.;Rusz,<br>Ind. Chem. 1976 | gas as i<br>m glass s<br>buret. T<br>ute gas p<br>is mainta<br>bsorbed.<br>ranczy, J<br>L.;Patyi | t flows throug<br>piral at-<br>the total<br>blus solvent<br>ined at 1 atm<br>.; Megyery-<br>, L. Hung. J. | h l. Neon. M<br>standar<br>were us<br>results<br>2. Hexane.<br>New Hav | d and research<br>ed with no dif                                      | Inc. Both<br>n grades<br>fference in<br>kinson, Inc.,<br>n with H <sub>2</sub> SO <sub>4</sub> , |
| Ostwald coeffic:<br>K for this system<br>used in the smooth<br>APPARATUS/PROCEDUR<br>modification of   | ient of 0<br>em. The v<br>othed dat<br><sup>E</sup> :The app<br>that of                          | .076 at 298.15<br>alue was not<br>a fit above.<br>waratus is a<br>Morrison and                            |  | $b^{R:} \delta T/K = 0.05 \\ \delta P/torr = 3 \\ \delta X_1/X_1 = 0$ | 3  |
| Billett (1). The<br>clude the addit<br>age for the solution<br>a constant reference<br>extra buret for   | ion of a<br>vent, a m<br>rence pre   | spiral stor-<br>anometer for<br>ssure, and an   | REFERENCES:<br>1. Morrison   | , T.J.; Billet  |  |
| The solvent is of fication of the Daniel (2).  | degassed   | by a modi-  | J. <u>Chem</u> .<br>ibid.195   | Soc. 1948, 20   | )33;   |
|  |  |   | J. Appl.   | <u>Chem</u> . 1952,   | 2, 161.  |

|   | · · · · · · · · · · · · · · · · · · ·   |
|---|---|
| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
| 1. Neon; Ne; 7440-01-9  | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.  |
| 2. Heptane; C <sub>7</sub> H <sub>16</sub> ; 142-82-5   |   |
| 2. heptune, c <sub>7</sub> ., <sub>16</sub> , 112 oz o  | J. Phys. Chem. 1957, 61, 1078 - 1083.   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 287.15 - 311.95<br>P/kPa: 101.325 (1 atm)  | P. L. Long  |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Fraction  | Bunsen Ostwald  |
| $x_{1} \times 10^{4}$   | Coefficient Coefficient   |
| 287.15 3.30   | 5.09 5.35   |
| 298.15 3.48   | 5.29 5.77   |
| 311.95 3.96   | 5.92 6.76   |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$  | $X_1 = 5,571.9 + 47.347 \text{ T}$  |
| Std. Dev. $\Delta G = 45.0$ ,   | Coef. Corr. = 0.9971  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 5,571.9$   | , $\Delta S^{\circ}/J K^{-1} mol^{-1} = -47.347$  |
| T/K Mol Frac<br>X <sub>1</sub> x 1  | tion ΔG°/J mol <sup>-1</sup><br>04  |
| 283.15 3.15   | 18,978  |
| 288.15 3.29   |   |
| 293.15 3.42<br>298.15 3.55  | •   |
| 303.15 3.69   |   |
| 308.15 3.82<br>313.15 3.96  | •   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate   |   |
| AUXILIARY   | INFORMATION   |
|   | SOURCE AND PURITY OF MATERIALS;   |
| urated with the gas as it flows<br>through an 8 mm x 180 cm glass spiral<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent   | <ol> <li>Neon. Matheson Co., Inc. Both<br/>standard and research grades were<br/>used.</li> </ol> |
| vapor pressure is maintained at 1 atm as the gas is absorbed.   | 2. Heptane. Phillips Petroleum Co.<br>Bartlesville, OK. Used as                                   |
| ADDED NOTE. Makranczy, J.; Megyery-<br>Balog, K.;Rusz, L.;Patyi, L. <u>Hung. J.</u><br>Ind. Chem. 1976, <u>4</u> , 269 report an<br>Ostwald coefficient of 0.069 at 298.1<br>K for this system. The value was not | received.   |
| used in the smoothed data fit above.  | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett(1). The modifications in-<br>clude the addition of a spiral stor-  | $\begin{array}{r} \delta T/K = 0.05\\ \delta P/torr = 3\\ \delta X_1/X_1 = 0.03 \end{array}$      |
| age for the solvent, a manometer for  | REFERENCES :  |
| a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and   | 1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br><u>ibid.1952, 3819.</u>           |
| Daniel (2).   | 2. Baldwin, R. R.; Daniel, S. G.<br>J. <u>Appl</u> . <u>Chem</u> . 1952, <u>2</u> , 161.          |

| COMPONENTS:  | EVALUATOR:                                      |  |
|--|---|--|
| l. Neon; Ne; 7440-01-9                               | H. L. Clever<br>Chemistry Department            |  |
| 2. Octane; C <sub>8</sub> H <sub>18</sub> ; 111-65-9 | Emory University<br>Atlanta, GA 30322<br>U.S.A. |  |
|  | March 1978                                      |  |

CRITICAL EVALUATION:

The solubility of neon in octane was measured at three laboratories. Clever, Battino, Saylor and Gross (1) report three solubility values between 287.25 and 312.15 K. Makranczy, Megyery-Balog, Rusz, and Patyi (2) and Wilcock, Battino and Danforth (3) each report one solubility value near 298 K.

The solubility value of Makranczy et al. (Ostwald coefficient  $5.7 \times 10^{-2}$  and mole fraction  $3.8 \times 10^{-4}$  at 298.15 K) is not recommended. It was reported to only two significant figures and it is 5.5 percent higher than the values from the other two laboratories.

The solubility values of Clever et al. and Wilcock et al. agree within 0.8 percent at 298.15 K. Without solubility values to compare at several temperatures it is not possible to recommend values of neon in octane solubility except for the mole fraction of  $3.595 \times 10^{-4}$  at 298.15 K and 101.325 kPa. However, we have combined the solubility data of Clever, et al. and Wilcock et al. in a one to one weight least squares fit to a Gibbs energy equation linear in temperature. The result gives a tentative set of solubility data and changes in thermodynamic properties.

The tentative values for the transfer of one mole of neon from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 6,962.8 + 42.524 T$ 

Std. Dev.  $\triangle G^{\circ} = 27.6$ , Coef. Corr. = 0.9980

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,962.8, \quad \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -42.524$ 

The tentative solubility values and Gibbs energy as a function of temperature are in Table 1.

TABLE 1. The solubility of neon in octane. Tentative values of the mole fraction solubility at 101.325 kPa and the Gibbs energy change as a function of temperature.

| Т/К    | Mol Fraction $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|--------------------------------|-------------------------|
| 288.15 | 3.285                          | 19,216                  |
| 293.15 | 3.45                           | 19,429                  |
| 298.15 | 3.62                           | 19,641                  |
| 303.15 | 3.79                           | 19,854                  |
| 308.15 | 3.97                           | 20,067                  |
| 313.15 | 4.14                           | 20,279                  |

 Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1957, 61, 1078.

 Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. <u>Hung. J. Ind.</u> Chem. 1976, 4, 269.

 Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. Chem. Thermodyn. 1978, 10, 817.

| COMPONENTS:  |   |  | ORIGINAL MEAS  | UREMENTS:   |
|--|---|--|--|---|
| 1. Neon; Ne;   | 7440-01-9   |  | Clever, H.L  | .; Battino, R.;   |
| 2. Octane; C <sub>{</sub>  | 3 <sup>H</sup> 18; 111-6  | 55-9   | Saylor,  | J.H.; Gross, P.M.   |
|  |   |  | J. Phys. Ch  | <u>em</u> . 1957, <u>61</u> , 1078-1083.  |
| VARIABLES:   |   |  | PREPARED BY:   | · · · · · · · · · · · · · · · · · · ·   |
|  | 287.25 -  |  |  | P.L. Long   |
| P/kPa:   | 101.325   | (1 atm)  |  | - · - · - · · · · · · · · · · · · · · ·   |
| EXPERIMENTAL VALU  | JES:  |  |  |   |
|  | T/K M   |  | Bunsen<br>Coefficient  | Ostwald<br>Coefficient  |
|  |   | x <sub>1</sub> x 10 <sup>4</sup>   | α x 10 <sup>2</sup>  | L x 10 <sup>2</sup>   |
|  | 287.25  | 3.29   | 4.56   | 4.80  |
|  | 298.35<br>312.15  | 3.58<br>4.14   | 4.91<br>5.58   | 5.36<br>6.38  |
| Smoothed Data:   |   |  |  |   |
|  |   | $\Delta G^{O} = 32.5,$   | *  |   |
|  | sta. Dev  | $\Delta G = 32.5,$   | coer. Corr.  | = 0.998T  |
| For the recomm   | ended Gibb  | s energy equa  | tion and smo   | othed values of the solu-   |
| For the recomm   | ended Gibb  | s energy equa  | tion and smo   |   |
|  | ended Gibb  | s energy equa<br>evaluation of   | tion and smo   | othed values of the solu-   |
| For the recomm<br>bility see the<br>METHOD:  | The solv<br>gas as it<br>cm glass s<br>The tot<br>s solvent                 | AUXILIARY<br>ent is satu-<br>flows throug<br>piral attached<br>al pressure o<br>vapor pressure   | INFORMATION<br>SOURCE AND PU<br>1. Neon.<br>standa:<br>used with<br>results<br>2. Octane   | othed values of the solu-<br>ity of neon in octane.<br>RITY OF MATERIALS:<br>Matheson Co., Inc. Both<br>rd and research grades wer<br>ith no difference in<br>s.<br>. Humphrey-Wilkinson Inc.<br>with H <sub>2</sub> SO <sub>4</sub> , washed, dried          |
| For the recomm<br>bility see the<br>METHOD:<br>Volumetric.<br>rated with the<br>an 8 mm x 180<br>to a gas buret<br>solute gas plu<br>is maintained<br>absorbed.  | The solv<br>gas as it<br>cm glass s<br>. The tot<br>s solvent<br>at 1 atm a | AUXILIARY<br>ent is satu-<br>flows throug<br>piral attached<br>al pressure o<br>vapor pressure   | INFORMATION<br>SOURCE AND PU<br>1. Neon.<br>standa:<br>used with<br>results<br>2. Octane.<br>Shaken  | othed values of the solu-<br>ity of neon in octane.<br>WRITY OF MATERIALS:<br>Matheson Co., Inc. Both<br>rd and research grades wer<br>ith no difference in<br>s.<br>. Humphrey-Wilkinson Inc.<br>with H <sub>2</sub> SO <sub>4</sub> , washed, dried<br>led. |
| For the recomm<br>bility see the<br>METHOD:<br>Volumetric.<br>rated with the<br>an 8 mm x 180<br>to a gas buret<br>solute gas plu<br>is maintained<br>absorbed.<br>APPARATUS/PROCEDU<br>The apparatu<br>that of Morrise<br>modifications | The solv<br>gas as it<br>cm glass s<br>. The tot<br>s solvent<br>at 1 atm a | AUXILIARY<br>ent is satu-<br>flows throug<br>piral attached<br>al pressure of<br>vapor pressure<br>s the gas is<br>dification of<br>lett(1). The<br>e addition of  | INFORMATION<br>SOURCE AND PU<br>1. Neon.<br>standa:<br>used wi<br>results<br>2. Octane.<br>Shaken<br>distill   | othed values of the solu-<br>ity of neon in octane.<br>RITY OF MATERIALS:<br>Matheson Co., Inc. Both<br>rd and research grades wer<br>ith no difference in<br>s.<br>. Humphrey-Wilkinson Inc.<br>with H <sub>2</sub> SO <sub>4</sub> , washed, dried<br>led.  |
| For the recomm<br>bility see the<br>METHOD:<br>Volumetric.<br>rated with the<br>an 8 mm x 180<br>to a gas buret<br>solute gas plu<br>is maintained<br>absorbed.<br>APPARATUS/PROCEDU<br>The apparatu                                     | The solv<br>gas as it<br>cm glass s<br>. The tot<br>s solvent<br>at 1 atm a | AUXILIARY<br>ent is satu-<br>flows throug<br>piral attached<br>al pressure of<br>vapor pressure<br>s the gas is<br>dification of<br>lett(1). The<br>e addition of<br>solvent, a<br>reference<br>uret for<br>he solvent is<br>on of the | INFORMATION<br>SOURCE AND PU<br>1. Neon.<br>Standa:<br>used w:<br>results<br>2. Octane.<br>Shaken<br>distill<br>ESTIMATED ERR<br>REFERENCES:<br>1. Morrisc<br>J. Chem<br>ibid.19 | othed values of the solu-<br>ity of neon in octane.   |

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**ORIGINAL MEASUREMENTS:** COMPONENTS: 1. Neon; Ne; 7440-01-9 Wilcock, R.J.; Battino, R.; Danforth, W.F; Wilhelm, E. 2. Octane; C<sub>3</sub>H<sub>18</sub>; 111-65-9 J. Chem. Thermodyn. 1978, 10, 817-822. VARIABLES: PREPARED BY: т/к: 298.27 A.L. Cramer P/kPa: 101.325 (1 atm) **EXPERIMENTAL VALUES:** T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $x_1 \times 10^4$  $\alpha \times 10^2$  $L \times 10^2$ 298.27 3,609 4.951 5.406 See the evaluation of neon + octane for recommended Gibbs equation and smoothed solubility values. The solubility value was adjusted to a partial pressure of neon of 101.325 kPa by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD /APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: 1. The apparatus is based on the de-Neon. Matheson Co. Inc. sign of Morrison and Billett (1), and the version used is described by Purest commercially available grade. Battino, Evans, and Danforth (2). The degassing apparatus and procedure are 2. Octane. Phillips Petroleum Co. described by Battino, Banzhof, Bogan, and Wilhelm (3). Degassing. Up to 500 cm<sup>3</sup> of sol-vent is placed in a flask of such size minimum 99 mol per cent. that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is applied intermittently through a liquid N2 trap until the ESTIMATED ERROR: permanent gas residual pressure drops  $\delta T/K = 0.03$  $\delta P/mmHg = 0.5$  $\delta X_1/X_1 = 0.02$ to 5 microns. Solubility Determination. The degassed solvent is passed in a thin film down a glass spiral tube con-**REFERENCES**: taining the solute gas plus the sol-1.Morrison, T.J.; Billett, F. vent vapor at a total pressure of one J. Chem. Soc. 1948, 2033. atm. The volume of gas absorbed is found by difference between the ini-2.Battino, R.; Evans, F.D.; Danforth, W.F. J.Am.Oil Chem.Soc. 1968, 45, 830. tial and final volumes in the buret 3.Battino, R.; Banzhof, M.; Bogan, M.; system. The solvent is collected in a Wilhelm, E. tared flask and weighed. Anal. Chem. 1971, 43, 806.

| COMPONENTS:   |   |
|---|---|
|   | ORIGINAL MEASUREMENTS:  |
| 1. Neon; Ne; 7440-01-9  | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.  |
| 2. 3-Methylheptane; C <sub>8</sub> H <sub>18</sub> , 589-81-1   |   |
|   | <u>J. Phys. Chem</u> . 1957, <u>61</u> , 1078 - 1083.   |
| VARIABLES:  | PREPARED BY:  |
| T/K: 287.15 - 312.15<br>P/kPa: 101.325 (1 atm)  | P. L. Long  |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Fraction<br>$X_1 \times 10^4$   | BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L $\times 10^2$  |
| 287.15 3.47   | 4.85 5.10   |
| 298.15 3.66<br>312.15 4.18  | 5.05 5.51<br>5.66 6.47  |
|   |   |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln I$   | -   |
| Std. Dev. ∆G° = 46.3,   | Coef. Corr. = 0.9969  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 5,652.7$   | $\Delta S^{\circ}/J \mod K^{-1} \mod^{-1} = -46.652$  |
| T/K Mol Fract<br>$X_1 \times 10$  |   |
| 283.15 3.31   |   |
| 288.15 3.46<br>293.15 3.60  |   |
| 298.15 3.74   |   |
| 303.15 3.88<br>308.15 4.03  | 19,795<br>20,028  |
| 313.15 4.17   | 20,262  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD: Volumetric. The solvent is sat-<br>urated with the gas as it flows<br>through an 8 mm x 180 cm glass spiral | ed by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc. Both   |
| attached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor pressure is maintained at 1 atm  | were used with no difference in results.  |
| as the gas is absorbed.   | <ol> <li>3-Methylheptane. Humphrey-<br/>Wilkinson, Inc., New Haven, CN.<br/>Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, dried<br/>over Na, distilled through a<br/>vacuum column.</li> </ol> |
| APPARATUS/PROCEDURE: The apparatus is a   | ESTIMATED ERROR:  |
| modification of that of Morrison and<br>Billett(1). The modifications in-<br>clude the addition of a spiral stor-   | $\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$   |
| age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and   | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br><u>ibid</u> .1952, 3819.   |
| Daniel (2).   | <ol> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. <u>Appl</u>. <u>Chem</u>. 1952, <u>2</u>, 161.</li> </ol>   |

| COMPONENTS :  | ODICINAL MELOUDING   |
|---|--|
|   | ORIGINAL MEASUREMENTS:<br>Clever, H. L.; Battino, R.;  |
| 1. Neon; Ne; 7440-01-9  | Saylor, J. H.; Gross, P. M.  |
| 2. 2,3-Dimethylhexane; C <sub>8</sub> H <sub>18</sub> ;<br>584-94-1   |  |
|   | J. Phys. Chem. 1957, <u>61</u> , 1078 - 1083.  |
| VARIABLES:  |  |
| т/к: 287.15 - 312.15  | PREPARED BY:<br>P. L. Long   |
| P/kPa: 101.325 (1 atm)  |  |
|   |  |
| EXPERIMENTAL VALUES.<br>T/K Mol Fraction  | Bunsen Ostwald   |
|   | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$   |
| 287.15 3.28   | 4.61 4.85  |
| 298.15 3.66<br>312.15 4.00  | 5.09 5.56<br>5.47 6.25   |
|   |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$   | $x_1 = 5,857.7 + 46.243 \text{ T}$   |
| Std. Dev. ∆G° = 26.0,   | Coef. Corr. = 0.9990   |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 5.857.7$   | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -46.243$   |
| T/K Mol Fract   | tion $\Delta G^{\circ}/J \text{ mol}^{-1}$   |
| $x_1 \times 10$   | 0 <sup>4</sup>   |
| 283.15 3.19   |  |
| 288.15 3.33<br>293.15 3.47  | •  |
| 298.15 3.62   |  |
| 303.15 3.76<br>308.15 3.90  | 19,876<br>20,108   |
| 313.15 4.05   | 20,339   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.   | o a partial pressure of neon of  |
| The Bunsen coefficients were calculate  | ed by the compiler.  |
|   |  |
| AUXILIARY   | INFORMATION  |
| urated with the gas as it flows<br>through an 8 mm x 180 cm glass spiral<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent | were used with no difference in results.   |
| vapor pressure is maintained at 1 atm<br>as the gas is absorbed.  | <ol> <li>2,3-Dimethylhexane. Humphrey-<br/>Wilkinson, Inc., New Haven, CT.<br/>Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, dried<br/>over Na, distilled through a<br/>vacuum column.</li> </ol> |
|   | ESTIMATED ERROR:   |
| APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett(1). The modifications in-  | $\begin{array}{l} \delta T/K = 0.05\\ \delta P/torr = 3\\ \delta X_1/X_1 = 0.03 \end{array}$   |
| clude the addition of a spiral stor-<br>age for the solvent, a manometer for  |  |
| a constant reference pressure, and an   | REFERENCES:  |
| extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and                                  | 1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br>ibid.1952, 3819.   |
| Daniel (2).   | 2. Baldwin, R. R.; Daniel, S. G.<br>J. Appl. Chem. 1952, 2, 161.   |
|   |  |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
| 1. Neon; Ne; 7440-01-9   | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.   |
| 2. 2,4-Dimethylhexane; C <sub>8</sub> H <sub>18</sub> ;<br>589-43-5  |  |
|  | J. Phys. Chem. 1957, 61, 1078 - 1083   |
| VARIABLES:   | PREPARED BY:   |
| T/K: 287.35 - 312.15<br>P/kPa: 101.325 (1 atm)   | PREPARED BY: P. L. Long  |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol Fraction<br>X <sub>1</sub> × 10 <sup>4</sup>   | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$   |
| 287.35 3.68  | 5.08 5.34  |
| 298.15 3.99<br>312.15 4.39   | 5.42 5.92<br>5.89 6.73   |
|  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = -RT$   | ln X <sub>1</sub> = 5,303.5 + 47.287 T   |
| Std. Dev. $\Delta G^\circ = 0.6$   | , Coef. Corr. = 0.9999   |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 5,303$  | .5, $\Delta S^{\circ}/J K^{-1} mol^{-1} = -47.287$   |
| T/K Mol Fra<br>X <sub>1</sub> x  | action $\Delta G^{\circ}/J \text{ mol}^{-1}$<br>10 <sup>4</sup>  |
| 283.15 3.1   | <br>56 18,693  |
| 288.15 3.1   | 70 18,929  |
|  | •  |
| 293.15 3.<br>298.15 3.   | 85 19,166  |
| 298.15 3.<br>303.15 4.   | 85 19,166<br>99 19,402<br>13 19,638  |
| 298.15 3.1   | 85       19,166         99       19,402         13       19,638         28       19,875  |
| 298.15 3.1<br>303.15 4.1<br>308.15 4.1   | 85 19,166<br>99 19,402<br>13 19,638<br>28 19,875<br>42 20,111<br>to a partial pressure of neon of  |
| 298.15 3.<br>303.15 4.<br>308.15 4.<br>313.15 4.<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calcula   | 85 19,166<br>99 19,402<br>13 19,638<br>28 19,875<br>42 20,111<br>to a partial pressure of neon of  |
| 298.15 3.<br>303.15 4.<br>308.15 4.<br>313.15 4.<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calcula<br>AUXILIA<br>METHOD: Volumetric. The solvent is sa   | <pre>85 19,166<br/>99 19,402<br/>13 19,638<br/>28 19,875<br/>42 20,111<br/>to a partial pressure of neon of<br/>ated by the compiler.<br/>RY INFORMATION<br/>at SOURCE AND PURITY OF MATERIALS:</pre>  |
| 298.15 3.<br>303.15 4.<br>308.15 4.<br>313.15 4.<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calcula<br>AUXILIA<br>METHOD: Volumetric. The solvent is sa<br>urated with the gas as it flows  | <pre>85 19,166<br/>99 19,402<br/>13 19,638<br/>28 19,875<br/>42 20,111<br/>to a partial pressure of neon of<br/>ated by the compiler.<br/>RY INFORMATION<br/>at-SOURCE AND PURITY OF MATERIALS:<br/>1. Neon. Matheson Co., Inc. Both</pre>   |
| 298.15 3.1<br>303.15 4.1<br>308.15 4.2<br>313.15 4.2<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calcula<br>AUXILIA<br>METHOD: Volumetric. The solvent is sa<br>urated with the gas as it flows<br>through an 8 mm x 180 cm glass spira<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent   | <pre>85 19,166<br/>99 19,402<br/>13 19,638<br/>28 19,875<br/>42 20,111<br/>to a partial pressure of neon of<br/>ated by the compiler.<br/>RY INFORMATION<br/>at-SOURCE AND PURITY OF MATERIALS:<br/>1. Neon. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used with no difference in<br/>results.</pre>   |
| 298.15 3.<br>303.15 4.<br>308.15 4.<br>313.15 4.<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calcula<br>AUXILIA<br>METHOD: Volumetric. The solvent is sa<br>urated with the gas as it flows<br>through an 8 mm x 180 cm glass spira<br>attached to a gas buret. The total  | <pre>85 19,166<br/>99 19,402<br/>13 19,638<br/>28 19,875<br/>42 20,111<br/>to a partial pressure of neon of<br/>ated by the compiler.<br/>RY INFORMATION<br/>at-SOURCE AND PURITY OF MATERIALS:<br/>1. Neon. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used with no difference in<br/>results.<br/>tm<br/>2. 2,4-Dimethylhexane. Humphrey-<br/>Wilkinson, Inc., New Haven, CT.</pre>   |
| 298.15 3.1<br>303.15 4.1<br>308.15 4.2<br>313.15 4.2<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated<br>METHOD: Volumetric. The solvent is saturated with the gas as it flows<br>through an 8 mm x 180 cm glass spiral<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor pressure is maintained at 1 attached to a gas buret.   | <pre>85 19,166<br/>99 19,402<br/>13 19,638<br/>28 19,875<br/>42 20,111<br/>to a partial pressure of neon of<br/>ated by the compiler.<br/>RY INFORMATION<br/>at-SOURCE AND PURITY OF MATERIALS:<br/>1. Neon. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used with no difference in<br/>results.<br/>tm<br/>2. 2,4-Dimethylhexane. Humphrey-<br/>Wilkinson, Inc., New Haven, CT.</pre>   |
| 298.15 3.1<br>303.15 4.1<br>308.15 4.2<br>313.15 4.2<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculated<br>METHOD: Volumetric. The solvent is saturated with the gas as it flows<br>through an 8 mm x 180 cm glass spirated<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor pressure is maintained at 1 attached to a gas buret.   | <pre>85 19,166<br/>99 19,402<br/>13 19,638<br/>28 19,875<br/>42 20,111<br/>to a partial pressure of neon of<br/>ated by the compiler.<br/>RY INFORMATION<br/>at-SOURCE AND PURITY OF MATERIALS:<br/>1. Neon. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used with no difference in<br/>results.<br/>tm<br/>2. 2,4-Dimethylhexane. Humphrey-<br/>Wilkinson, Inc., New Haven, CT.<br/>Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, dried<br/>over Na, distilled through a<br/>vacuum column.</pre>  |
| 298.15 3.<br>303.15 4.<br>308.15 4.<br>313.15 4.<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculation<br>MUXILIA<br>METHOD: Volumetric. The solvent is saturated with the gas as it flows<br>through an 8 mm x 180 cm glass spiration<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor pressure is maintained at 1 attached at 1 attached at 1 attached.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett(1). The modifications in-<br>clude the addition of a spiral stor- | 85 19,166<br>99 19,402<br>13 19,638<br>28 19,875<br>42 20,111<br>to a partial pressure of neon of<br>ated by the compiler.<br>RY INFORMATION<br>at-SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc. Both<br>standard and research grades<br>were used with no difference in<br>results.<br>tm<br>2. 2,4-Dimethylhexane. Humphrey-<br>Wilkinson, Inc., New Haven, CT.<br>Shaken with H <sub>2</sub> SO <sub>4</sub> , washed, dried<br>over Na, distilled through a<br>vacuum column.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$  |
| 298.15 3.<br>303.15 4.<br>308.15 4.<br>313.15 4.<br>The solubility values were adjusted<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calcula<br>AUXILIA<br>METHOD: Volumetric. The solvent is sa<br>urated with the gas as it flows<br>through an 8 mm x 180 cm glass spira<br>attached to a gas buret. The total<br>pressure of solute gas plus solvent<br>vapor pressure is maintained at 1 at<br>as the gas is absorbed.<br>APPARATUS/PROCEDURE: The apparatus is a<br>modification of that of Morrison and<br>Billett(1). The modifications in-  | 85 19,166<br>99 19,402<br>13 19,638<br>28 19,875<br>42 20,111<br>to a partial pressure of neon of<br>ated by the compiler.<br>RY INFORMATION<br>at-SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc. Both<br>standard and research grades<br>were used with no difference in<br>results.<br>2. 2,4-Dimethylhexane. Humphrey-<br>Wilkinson, Inc., New Haven, CT.<br>Shaken with H <sub>2</sub> SO <sub>4</sub> , washed, dried<br>over Na, distilled through a<br>vacuum column.<br>ESTIMATED ERROR:<br>6T/K = 0.05<br>6P/torr = 3<br>6X <sub>1</sub> /X <sub>1</sub> = 0.03<br>r<br>REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br>Thid 1052 2010 |

| COMPONENTS:   |   | ORIGINAL MEASUREMENTS:  |
|---|---|---|
| 1. Neon; Ne;  | 7440-01-9   | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M.  |
|   | methylpentane; C <sub>8</sub> H <sub>18</sub> ;   |   |
| 540-84-1  | meenyipencane, c8"18,   |   |
|   |   | <u>J. Phys. Chem. 1957, 61, 1078 - 108</u>  |
|   |   |   |
| VARIABLES:<br>T/K:  | 289.30 - 312.15   | PREPARED BY: P. L. Long   |
| P/kPa:  | 101.325 (1 atm)   |   |
|   |   |   |
| EXPERIMENTAL VALU   | T/K Mol Fraction  |   |
|   | $x_{1} \times 10^{4}$   | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$  |
|   | 289.30 4.32   | 5.90 6.25   |
|   | 298.15 4.61   | 6.25 6.82   |
|   | 312.15 4.96   | 6.60 7.54   |
| Smoothed Data:  | $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT$  | $\ln x_1 = 4,489.0 + 48.864 \text{ T}$  |
|   | Std. Dev. $\Delta G^\circ = 12$   | 7, Coef. Corr. = 0.9997   |
|   | $\Delta H^{\circ}/J \text{ mol}^{-1} = 4,489$   | 0.0, $\Delta S^{\circ}/J K^{-1} mol^{-1} = -48.864$   |
|   |   | $\Delta G^{\circ}/J \text{ mol}^{-1}$   |
|   | T/K Mol Fi<br>X <sub>l</sub> 3  | $10^4$  |
|   |   | 16 18,325   |
|   |   | 30         18,569           44         18,813   |
|   |   | TO 010  |
|   | 298.15 4.   | .58 19,058  |
|   | 303.15 4.   | 72 19,302   |
| The solubility  | 303.15       4.         308.15       4.         313.15       5.   | 72         19,302           86         19,546           00         19,791   |
| 101.325 kPa (]  | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.   | .72       19,302         .86       19,546         .00       19,791         Ito a partial pressure of neon of  |
| 101.325 kPa (]  | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul   | 72       19,302         86       19,546         00       19,791         1 to a partial pressure of neon of  |
| 101.325 kPa (]<br>The Bunsen coe  | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul<br>AUXILIA  | 72       19,302         86       19,546         00       19,791         1 to a partial pressure of neon of         .ated by the compiler.         ARY INFORMATION   |
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| 101.325 kPa ()<br>The Bunsen coe<br>METHOD: Volumetr<br>urated with th<br>through an 8 m<br>attached to a<br>pressure of sc   | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul<br>AUXILIA<br>ric. The solvent is solvent<br>the gas as it flows<br>m x 180 cm glass spir<br>gas buret. The total<br>plute gas plus solvent   | 72       19,302         86       19,546         90       19,791         4 to a partial pressure of neon of         .ated by the compiler.         ARY INFORMATION         Sat-         SOURCE AND PURITY OF MATERIALS:         1.       Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.   |
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| 101.325 kPa ()<br>The Bunsen coe<br>METHOD: Volumetr<br>urated with th<br>through an 8 m<br>attached to a<br>pressure of sc   | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul<br>AUXILIA<br>ric. The solvent is s<br>m x 180 cm glass spir<br>gas buret. The total<br>plute gas plus solvent<br>a is maintained at 1 a  | 72       19,302         86       19,546         90       19,791         ated by the compiler.         ARY INFORMATION         Sate         SOURCE AND PURITY OF MATERIALS:         1.       Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.         ttm       2.       2,2,4-Trimethylpentane. Enjay  |
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| 101.325 kPa ()<br>The Bunsen coe<br>METHOD: Volumetr<br>urated with th<br>through an 8 m<br>attached to a<br>pressure of sc<br>vapor pressure   | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul<br>AUXILIA<br>ric. The solvent is s<br>m x 180 cm glass spir<br>gas buret. The total<br>plute gas plus solvent<br>a is maintained at 1 a  | 72       19,302         86       19,546         90       19,791         ated by the compiler.         ARY INFORMATION         Sate         SOURCE AND PURITY OF MATERIALS:         1.       Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.         ttm       2.       2,2,4-Trimethylpentane. Enjay  |
| 101.325 kPa ()<br>The Bunsen coe<br>METHOD: Volumetr<br>urated with th<br>through an 8 m<br>attached to a<br>pressure of sc<br>vapor pressure   | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul<br>AUXILIA<br>ric. The solvent is s<br>m x 180 cm glass spir<br>gas buret. The total<br>plute gas plus solvent<br>a is maintained at 1 a  | 72       19,302         86       19,546         90       19,791         ated by the compiler.         ARY INFORMATION         Sate         SOURCE AND PURITY OF MATERIALS:         1.       Neon. Matheson Co., Inc. Both standard and research grades were used with no difference in results.         ttm       2.       2,2,4-Trimethylpentane. Enjay  |
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| 101.325 kPa ()<br>The Bunsen coe<br>METHOD: Volumetr<br>urated with th<br>through an 8 m<br>attached to a<br>pressure of sc<br>vapor pressure<br>as the gas is  | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul<br>AUXILIA<br>ric. The solvent is s<br>m x 180 cm glass spir<br>gas buret. The total<br>plute gas plus solvent<br>a is maintained at 1 a  | <pre>72 19,302<br/>86 19,546<br/>00 19,791<br/>4 to a partial pressure of neon of<br/>.ated by the compiler.<br/>ARY INFORMATION<br/>sat-SOURCE AND PURITY OF MATERIALS:<br/>1. Neon. Matheson Co., Inc. Both<br/>standard and research grades<br/>were used with no difference in<br/>results.<br/>tm<br/>2. 2,2,4-Trimethylpentane. Enjay<br/>Co., New York. Used as receive<br/>ESTIMATED ERROR:</pre>   |
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| 101.325 kPa ()<br>The Bunsen coe<br>METHOD: Volumetr<br>urated with th<br>through an 8 m<br>attached to a<br>pressure of so<br>vapor pressure<br>as the gas is<br>APPARATUS/PROCEDU<br>modification o<br>Billett(1). T<br>clude the addi<br>age for the so  | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul<br>AUXILI.<br>AUXILI.<br>ric. The solvent is a<br>he gas as it flows<br>m x 180 cm glass spir<br>gas buret. The total<br>blute gas plus solvent<br>absorbed.<br>RE: The apparatus is a<br>of that of Morrison an<br>he modifications in-<br>tion of a spiral stor<br>lyent, a manometer for   | 7219,3028619,5460019,7911 to a partial pressure of neon of.ated by the compiler.ARY INFORMATIONSat-SOURCE AND PURITY OF MATERIALS:1. Neon. Matheson Co., Inc. Both<br>standard and research grades<br>were used with no difference in<br>resultsatematical standard and research grades<br>were used with no difference in<br>resultsatematical standard and research grades<br>were used with no difference in<br>resultsatematical standard and research grades<br>were used with no difference in<br>resultsatematical standard and research grades<br>were used with no difference in<br>resultsatematical standard standard and research grades<br>were used with no difference in<br>resultsatematical standard stand |
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| 101.325 kPa ()<br>The Bunsen coe<br>METHOD: Volumetr<br>urated with th<br>through an 8 m<br>attached to a<br>pressure of so<br>vapor pressure<br>as the gas is<br>APPARATUS/PROCEDU<br>modification o<br>Billett(1). Ti<br>clude the addi<br>age for the so<br>a constant ref<br>extra buret fo<br>The solvent is                 | 303.15 4.<br>308.15 4.<br>313.15 5.<br>y values were adjusted<br>atm) by Henry's law.<br>efficients were calcul<br>AUXILI.<br>AUXILI.<br>The solvent is solvent is solvent<br>is maintained at 1 and<br>absorbed.<br>RE: The apparatus is and<br>if that of Morrison and<br>the modifications in-<br>tion of a spiral stor<br>lvent, a manometer for<br>erence pressure, and<br>r highly soluble gase<br>degassed by a modifi   | 7219,3028619,546.0019,7911 to a partial pressure of neon of.ated by the compiler.ARY INFORMATION.ated SOURCE AND PURITY OF MATERIALS:1. Neon. Matheson Co., Inc. Both<br>standard and research grades<br>were used with no difference in<br>resultsatel Source and Co., New York. Used as receive.atel ESTIMATED ERROR:<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$ .atel Co., New York. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;   |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| 1. Neon; Ne; 7440-01-9  | Clever, H. L.; Battino, R.<br>Saylor, J. H.; Gross, P. M.   |
| 2. Nonane; C <sub>9</sub> H <sub>20</sub> ; 111-84-2  |   |
|   | <u>J. Phys. Chem</u> . 1957, <u>61</u> , 1078 - 1083  |
| VARIABLES:<br>T/K: 287.15 - 312.15  | PREPARED BY:  |
| P/kPa: 101.325 (1 atm)  | P. L. Long  |
| EXPERIMENTAL VALUES:  |   |
| T/K Mol Fraction  | BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L x $10^2$   |
| 287.15 3.07   | 3.88 4.08   |
| 298.15 3.50<br>312.15 3.81  | 4.37 4.77<br>4.68 5.35  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$  | $X_{-} = 6_{-}336_{-}7 + 45_{-}083$ T   |
|   | T   |
|   | Coef. Corr. = 0.9968  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,336.7$   | , $\Delta S^{\circ}/J K^{-1} mol^{-1} = -45.083$  |
| $\frac{T/K}{X_1 \times 10}$   |   |
| 283.15 2.99   | - •   |
| 288.15 3.14<br>293.15 3.28  | 19,327<br>19,553  |
| 298.15 3.43   | 19,778  |
| 303.15 3.57<br>308.15 3.72  | 20,004<br>20,229  |
| 313.15 3.87   | 20,454  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate   |   |
| AUXILIARY   | INFORMATION   |
|   | SOURCE AND PURITY OF MATERIALS:   |
| urated with the gas as it flows<br>through an 8 mm x 180 cm glass spiral  | 1. Neon. Matheson Co., Inc. Both  |
| attached to a gas buret. The total  | standard and research grades<br>were used with no difference in   |
| pressure of solute gas plus solvent<br>vapor pressure is maintained at 1 atm  | rogulte   |
| as the gas is absorbed.   |   |
| ADDED NOTE.Makranczy, J.; Megyery-  | 2. Nonane. Phillips Petroleum Co.,<br>Bartlesville, OK. Used as   |
| Balog, K.; Rusz, L.; Patyi, L. Hung. J.   | received.   |
| Ind. Chem. 1976, 4, 269 report an<br>Ostwald coefficient of 0.047 at 298.15   |   |
| K for this system . The value was not   |   |
| used in the smoothed data fit above.  | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE: The apparatus is a   | $\delta T/K = 0.05$   |
| modification of that of Morrison and  | $\delta P/torr = 3$   |
| Billett(1) The modifications in-  |   |
| Billett(1). The modifications in-<br>clude the addition of a spiral stor-   | $\delta x_{1}/x_{1} = 0.03$   |
| clude the addition of a spiral stor-<br>age for the solvent, a manometer for  | $\delta x_{1}^{\prime} / x_{1} = 0.03$  |
| clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an   | $\delta X_1 / X_1 = 0.03$<br>REFERENCES:  |
| clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-  | δX <sub>1</sub> /X <sub>1</sub> = 0.03<br>REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br><u>J. Chem. Soc</u> . 1948, 2033; |
| clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.  | $\delta X_1 / X_1 = 0.03$ REFERENCES: 1. Morrison, T. J.; Billett, F.   |
| clude the addition of a spiral stor-<br>age for the solvent, a manometer for<br>a constant reference pressure, and an<br>extra buret for highly soluble gases.<br>The solvent is degassed by a modifi-<br>cation of the method of Baldwin and | δX <sub>1</sub> /X <sub>1</sub> = 0.03<br>REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br><u>J. Chem. Soc</u> . 1948, 2033; |

COMPONENTS: EVALUATOR: 1. Neon; Ne; 7440-01-9 H. L. Clever Chemistry Department 2. Decane; C10H22; 124-18-5 Emory University Atlanta, GA 30322 U.S.A. February 1978

CRITICAL EVALUATION:

The solubility of neon in decane was measured in three laboratories. Clever, Battino, Saylor and Gross (1) report three solubility values be-tween 289.05 and 312.15 K. Makranczy, Megyery-Balog, Rusz and Patyi (2) and Wilcock, Battino and Danforth (3) each report one solubility value near 298 K.

The solubility value of Makranczy et al. (Ostwald coefficient 4.5 x  $10^{-2}$  and mole fraction 3.6 x  $10^{-4}$  at 298.15 K) agrees well with the value of Clever et al., but it is reported to only two significant figures.

The solubility values of Clever et al. and Wilcock et al. differ by 3.9 percent at 298.15 K which is within the estimated error of the two laboratories. The Wilcock et al. solubility determination uses an improved de-gassing procedure, and improved control of temperature and pressure. Their solubility value should be considered the more reliable. It is a mole fraction of  $3.430 \times 10^{-4}$  at 298.27 K.

Without other solubility values to compare at several temperatures it is not possible to recommend values of solubility and thermodynamic changes. We have used the data of Clever <u>et al</u>. and Wilcock <u>et al</u>. on a one to one weight basis to obtain a tentative set of solubility data and changes in thermodynamic properties. The discussion above indicates the tentative solubility values may be 2 percent or more high.

The tentative values for the transfer of one mole of neon from the gas at a pressure of 101.325 kPa to the hypothetical unit mole fraction solution are

> $\Delta G^{\circ}/J \mod^{-1} = -RT \ln X_1 = 6,536.6 + 44.288 T$ Std. Dev.  $\Delta G^{\circ} = 44.2$ , Coef. Corr. = 0.9946  $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,536.6, \quad \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -44.288$

The tentative solubility values and Gibbs energy change as a function of temperature are in Table 1.

TABLE 1. The solubility of neon in decane. Tentative values of the mole fraction solubility at 101.325 kPa and the Gibbs energy change as a function of temperature.

| T/K    | Mol Fraction $X_1 \times 10^4$ | ΔG°/J mol <sup>-1</sup> |
|--------|--------------------------------|-------------------------|
| 288,15 | 3.17                           | 19,298                  |
| 288.15 | 3.33                           | 19,298                  |
| 298.15 | 3.48                           | 19,741                  |
| 303.15 | 3.63                           | 19,962                  |
| 308.15 | 3.79                           | 20,184                  |
| 313.15 | 3.95                           | 20,405                  |

Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. J. Phys. Chem. 1. 1957, 61, 1078.

Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. 2.

<u>Chem</u>. 1976, 4, 269. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. J. <u>Chem</u>. <u>Thermodyn</u>. 1978, <u>10</u>, 817. 3.

|  |   | ORIGINAL MEASUREMENTS:  |  |
|--|---|---|--|
| <ol> <li>Neon; Ne;</li> </ol>  | 7440-01-9   | Clever, H.L.; Battino, R.;  |  |
| 2. Decane; C <sub>1</sub>  | Haa: 124-18-5   | Saylor, J.H.; Gross, P.M.   |  |
|  | 0-227   |   |  |
|  |   | J. Phys Chem. 1957, 61, 1078-10   | 083.                                     |
|  |   |   |  |
| VARIABLES:   |   | PREPARED BY:  |  |
| T/K:   | 289.05 - 312.15   | P.L. Long   |  |
| P/kPa:   | 101.325 (1 atm)   |   |  |
| EXPERIMENTAL VALU  | ES:   |   |  |
|  | T/K Mol Fraction  | Bunsen Ostwald  |  |
|  |   | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$  |  |
|  | $x_1 \times 10^4$   | $\alpha \times 10^{-1}$ L $\times 10^{-1}$  |  |
|  | 289.05 3.18   | 3.68 3.89   |  |
|  | 298.15 3.57   | 4.07 4.44   |  |
|  | 312.15 3.90   | 4.39 5.02   |  |
| Smoothed Data:   | $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln$  | X <sub>1</sub> = 6460.8 + 44.500 T  |  |
|  | Std. Dev. $\Delta G^{O} = 44.8$ ,   | 1   |  |
|  | Stu. Dev. 46 - 44.8,  | COEL. COLL 0.9983   |  |
|  | fficients were calculat   | ed by the compiler.   |  |
|  | tion of neon + decane fo<br>olubility values.   | or the recommended Gibbs energy e   | equatio                                  |
|  | olubility values.   | or the recommended Gibbs energy e   | equation                                 |
| and smoothed s   | olubility values.   | INFORMATION   | equatio                                  |
| And smoothed so<br>METHOD:<br>Volumetric.<br>rated with the<br>an 8 mm x 180<br>to a gas buret<br>solute gas plu                                 | olubility values.   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc.<br>h standard and research grade<br>were used with no difference<br>f results.   | Both<br>es<br>ce in<br>n, Inc.           |
| And smoothed so<br>METHOD:<br>Volumetric.<br>rated with the<br>an 8 mm x 180<br>to a gas buret<br>solute gas plu<br>is maintained a<br>absorbed. | AUXILIARY<br>The solvent is satu-<br>gas as it flows throug<br>cm glass spiral attached.<br>The total pressure o<br>s solvent vapor pressure<br>at 1 atm as the gas is  | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. h standard and research grade were used with no difference f results. 2. Decane. Humphrey-Wilkinsor Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, distilled. ESTIMATED ERROR:</pre>   | Both<br>es<br>ce in<br>n, Inc.           |
| APPARATUS/PROCEDU<br>The apparatu  | AUXILIARY<br>The solvent is satu-<br>gas as it flows throug<br>cm glass spiral attached.<br>The total pressure o<br>s solvent vapor pressure<br>at 1 atm as the gas is  | Y INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc.<br>standard and research grade<br>were used with no difference<br>f results.<br>2. Decane. Humphrey-Wilkinsor<br>Shaken with $H_2SO_4$ , washed,<br>distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$   | Both<br>es<br>ce in<br>n, Inc.           |
| APPARATUS/PROCEDU<br>The apparatu<br>that of Morrisc<br>a spiral storag<br>manometer for a<br>pressure, and a<br>highly soluble                  | AUXILIARY<br>The solvent is satu-<br>gas as it flows throug<br>cm glass spiral attached<br>. The total pressure o<br>s solvent vapor pressure<br>at 1 atm as the gas is<br>RE:<br>ns is a modification of<br>on and Billett(1). The | INFORMATION         SOURCE AND PURITY OF MATERIALS:         1. Neon. Matheson Co., Inc.         standard and research graded         were used with no difference         f         results.         2. Decane. Humphrey-Wilkinson         Shaken with $H_2SO_4$ , washed,         distilled.         ESTIMATED ERROR: $\delta T/K = 0.05$ $\delta P/torr = 3$ $\delta X_1/X_1 = 0.03$ REFERENCES:         1. Morrison, T.J.; Billett, F.         J. Chem. Soc. 1948, 2033: | Both<br>es<br>ce in<br>a, Inc.<br>dried, |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 Wilcock, R.J.; Battino, R.; 1. Danforth, W.F; Wilhelm, E. 2. Decane; C<sub>10</sub>H<sub>22</sub>; 124-18-5 J. Chem. Thermodyn. 1978, 10, 817-822 VARIABLES: PREPARED BY: T/K: 298.24 A.L. Cramer P/kPa: 101.325 (1 atm) **EXPERIMENTAL VALUES:** T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $x_1 \times 10^4$  $\alpha \times 10^2$  $L \times 10^2$ 298.24 3.430 3.928 4.288 See the evaluation of neon + decane for recommended Gibbs energy equation and smoothed solubility values. The solubility value was adjusted to a partial pressure of neon of 101.325  $\ensuremath{kPa}$  by Henry's law. The Bunsen coefficients were calculated by the compiler. A preliminary report of this work appeared in Conf. Int. Thermodyn. Chim., {C.R.}, 4th 1975, 6, 122 - 128; Chem. Abstr. 1977, 86, 22375d. AUXILIARY INFORMATION METHOD /APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: The apparatus is based on the de-1. Neon. Matheson Co. Inc. sign of Morrison and Billett (1), and Purest commercially available the version used is described by Battino, Evans, and Danforth (2). grade. The degassing apparatus and procedure are 2. Decane. Phillips Petroleum Co. described by Battino, Banzhof, Bogan, and Wilhelm (3). See neon + octane data sheet for 99 mol per cent minimum. more details. ESTIMATED ERROR:  $\delta T/K = 0.03$  $\delta P/mmHg = 0.5$  $\delta X_1 / X_1 = 0.02$ **REFERENCES**: 1.Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033. 2.Battino,R.;Evans,F.D.;Danforth,W.F. J.Am.Oil Chem. Soc. 1968, 45, 830. 3.Battino,R.;Banzhof,M.;Bogan, M.; Wilhelm,E. Anal. Chem. 1971, 43, 806.

| COMPONENTS:  | ODICINAL NEACUDELENTS   |
|--|---|
|  | ORIGINAL MEASUREMENTS:  |
| 1. Neon; Ne; 7440-01-9                                   | Makranczy, J.; Megyery-Balog, K.;<br>Rusz, L.; Patyi, L.  |
| 2. Undecane; C <sub>11</sub> H <sub>24</sub> ; 1120-21-4 |   |
|  |   |
|  | Hung. J. Ind. Chem. 1976, 4, 269-280.   |
| VARIABLES:   | PREPARED BY:  |
| T/K: 298.15  |   |
| P/kPa: 101.325 (1 atm)                                   | S. A. Johnson   |
| EXPERIMENTAL VALUES:                                     |   |
| T/K Mol Fraction   | Bunsen Ostwald  |
| $x_{1} \times 10^{4}$                                    | $\begin{array}{ccc} \text{Coefficient} & \text{Coefficient} \\ \alpha \times 10^2 & \text{L} \times 10^2 \end{array}$ |
| $\frac{1}{298.15}$ 3.7                                   | 3.9 4.3   |
|  |   |
| The mole fraction and Bunsen coefficie                   | ent were calculated by the compiler.  |
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| AUXILIARY  | INFORMATION   |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:   |
| Volumetric method. The apparatus of                      | Both the gas and liquid were analyti-   |
| Bodor, Bor, Mohai, and Sipos (1) was used.               | cal grade reagents of Hungarian or foreign origin. No further informa-  |
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| APPARATUS/PROCEDURE:                                     | ESTIMATED ERROR:  |
| ALIMATOD/LAUGDURE;                                       | $\delta x_1 / x_1 = 0.03$   |
|  | - 1   |
|  | DEEEDENCES .  |
|  | REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;   |
|  | Sipos, G.   |
|  | Veszpremi Vegyip. Egy. Kozl.<br>1957, 1, 55;  |
|  | <u>Chem. Abstr</u> . 1961, <u>55</u> , 3175h.   |
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COMPONENTS: ORIGINAL MEASUREMENTS: Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. Neon; Ne; 7440-01-9 1. 2. Dodecane; C12H26; 112-40-3 J. Phys. Chem. 1957, 61, 1078 - 1083. VARIABLES: PREPARED BY: T/K: 289.05 - 312.15 P. L. Long P/kPa: 101.325 (1 atm) EXPERIMENTAL VALUES: T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $X_1 \times 10^4$  $\alpha \times 10^2$  $L \times 10^2$ 2.81 289.05 2.77 2.93 298.15 3.24 3.18 3.47 3.39 312.15 3.50 3.87 Smoothed Data:  $\Delta G^{\circ}/J \mod^{-1} = - RT \ln X_1 = 6,855.7 + 44.092 T$ Std. Dev. ∆G° = 73.6, Coef. Corr. = 0.9899  $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,855.7, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -44.092$ ∆G°/J mol<sup>-1</sup> T/K Mol Fraction  $X_1 \times 10^{4}$ 288.15 19,561 2.84 293.15 2.99 19,781 20,002 298.15 3.13 303.15 20,222 3.28 20,443 308.15 3.43 313.15 3.58 20,663 The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: Volumetric. The solvent is sat-SOURCE AND PURITY OF MATERIALS: urated with the gas as it flows 1. Neon. Matheson Co., Inc. Both through an 8 mm x 180 cm glass spiral standard and research grades attached to a gas buret. The total pressure of solute gas plus solvent were used with no difference in results. vapor pressure is maintained at 1 atm as the gas is absorbed. 2. Dodecane. Humphrey-Wilkinson, Inc. Shaken with  $H_2SO_4$ , washed, dried over Na. ADDED NOTE. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.040 at 298.15 K for this system. The value was not used in the smoothed data fit above. ESTIMATED ERROR: APPARATUS/PROCEDURE: The apparatus is a  $\delta T/K = 0.05$ modification of that of Morrison and  $\delta P/torr = 3$  $\delta X_1 / X_1 = 0.03$ Billett(1). The modifications include the addition of a spiral storage for the solvent, a manometer for **REFERENCES**: a constant reference pressure, and an Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid.1952, 3819. extra buret for highly soluble gases. 1. The solvent is degassed by a modification of the method of Baldwin and Daniel (2). 2. Baldwin, R. R.; Daniel, S. G. J. Appl. Chem. 1952, 2, 161.

| COMPONENTS :  | ORIGINAL MEASUREMENTS:   |  |  |
|---|--|--|--|
| 1. Neon; Ne; 7440-01-9  | Makranczy, J.; Megyery-Balog, K.;  |  |  |
| 2. Tridecane; C <sub>13</sub> H <sub>28</sub> ; 629-50-5  | Rusz, L.; Patyi, L.  |  |  |
| 2. 111acoune, 01328, 010 00 0   |  |  |  |
|   |  |  |  |
|   | <u>Hung. J. Ind. Chem</u> . 1976, <u>4</u> , 269-280.  |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)   | S. A. Johnson  |  |  |
| -   |  |  |  |
| EXPERIMENTAL VALUES:  |  |  |  |
| T/K Mol Fraction  | Bunsen Ostwald<br>Coefficient Coefficient  |  |  |
| $x_{1} \times 10^{4}$   | $\alpha \times 10^2$ L $\times 10^2$   |  |  |
| 298.15 3.6  | 3.3 3.6  |  |  |
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| The mole fraction and Bunsen coeffici   | ent were calculated by the compiler.   |  |  |
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| AUXILIARY   | INFORMATION  |  |  |
|   | INFORMATION  |  |  |
| ME THOD:  | SOURCE AND PURITY OF MATERIALS:  |  |  |
| METHOD:<br>Volumetric method. The apparatus of  | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-   |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or   |  |  |
| METHOD:<br>Volumetric method. The apparatus of  | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or   |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.   |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was          | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.   |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.   |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.   |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:   |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G.  |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;<br>Sipos, G.<br>Veszpremi Vegyip. Egy. Kozl.                 |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;<br>Sipos, G.<br>Veszpremi Vegyip. Egy. Kozl.<br>1957, 1, 55; |  |  |
| METHOD:<br>Volumetric method. The apparatus of<br>Bodor, Bor, Mohai, and Sipos (1) was<br>used. | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analytical grade reagents of Hungarian or foreign origin. No further information.<br>ESTIMATED ERROR:<br>$\delta X_1/X_1 = 0.03$<br>REFERENCES:<br>1. Bodor, E.; Bor, Gy.; Mohai, B.;<br>Sipos, G.<br>Veszpremi Vegyip. Egy. Kozl.                 |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Clever, H. L.; Battino, R.; 1. Neon; Ne; 7440-01-9 Saylor, J. H.; Gross, P. M. Tetradecane; C14H30; 629-59-4 2. J. Phys. Chem. 1957, 61, 1078 - 1083. VARIABLES: PREPARED BY: T/K: 289.05 - 313.25 P. L. Long P/kPa: 101.325 (1 atm) EXPERIMENTAL VALUES: Mol Fraction Bunsen Ostwald T/K Coefficient Coefficient  $x_1 \times 10^4$ a x 10<sup>2</sup>  $L \times 10^2$ 289.05 3.00 2.66 2.82 3.24 2.90 3.16 298.15 313.25 3.63 3.16 3.62 Smoothed Data:  $\Delta G^{\circ}/J \mod^{-1} = - RT \ln X_1 = 5,920.3 + 46.956 T$ Std. Dev.  $\Delta G^{\circ} = 2.3$ , Coef. Corr. = 0.9999 $\Delta H^{\circ}/J \text{ mol}^{-1} = 5,920.3 \quad \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -46.956$ Mol Fraction  $\Delta G^{\circ}/J \text{ mol}^{-1}$ X<sub>1</sub> x 10<sup>4</sup> T/K 288.15 2.98 19,451 3.11 293.15 19,685 3.24 298.15 19,920 20,155 303.15 3.37 308.15 3.50 20,390 313.15 3.63 20,624 318.15 3.76 20,859 The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: Volumetric. The solvent is sat-urated with the gas as it flows SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Both urated with the gas as it flows standard and research grades through an 8 mm x 180 cm glass spiral attached to a gas buret. The total were used with no difference in results. pressure of solute gas plus solvent vapor pressure is maintained at 1 atm 2. Tetradecane. Humphrey-Wilkinson, as the gas is absorbed. Inc. Shaken with H<sub>2</sub>SO<sub>4</sub>, washed, ADDED NOTE.Makranczy, J.; Megyerydried over Na. Balog, K.; Rusz, L.; Patyi, L. Hung. J. Ind. Chem. 1976, 4, 269 report an Ostwald coefficient of 0.033 at 298.15 K for this system. The value was not used in the smoothed data fit above. ESTIMATED ERROR: APPARATUS/PROCEDURE: The apparatus is a  $\delta T/K = 0.05$ modification of that of Morrison and  $\delta P/torr = 3$ Billett(1). The modifications in- $\delta X_1 / X_1 = 0.03$ clude the addition of a spiral storage for the solvent, a manometer for **REFERENCES**: a constant reference pressure, and an extra buret for highly soluble gases. 1. Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; ibid.1952, 3819. The solvent is degassed by a modification of the method of Baldwin and Daniel (2). Baldwin, R. R.; Daniel, S. G. 2. J. Appl. Chem. 1952, 2, 161.

| COMPONENTS:  |                                       |   | ORIGINAL MEASUREMENTS:   |
|--|---------------------------------------|---|--|
| 1. Neon; Ne;   | 7440-01-9                             |   | Makranczy, J.; Megyery-Balog, K.;  |
| 2. Pentadecane; C <sub>15</sub> H <sub>32</sub> ; 629-62-9 |                                       | 629-62-9  | Rusz, L.; Patyi, L.  |
| or   |                                       |   |  |
| Hexadecane   | ; C <sub>16</sub> H <sub>34</sub> ; 5 | 544-76-3  | Hung. J. Ind. Chem. 1976, 4, 269-280.  |
| VARIABLES:   |                                       |   | PREPARED BY:   |
| T/K: 2<br>P/kPa: ]   | 298.15<br>101.325 (1                  | atm)  | S. A. Johnson  |
| EXPERIMENTAL VALUES  |                                       |   | • • • • • • • • • • • • • • • • • • •  |
|  | Т/К Мо                                | ol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup> | BunsenOstwaldCoefficientCoefficient $\alpha \times 10^2$ L $\times 10^2$   |
|  |                                       | Pentadecan                                      | e; C <sub>15</sub> H <sub>32</sub> ; 629-62-9  |
|  | 298.15                                | 3.5   | 2.8 3.1  |
|  |                                       | Hexadecane                                      | ; C <sub>16</sub> H <sub>34</sub> ; 544-76-3   |
|  | 298.15                                | 3.2   | 2.5 2.7  |
|  | · · · · · · · · · · · · · · · · · · · |   | ent were calculated by the compiler.   |
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|  |                                       |   |  |
|  |                                       | AUXILIARY                                       | INFORMATION  |
| METHOD:  |                                       | AUXILIARY                                       | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:   |
| METHOD:<br>Volumetric meth<br>Bodor, Bor, Moh<br>used.     |                                       | apparatus of                                    |  |
| Volumetric meth<br>Bodor, Bor, Moh<br>used.                | nai, and Si                           | apparatus of                                    | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-          |
| Volumetric meth<br>Bodor, Bor, Moh                         | nai, and Si                           | apparatus of                                    | SOURCE AND PURITY OF MATERIALS:<br>Both the gas and liquid were analyti-<br>cal grade reagents of Hungarian or<br>foreign origin. No further informa-<br>tion. |

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| COMPONENTS:   | EVALUATOR:   |
|---|--|
| <ol> <li>Neon; Ne; 7440-01-9</li> <li>Cyclohexane; C<sub>6</sub>H<sub>12</sub>; 110-82-7</li> </ol> | H. L. Clever<br>Chemistry Department<br>Emory University |
|   | Atlanta, Georgia 30322<br>U. S. A.<br>January 1978       |

CRITICAL EVALUATION:

The solubility of neon in cyclohexane was measured at three laboratories. Lannung (1) reported seven solubility values between 288.15 and 303.15 K; Clever, Battino, Saylor and Gross (2) reported three values between 287.15 and 312.15 K; and Dymond (3) reported four solubility values between 292.97 and 310.50 K.

Each data set was smoothed by the method of least squares fit to a Gibbs energy equation linear in temperature. The Lannung and Dymond smoothed solubility values differed by 5 - 5.5 percent over the temperature range of 288.15 - 303.15 K, while the Clever, Battino, Saylor and Gross smoothed solubility values ranged lower than the Dymond data from 2.4 per cent at 288.15 K to 12 per cent at 313.15 K. The three data sets were combined in one least square fit to a Gibbs energy equation that was linear in temperature. No solubility value was over two standard deviations from the fit-ted equation, but of the 14 solubility values five were of greater magnitude than the fitted line and nine were of lesser magnitude. An arbitrary decision was made to drop the two lowest values both of which were from the same paper (2). The twelve data points were used to obtain the recommended equation.

The recommended thermodynamic values for the transfer of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

> $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 9661.6 + 39.074 T$ Std. Dev. ΔG° = 63, Coef. Corr. = 0.9778

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 9661.6, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -39.074$ 

Table 1 contains the recommended values of the mole fraction solubility and the Gibbs energy at five degree intervals between 283.15 and 313.15 K.

TABLE 1. Solubility of neon in cyclohexane at 101.325 kPa. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

| T/K    | Mol Fraction <sup>a</sup><br>X <sub>l</sub> x 10 <sup>4</sup> | ∆G°/J mol <sup>-1</sup> |
|--------|---|-------------------------|
| 283.15 | 1.500   | 20,725                  |
| 288.15 | 1.615   | 20,921                  |
| 293.15 | 1.730   | 21,116                  |
| 298.15 | 1.845   | 21,312                  |
| 303.15 | 1.970   | 21,507                  |
| 308.15 | 2.095   | 21,702                  |
| 313.15 | 2.225   | 21,898                  |
|        |   |                         |

<sup>a</sup>rounded to the nearest 0.005 x  $10^{-4}$ .

1.

Lannung, A. J. <u>Am. Chem. Soc. 1930, 52, 68.</u> Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. <u>J. Phys. Chem</u>. 2. 1957, <u>61</u>, 1078.

3. Dymond, J. H. J. Phys. Chem. 1967, 71, 1829.

| OMPONENTS:  |  | ORIGINAL MEASUREMENTS:  |   |   |   |
|---|--|---|---|---|---|
|   |  |   |   |   |   |
| 1. Neon; Ne; 7440-01-9  |  | Lannung, A.   | •   |   |   |
| 2. Cyclohexane; C <sub>6</sub> H <sub>12</sub> ; 110-82-7   |  |   |   |   |   |
|   |  | J. Am. Chen   | <u>n. Soc</u> . 1930, <u>52</u>   | 2, 68 - 80.   |   |
| VARIABLES:  |  |   | PREPARED BY:  |   |   |
| T/K: 2<br>Ne P/kPa: ]   | 288.15 - 303<br>101.325 (l a   |   |   | P. L. Long  |   |
| EXPERIMENTAL VALU   | ES:  |   |   |   |   |
|   | T/K MO   | l Fraction  | Bunsen  | Ostwald   |   |
|   |  | $x_1 \times 10^4$   | Coefficient $\alpha \times 10^2$  | Coefficient<br>L x 10 <sup>2</sup>  |   |
|   | 288.15   | $\frac{x_1 \times 10}{1.60}$  | 3.34  | 3.52  |   |
|   | 288.15   | 1.57  | 3.27  | 3.45  |   |
|   | 293.15   | 1.71  | 3.54  | 3.80  |   |
|   | 293.15   | 1.70  | 3.53  | 3.79  |   |
|   | 298.15   | 1.81  | 3.73  | 4.07  |   |
|   | 303.15   | 1.92  | 3.93  | 4.36  |   |
|   | 303.15   | 1.91  | 3.91  | 4.34  | -   |
| Smoothed Data:  | ∆G°/J mol  | 1 = - RT ln   | $x_1 = 9,092.5$   | 5 + 41.164 T  |   |
|   | Std. Dev.  | ∆G° = 16.9,   | Coef. Corr.   | . = 0.9979  |   |
| The solubility<br>101.325 kPa (1<br>The mole fracts   | values were<br>atm) by Hen   | in cyclohexa<br>adjusted to<br>ry's law.  | nne.<br>5 a partial p   | e the critical e<br>pressure of neor<br>ficient were cal  | n of  |
| The solubility<br>101.325 kPa (1<br>The mole fracti   | values were<br>atm) by Hen   | in cyclohexa<br>adjusted to<br>ry's law.  | nne.<br>5 a partial p   | pressure of neor  | n of .  |
| The solubility<br>101.325 kPa (1<br>The mole fracts   | values were<br>atm) by Hen   | in cyclohexa<br>adjusted to<br>ry's law.<br>ty and the C  | nne.<br>5 a partial p   | pressure of neor  | n of  |
| The solubility<br>101.325 kPa (1  | values were<br>atm) by Hen   | in cyclohexa<br>adjusted to<br>ry's law.<br>ty and the C  | nne.<br>> a partial p<br>Ostwald coeff<br>INFORMATION   | pressure of neor  | n of<br>Lculated by   |
| The solubility<br>101.325 kPa (1)<br>The mole fract:<br>the compiler.<br>METHOD:<br>Gas absorption.<br>rated with solv<br>volume absorbed<br>between initial  | values were<br>atm) by Hen<br>ion solubili<br>. The gas i<br>vent vapor.<br>d is the dif<br>l and final  | in cyclohexa<br>e adjusted to<br>ry's law.<br>.ty and the C<br>AUXILIARY<br>AUXILIARY<br>.s presatu-<br>The gas<br>ference<br>gas vol-  | INFORMATION<br>SOURCE AND PU<br>I. Neon.<br>Of heli   | Pressure of neor<br>ficient were cal<br>WRITY OF MATERIALS:<br>Linde's Liquid<br>ned one percent  | A of<br>Loulated by   |
| The solubility<br>101.325 kPa (1<br>The mole fract:<br>the compiler.<br>METHOD:<br>Gas absorption.<br>rated with solv<br>volume absorbed  | values were<br>atm) by Hen<br>ion solubili<br>. The gas i<br>vent vapor.<br>d is the dif<br>l and final<br>unt of solve  | in cyclohexa<br>adjusted to<br>ry's law.<br>ty and the C<br>AUXILIARY<br>AUXILIARY<br>The gas<br>ference<br>gas vol-<br>int is deter-   | INFORMATION<br>SOURCE AND PU<br>1. Neon.<br>Contair<br>of heli<br>2. Cyclohe<br>Shaken<br>washed,<br>led fro<br>first c   | Pressure of neor<br>ficient were cal<br>WRITY OF MATERIALS:<br>Linde's Liquid<br>ned one percent  | Air Factory<br>by volume<br>Frères.<br>504, water<br>55. Distil-                          |
| The solubility<br>101.325 kPa (1<br>The mole fract:<br>the compiler.<br>METHOD:<br>Gas absorption.<br>rated with solv<br>volume absorbed<br>between initial<br>umes. The amou<br>mined by the we<br>placed.   | values were<br>atm) by Hen<br>ion solubili<br>. The gas i<br>vent vapor.<br>d is the dif<br>l and final<br>unt of solve<br>eight of mer  | in cyclohexa<br>adjusted to<br>ry's law.<br>.ty and the C<br>AUXILIARY<br>.s presatu-<br>The gas<br>ference<br>gas vol-<br>.nt is deter-<br>cury dis-   | INFORMATION<br>SOURCE AND PU<br>1. Neon.<br>Contair<br>of heli<br>2. Cyclohe<br>Shaken<br>washed,<br>led fro<br>first c   | PRITY OF MATERIALS:<br>Linde's Liquid<br>ned one percent<br>ium.<br>exane. Poulenc<br>with fuming H <sub>2</sub> S<br>, dried over P <sub>2</sub> O<br>om P <sub>2</sub> O <sub>5</sub> with re-<br>quarter. Distil<br>. m.p. 6.3° C. | Air Factory<br>by volume<br>Frères.<br>504, water<br>55. Distil                           |
| The solubility<br>101.325 kPa (1<br>The mole fracti<br>the compiler.<br>METHOD:<br>Gas absorption.<br>rated with solv<br>volume absorbed<br>between initial<br>umes. The amou<br>mined by the we<br>placed.<br>APPARATUS/PROCEDU:<br>modification of<br>(1). A calibra<br>manometer and b | values were<br>atm) by Hen<br>ion solubili<br>. The gas i<br>vent vapor.<br>d is the dif<br>l and final<br>unt of solve<br>eight of mer<br>RE: The appar<br>f that of vo<br>ated, combin<br>bulb is encl   | in cyclohexa<br>adjusted to<br>ry's law.<br>.ty and the C<br>AUXILIARY<br>.s presatu-<br>The gas<br>ference<br>gas vol-<br>ent is deter-<br>cury dis-   | INFORMATION<br>SOURCE AND PU<br>1. Neon.<br>Contair<br>of heli<br>2. Cyclohe<br>Shaken<br>washed,<br>led fro<br>first o<br>sodium.  | PRITY OF MATERIALS:<br>Linde's Liquid<br>ned one percent<br>ium.<br>exane. Poulenc<br>with fuming H <sub>2</sub> S<br>, dried over P <sub>2</sub> O<br>om P <sub>2</sub> O <sub>5</sub> with re-<br>quarter. Distil<br>. m.p. 6.3° C. | Air Factor<br>by volume<br>Frères.<br>504, water<br>55. Distil                            |
| The solubility<br>101.325 kPa (1<br>The mole fracti<br>the compiler.<br>METHOD:<br>Gas absorption.<br>rated with solu-<br>volume absorbed<br>between initial<br>umes. The amou<br>mined by the we   | values were<br>atm) by Hen<br>ion solubili<br>. The gas i<br>vent vapor.<br>d is the dif<br>l and final<br>unt of solve<br>eight of mer<br>RE: The appar<br>f that of vo<br>ated, combin<br>bulb is encl<br>. Mercury i<br>n and confin<br>degassed in<br>lvent and th | in cyclohexa<br>adjusted to<br>ry's law.<br>.ty and the C<br>AUXILIARY<br>.s presatu-<br>The gas<br>ference<br>gas vol-<br>.nt is deter-<br>cury dis-<br>cury d | INFORMATION<br>Source AND PU<br>1. Neon.<br>Contair<br>of heli<br>2. Cyclohe<br>Shaken<br>washed,<br>led fro<br>first of<br>sodium.<br>ESTIMATED ERR<br>REFERENCES:<br>1. v. Anta | PRITY OF MATERIALS:<br>Linde's Liquid<br>ned one percent<br>ium.<br>exane. Poulenc<br>with fuming H2S<br>, dried over P2C<br>om P2O5 with re-<br>quarter. Distil<br>. m.p. 6.3° C.  | Air Factor<br>by volume<br>Frères.<br>504, water<br>55. Distil-<br>jection of<br>led from |

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| COMPONENTS:   |  |  | ORIGINAL MEASU   | UREMENTS:   |
|---|--|--|--|---|
| 1. Neon; Ne; 7440-01-9  |  | Clever, H. L.; Battino, R.;                            |  |   |
|   |  |  | Clever, H. L.; Battino, R.;<br>Saylor, J. H.; Gross, P. M. |   |
| VARIABLES:  |  | J. Phys. Ch<br>PREPARED BY:                            | <u>tem</u> . 1957, <u>61</u> , 1078 - 1083.                |   |
|   | 87.15 - 312<br>01.325 (1                                 |  |  | . L. Long   |
| EXPERIMENTAL VALUE  | s:   |  | 1  |   |
|   | -  | 1 Fraction $X_1 \times 10^4$                           | Bunsen<br>Coefficient<br>a x 10 <sup>2</sup>               | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>   |
|   | 287.15<br>298.15<br>312.15                               | 1.65<br>1.74<br>2.02                                   | 3.46<br>3.59<br>4.10                                       | 3.64<br>3.92<br>4.69  |
| Smoothed Data:  |  |  |  |   |
|   | Std. Dev.  | $\Delta G^{\circ} = 57.2,$                             | Coef. Corr.  | = 0.9960  |
| solubility of r   | eon in cycl  | ohexane.   |  | critical evaluation of the  |
| kPa (l atm) by  |  |  | a partiai p  | pressure of neon of 101.325   |
| The Bunsen coef   |  |  |  |   |
|   | ······   | AUXILIARY  | INFORMATION  |   |
| METHOD: Volumet   | ic. The so   | lvent is sat   | SOURCE AND PUL   | RITY OF MATERIALS:  |
| urated with gas<br>an 8 mm x 180 c<br>tached to a gas<br>pressure is mai<br>gas is absorbed                     | as it flow<br>m glass spi<br>buret. Th<br>ntained at     | vs through<br>Fral at-<br>ne total                     | 1. Neon.<br>search   | Matheson Co. Both re-<br>and standard grades were<br>th no difference in re-  |
|   |  |  | 2. Cyclohe<br>Co. Us                                       | exane. Phillips Petroleum<br>sed as received.   |
| APPARATUS/PROCEDU<br>modification of<br>Billett (1). Th<br>clude the addit<br>age for the so<br>a constant refe | that of Mo<br>ne modificat<br>ion of a sp<br>vent, a mar | orrison and<br>cions in-<br>piral stor-<br>nometer for | ESTIMATED ERR  | OR:<br>$\delta T/K = 0.05$<br>$\delta P/torr = 3$<br>$\delta X_1/X_1 = 0.03$  |
| extra buret for<br>The solvent is<br>cation of the r<br>Daniel (2).   | highly sol<br>degassed by                                | uble gases.<br>/ a modifi-                             | J. <u>Chem</u><br><u>ibid</u> .<br>2. Baldwir              | on, T. J.; Billett, F.<br>n. <u>Soc</u> . 1948, 2033;<br>1952, 3819.<br>n, R. R.; Daniel, S. G.<br><u>1. Chem</u> . 1952, <u>2</u> , 161. |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |  |  |
|--|--|--|--|
| 1. Neon; Ne; 7440-01-9   | Dymond, J. H.  |  |  |
| 2. Cyclohexane; C <sub>6</sub> H <sub>12</sub> ; 110-82-7                        |  |  |  |
|  | <u>J. Phys</u> . <u>Chem</u> . 1967, <u>71</u> , 1829 - 1831.                          |  |  |
| VARIABLES:   | PREPARED BY:   |  |  |
| T/K: 292.97 - 310.50<br>P/kPa: 101.325 (l atm)                                   | M. E. Derrick  |  |  |
| EXPERIMENTAL VALUES:   |  |  |  |
| T/K Mol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup>                             | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \ge 10^2$ L $\ge 10^2$            |  |  |
| $\frac{1}{292.97}$ 1.79  | 3.71 3.98  |  |  |
| 299.55 1.93  | 3.97 4.35  |  |  |
| 304.75 2.04<br>310.50 2.20   | 4.17 4.65<br>4.47 5.08   |  |  |
|  |  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT \ln$                          | -  |  |  |
| Std. Dev. $\Delta G^\circ = 12.5$ ,  | Coef. Corr. = 0.9992   |  |  |
| See the evaluation of neon + cyclohexa<br>equation and smoothed solubility value |  |  |  |
| The Bunsen and Ostwald coefficients we   | ere calculated by the compiler.  |  |  |
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| AUXILIARY  | INFORMATION  |  |  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS:  |  |  |
| Saturation of liquid with gas at par-<br>tial pressure of gas equal to 1 atm.    | l. Neon. Matheson Co. Dried.   |  |  |
| crar properto or gab offer to r acent  | 2. Cyclohexane. Matheson, Coleman  |  |  |
|  | and Bell chromatoquality reagent.<br>Dried and fractionally frozen.                    |  |  |
|  | m.p. 6.45° C.  |  |  |
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|  |  |  |  |
| APPARATUS/PROCEDURE:   | ESTIMATED ERROR:   |  |  |
| Dymond-Hildebrand apparatus (1) using  | $\delta x_1 / x_1 = 0.01$  |  |  |
| an all-glass pumping system to spray   |  |  |  |
| slugs of degassed solvent into the gas. Amount of gas dissolved calcu-           | REFERENCES:  |  |  |
| lated from initial and final gas   |  |  |  |
| pressures.   | <ol> <li>Dymond, J.; Hildebrand, J. H.<br/>Ind. Eng. Chem. Fundam. 1967, 6,</li> </ol> |  |  |
|  | 130.   |  |  |
|  |  |  |  |
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| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |  |
|--|--|--|
|  | Clever, H. L.; Saylor, J. H.   |  |
| 1. Neon; Ne; 7440-01-9   | Gross, P. M.   |  |
| 2. Methylcyclohexane; C <sub>7</sub> H <sub>14</sub> ;                         |  |  |
| 108-87-2   | J. Phys. Chem. 1958, 62, 89 - 91.  |  |
|  | <u> </u>   |  |
| VARIABLES:   | PREPARED BY:   |  |
| T/K: 289.15 - 316.25   | P. L. Long   |  |
| P/kPa: 101.325 (1 atm)   |  |  |
| EXPERIMENTAL VALUES:   |  |  |
| T/K Mol Fraction   | Bunsen Ostwald   |  |
| $x_1 \times 10^4$  | Coefficient Coefficient<br>$\alpha \ge 10^2$ L $\ge 10^2$  |  |
| 289.15 2.11  | 3.73 3.95  |  |
| 303.15 2.34<br>316.25 2.82   | 4.09 4.54<br>4.85 5.62   |  |
|  |  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$                | $x_1 = 8,148.8 + 42.336 T$   |  |
| Std. Dev. ∆G° = 76.9,  | Coef. Corr. = 0.9911   |  |
|  | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -42.336$   |  |
| T/K Mol Fract<br>$X_1 \times 10$   | $\Delta G^{\circ}/J \text{ mol}^{-1}$  |  |
| 288.15 2.05  |  |  |
| 293.15 2.17<br>298.15 2.30   |  |  |
| 303.15 2.42<br>308.15 2.55   | 20,983   |  |
| 308.15 2.55<br>313.15 2.69   | 21,195<br>21,406   |  |
| 318.15 2.82  | 21,618   |  |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.  | o a partial pressure of neon of  |  |
| The Bunsen coefficients were calculate   | ed by the compiler.  |  |
| AUXILIARY  | INFORMATION  |  |
| METHOD: Volumetric. The solvent is sat-  | SOURCE AND PURITY OF MATERIALS:  |  |
| urated with the gas as it flows  | 1. Neon. Matheson Co., Inc. Both   |  |
| through an 8 mm x 180 cm glass spiral attached to a gas buret. The total       | standard and research grades<br>were used with no difference in                                  |  |
| pressure of solute gas plus solvent  | results.   |  |
| vapor pressure is maintained at 1 atm as the gas is absorbed.                  | 2. Methylcyclohexane. Eastman  |  |
|  | Kodak Co., white label, dried  |  |
|  | over Na and distilled, corrected b.p. 100.95 to 100.97°, lit. b.p.                               |  |
|  | 100.93°C.  |  |
|  | ,  |  |
|  | ESTIMATED ERROR:   |  |
| APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and   | $\delta T/K = 0.05$<br>$\delta P/torr = 3$   |  |
| Billett(l). The modifications in-<br>clude the addition of a spiral stor-      | $\delta X_1 / X_1 = 0.03$  |  |
| age for the solvent, a manometer for   |  |  |
| a constant reference pressure, and an<br>extra buret for highly soluble gases. | REFERENCES:<br>1. Morrison, T. J.; Billett, F.   |  |
| The solvent is degassed by a modifi-   | J. Chem. Soc. 1948, 2033;  |  |
| cation of the method of Baldwin and Daniel (2).                                | <u>ibid</u> .1952, 3819.   |  |
|  | <ol> <li>Baldwin, R. R.; Daniel, S. G.<br/>J. <u>Appl. Chem</u>. 1952, <u>2</u>, 161.</li> </ol> |  |
|  | 5. APP1. CHEM. 1952, 2, 101.   |  |
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|---|---|--|--|
| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |  |  |
| l. Neon; Ne; 7440-01-9  | Wilcock, R. J.; Battino, R.<br>Wilhelm, E.  |  |  |
| 2. Cyclooctane; C <sub>8</sub> H <sub>16</sub> ; 292-64-8   |   |  |  |
|   | <u>J. Chem</u> . <u>Thermodyn</u> . 1977, <u>9</u> , 111-115.                         |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |
| T/K: 298.21<br>P/kPa: 101.325 (1 atm)   | H. L. Clever  |  |  |
| EXPERIMENTAL VALUES:  | ۰   |  |  |
| T/K Mol Fraction  | Bunsen Ostwald  |  |  |
| $x_1 \times 10^4$   | Coefficient Coefficient<br>$lpha 	imes 10^2$ L x $10^2$                               |  |  |
| $\frac{1}{298.21} \frac{1.372}{1.372}$  | 2.28 2.491  |  |  |
|   |   |  |  |
| The solubility value was adjusted t<br>101.325 kPa (1 atm) by Henry's law.                                      | o a partial pressure of neon of   |  |  |
| The Bunsen coefficient was calculated   | by the compiler.  |  |  |
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| AUXILIARY   | INFORMATION   |  |  |
| METHOD: The apparatus is based on the   | SOURCE AND PURITY OF MATERIALS:   |  |  |
| design by Morrison and Billett (1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2). | <ol> <li>Neon. Matheson Co., Inc. Mini-<br/>mum purity 99.99 mol per cent.</li> </ol> |  |  |
|   | 2. Cyclooctane. Chemical Samples  |  |  |
| APPARATUS/PROCEDURE: Degassing. Up  | Co. 99 mol per cent, fractionally distilled, n(Na D, 298.15 K) =                      |  |  |
| to 500 cm <sup>3</sup> of solvent is placed in a  | 1 4562  |  |  |
| flask of such size that the liquid is about 4 cm deep. The liquid is rapid                                      |   |  |  |
| ly stirred and vacuum is applied in-  |   |  |  |
| termittently through a liquid N2 trap<br>until the permanent gas residual                                       |   |  |  |
| pressure drops to 5 microns.  | ESTIMATED ERROR:  |  |  |
| Solubility Determination. The de-<br>gassed solvent passes in a thin film                                       | $\delta T/K = 0.03$   |  |  |
| down a glass spiral containing the solute gas and solvent vapor at a  | $\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$                                      |  |  |
| total pressure of one atm. The vol-   | REFERENCES:   |  |  |
| ume of gas absorbed is measured in<br>the attached gas buret, and the   | 1. Morrison, T. J.; Billett, F.   |  |  |
| solvent is collected in a tared flask   |   |  |  |
| and weighed.  | 2. Battino, R.; Evans, F. D.;   |  |  |
|   | Danforth, W. F.   |  |  |
| · –   | J. Am. <u>Oil</u> <u>Chem</u> . <u>Soc</u> . 1968, <u>45</u> ,<br>830.                |  |  |

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| I Noone Noe 7  | MPONENTS:  |  | ORIGINAL MEASUREMENTS:  |   |  |
|--|--|--|---|---|--|
| · · · ·  | - · • •  |  | Wilhelm   | 8.; Battino, R.;<br>1, E.   |  |
| <ol> <li><u>cis</u>-1,2-Dim</li> <li>2207-01-4</li> </ol>  | aethylcyclo  | ohexane; C <sub>8</sub> H <sub>16</sub>  | ;   |   |  |
|  |  |  | J. Chem. Th   | <u>ermodyn</u> . 1976, <u>8</u> , 197-202.  |  |
| VARIABLES:   |  |  | PREPARED BY:  |   |  |
|  | 297.88 -<br>101.325  |  |   | H.L. Clever   |  |
| EXPERIMENTAL VALU  | ES:  |  |   |   |  |
|  | T/K M  | Aol Fraction   | Bunsen  | Ostwald   |  |
|  | <u></u>  | $x_1 \times 10^4$  | Coefficient   | Coefficient<br>L x 10 <sup>2</sup>  |  |
|  | 297.88<br>298.14   | 2.25<br>2.21   | 3.56<br>3.49  | 3.88<br>3.81  |  |
|  |  |  |   |   |  |
|  |  |  |   |   |  |
|  |  | AUXILIARY  | INFORMATION   |   |  |
| METHOD/APPARATU  |  |  | SOURCE AND PL   | JRITY OF MATERIALS:   |  |
| The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans<br>Degassing.<br>vent is placed<br>that the liquid<br>that the liquid<br>The liquid is r<br>vacuum is appli<br>through a liqui<br>permanent gas r<br>to 5 microns.  | ns is based<br>on and Bill<br>ad is desc:<br>and Danfo:<br>Up to 500<br>in a flas<br>is about<br>capidly st:<br>ad interm:<br>d N <sub>2</sub> trap<br>residual pr   | E:<br>1 on the de-<br>lett (1) and<br>ribed by<br>rth (2).<br>cm <sup>3</sup> of sol-<br>c of such size<br>4 cm. deep.<br>irred, and<br>ittently<br>until the<br>ressure drops   | SOURCE AND PU<br>1. Neon.<br>Chemica<br>Inc. 9<br>2. <u>cis</u> -1,2<br>Chemica<br>tionall  | URITY OF MATERIALS:<br>Either Air Products &<br>als, Inc.,or Matheson Co.,<br>99 mol % or better.<br>2-Dimethylcyclohexane.<br>al Samples Co., frac-<br>Ly distilled and stored<br>c. n <sub>D</sub> (298.15 K) 1.4337. |  |
| The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans<br>Degassing.<br>vent is placed<br>that the liquid<br>The liquid is r<br>vacuum is appli<br>through a liqui<br>permanent gas r<br>to 5 microns.<br>Solubility I<br>gassed solvent<br>film down a gla<br>taining the sol<br>vent vapor at a<br>atm. The volum<br>found by differ<br>tial and final | is is based<br>on and Bill<br>ad is desc:<br>and Danfo:<br>Up to 500<br>in a flas<br>is about<br>capidly st:<br>capidly st:<br>c | E:<br>d on the de-<br>lett (1) and<br>ribed by<br>rth (2).<br>cm <sup>3</sup> of sol-<br>c of such size<br>4 cm. deep.<br>irred, and<br>ittently<br>until the<br>ressure drops<br>ion. The de-<br>in a thin<br>tube con-<br>lus the sol-<br>essure of one<br>absorbed is<br>een the ini- | SOURCE AND PU<br>1. Neon.<br>Chemica<br>Inc. 9<br>2. <u>cis</u> -1,2<br>Chemica<br>tionall<br>in dark<br>ESTIMATED ERI<br>REFERENCES:<br>1. Morrisc | Either Air Products &<br>als, Inc.,or Matheson Co.,<br>99 mol % or better.<br>2-Dimethylcyclohexane.<br>al Samples Co., frac-<br>ly distilled and stored<br>c. n <sub>D</sub> (298.15 K) 1.4337.                        |  |

-----

| COMPONENTS :   | ORIGINAL MEASUREMENTS:   |  |  |
|--|--|--|--|
| 1. Neon; Ne; 7440-01-9   | Geller, E.B.; Battino, R.;   |  |  |
| 2. <u>trans</u> -1,2-Dimethylcyclohexane;<br>C <sub>8</sub> H <sub>16</sub> ; 6876-23-9  | Wilhelm, E.  |  |  |
| 0 10   | <u>J. Chem. Thermodyn</u> . 1976, <u>8</u> , 197-202.  |  |  |
| VARIABLES:   | PREPARED BY:   |  |  |
| T/K: 298.11<br>P/kPa: 101.325 (1 atm)  | H.L. Clever  |  |  |
| EXPERIMENTAL VALUES:   | ••••••••••••••••••••••••••••••••••••••   |  |  |
| T/K Mol Fraction   | Bunsen Ostwald<br>Coefficient Coefficient  |  |  |
| $x_1 \times 10^4$  | $\frac{\alpha \times 10^2}{10^2} = \frac{10^2}{10^2}$  |  |  |
| 298.11 2.65  | 4.26 4.66  |  |  |
| The solubility value was adjusted to a<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficient was calculated B   |  |  |  |
| AUXILIARY  | INFORMATION  |  |  |
| METHOD /APPARATUS/PROCEDURE:   | SOURCE AND PURITY OF MATERIALS:  |  |  |
| The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such size<br>that the liquid is about 4 cm deep.<br>The liquid is rapidly stirred and<br>vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure drops<br>to 5 microns. | <ol> <li>Neon. Either Air Products &amp;<br/>Chemicals, Inc., or Matheson Co.,<br/>Inc. 99 mol % or better.</li> <li>trans-1,2-Dimethylcyclohexane.</li> </ol> |  |  |
| Solubility Determination. The de-<br>gassed solvent passes in a thin film  | ESTIMATED ERROR:<br>$\delta T/K = 0.03$  |  |  |
| down a glass spiral containing the<br>solute gas plus the solvent vapor at<br>a total pressure of one atm. The vol-<br>ume of gas absorbed is measured in a<br>buret system, and the solvent is<br>collected in a tared flask and<br>weighed.  | $\delta P/mmHg = 0.5$  |  |  |

| COMPONENTS:  |                                 | RIGINAL MEASUREMENTS:   |
|--|---------------------------------|---|
| 1. Neon; Ne; 7440-01-9   |                                 | eller, E.B.; Battino, R.;<br>Wilhelm, E.  |
| 2. <u>cis</u> -1,3-Dimethylcyclohexane, 59<br>mol %; C <sub>8</sub> H <sub>16</sub> ; 638-04-0                   |                                 |   |
| 3. <u>trans</u> -1,3-Dimethylcycl<br>mol %; C <sub>8</sub> H <sub>16</sub> ; 2207-03-                            | ohexane, 41 J.<br>6             | . <u>Chem</u> . <u>Thermodyn</u> . 1976, <u>8</u> , 197-202.  |
| VARIABLES:   |                                 | REPARED BY:   |
| T/K: 298.15 - 29<br>P/kPa: 101.325 (1  |                                 | H.L. Clever   |
| EXPERIMENTAL VALUES:   |                                 |   |
| Т/К Мо   |                                 | Bunsen Ostwald  |
| ł  |                                 | efficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>  |
|  | $\frac{1}{1}$                   | '   |
| 298.15<br>298.40   | 2.72<br>2.70                    | 4.18     4.56       4.15     4.53   |
| The solubility value was a<br>101.325 kPa (l atm) by Hen   |                                 | artial pressure of neon of  |
| The Bunsen coefficient was   | calculated by                   | the compiler.   |
|  | ·                               |   |
|  | AUXILIARY IN                    | IFORMATION  |
| METHOD/APPARATUS/PROCEDURE   | : sc                            | OURCE AND PURITY OF MATERIALS:  |
| The apparatus is based<br>sign by Morrison and Bille<br>the version used is descri<br>Battino, Evans, and Danfor | tt (1) and<br>bed by<br>th (2). | <ol> <li>Neon. Either Air Products &amp;<br/>Chemicals, Inc., or Matheson Co.,<br/>Inc. 99 mol % or better.</li> </ol>  |
| See neon + 1,2 dimethyl<br>data sheet for more detail  | cyclohexane 2                   | <ol> <li><u>cis</u>-1,3-Dimethylcyclohexane.<br/>Chemical Samples Co., binary mix-<br/>ture, analysed by R. I. by auth-<br/>ors, used as received.</li> </ol> |
|  | 3                               | <ol> <li>trans-1,3-Dimethylcyclohexane.<br/>Chemical Samples Co., binary mix-<br/>ture, analysed by R. I. by auth-<br/>ors, used as received.</li> </ol>      |
|  | E                               | ESTIMATED ERROR: $\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.03$  |
|  |                                 | <pre>REFERENCES: 1. Morrison, T.J.; Billett, F. J. Chem. Soc. 1948, 2033.</pre>   |
|  | 2                               | <ol> <li>Battino, R.; Evans, F.D.;<br/>Danforth, W.F.<br/>J. Am. Oil Chem. <u>Soc</u>. 1968, <u>45</u>,</li> </ol>  |

| COMPONENTS:<br>1. Neon: Ne:   | 7440-01-0   |   | ORIGINAL MEAS  | UREMENTS:   |   |
|---|---|---|--|---|---|
| . Neon; Ne; 7440-01-9   |   | Wilhelm   | B.; Battino, R.;<br>M, E.  |   |   |
| 2. <u>cis</u> -1,4-D:<br>mol %; C <sub>8</sub> 1                                |   | clohexane, 70<br>29-3   |  |   |   |
| 3. <u>trans-1,4</u> -<br>mol %; C <sub>8</sub> 1                                | -Dimethyld<br>H <sub>16</sub> ; 2207-                             | cyclohexane, 30<br>-04-7  | J. Chem. Th  | <u>ermodyn</u> . 1976, <u>8</u>   | , 197-202.  |
| VARIABLES:  |   |   | PREPARED BY:   | <del></del>   |   |
|   | 298.14<br>101.325   | (1 atm)   |  | H.L. Clever   |   |
| EXPERIMENTAL VAL  | LUES:   |   |  |   |   |
|   |   | Mol Fraction  | Bunsen   | Ostwald   |   |
|   |   |   |  | Coefficient   |   |
|   |   | $x_1 \times 10^4$   | α x 10 <sup>2</sup>  | L x 10 <sup>2</sup>   |   |
|   | 298.14  | 2.66  | 4.10   | 4.48  |   |
| 101.325 kPa (   | l atm) by   | Henry's law.  |  | pressure of neon of   | f   |
| l'he Bunsen coe   | efficients  | s were calculate  | a by the com   | piler.  |   |
|   |   |   |  |   |   |
|   |   |   |  |   |   |
|   |   | AUXILIARY   | INFORMATION  | <u></u>   | -   |
| METHOD / ADDADAD  |   |   |  | TRITY OF MATERIALS.   |   |
| sign by Morris<br>the version us<br>Battino, Evans                              | tus is bas<br>son and Bi<br>sed is des<br>s, and Dan              | DURE:<br>ed on the de-<br>llett (1) and<br>cribed by<br>forth (2).                    | SOURCE AND PU<br>1. Neon.<br>Chemica<br>Inc. 99<br>2. cis-1,4  | RITY OF MATERIALS:<br>Either Air Product<br>ls, Inc., or Mathe<br>mol % or better.<br>-Dimethylcyclohexa<br>l Samples Co., bir  | eson Co.,<br>ane.   |
| The apparat<br>sign by Morris<br>the version us<br>Battino, Evans               | tus is bas<br>son and Bi<br>sed is des<br>s, and Dan<br>1,2 dimet | DURE:<br>ed on the de-<br>llett (1) and<br>scribed by<br>forth (2).<br>hylcyclohexane | SOURCE AND PU<br>1. Neon.<br>Chemica<br>Inc. 99<br>2. <u>cis</u> -1,4<br>Chemica<br>ture, a  | Either Air Product<br>ls, Inc., or Mathe<br>mol % or better.  | eson Co.,<br>ane.<br>nary mix-  |
| The apparat<br>sign by Morris<br>the version us<br>Battino, Evans<br>See neon + | tus is bas<br>son and Bi<br>sed is des<br>s, and Dan<br>1,2 dimet | DURE:<br>ed on the de-<br>llett (1) and<br>scribed by<br>forth (2).<br>hylcyclohexane | SOURCE AND PU<br>1. Neon.<br>Chemica<br>Inc. 99<br>2. <u>cis</u> -1,4<br>Chemica<br>ture, a<br>ors, us<br>3. <u>trans</u> -1<br><u>Chemica</u><br>ture, a<br>ors, us   | Either Air Product<br>ls, Inc., or Mather<br>mol % or better.<br>-Dimethylcyclohexa<br>l Samples Co., bir<br>nalysed by R. I. H<br>ed as received.<br>,4-Dimethylcyclohe<br>l Samples Co., bir<br>nalysed by R. I. H<br>ed as received.         | eson Co.,<br>nary mix-<br>by auth-<br>exane.<br>nary mix-                           |
| The apparat<br>sign by Morris<br>the version us<br>Battino, Evans<br>See neon + | tus is bas<br>son and Bi<br>sed is des<br>s, and Dan<br>1,2 dimet | DURE:<br>ed on the de-<br>llett (1) and<br>scribed by<br>forth (2).<br>hylcyclohexane | SOURCE AND PU<br>1. Neon.<br>Chemica<br>Inc. 99<br>2. <u>cis</u> -1,4<br>Chemica<br>ture, a<br>ors, us<br>3. <u>trans</u> -1<br>Chemica<br>ture, a   | Either Air Product<br>ls, Inc., or Mather<br>mol % or better.<br>-Dimethylcyclohexa<br>l Samples Co., bir<br>nalysed by R. I. H<br>ed as received.<br>,4-Dimethylcyclohe<br>l Samples Co., bir<br>nalysed by R. I. H<br>ed as received.         | eson Co.,<br>nary mix-<br>by auth-<br>exane.<br>nary mix-                           |
| The apparat<br>sign by Morris<br>the version us<br>Battino, Evans<br>See neon + | tus is bas<br>son and Bi<br>sed is des<br>s, and Dan<br>1,2 dimet | DURE:<br>ed on the de-<br>llett (1) and<br>scribed by<br>forth (2).<br>hylcyclohexane | SOURCE AND PU<br>1. Neon.<br>Chemica<br>Inc. 99<br>2. <u>cis</u> -1,4<br>Chemica<br>ture, a<br>ors, us<br>3. <u>trans</u> -1<br>Chemica<br>ture, a:<br>ors, us<br>ESTIMATED ERR<br>REFERENCES:<br>1. Morriso | Either Air Product<br>ls, Inc., or Mather<br>mol % or better.<br>-Dimethylcyclohexa<br>l Samples Co., bir<br>nalysed by R. I. H<br>ed as received.<br>,4-Dimethylcycloha<br>l Samples Co., bir<br>nalysed by R. I. H<br>ed as received.<br>COR: | eson Co.,<br>ane.<br>hary mix-<br>by auth-<br>exane.<br>hary mix-<br>by auth-<br>F. |

COMPONENTS: **EVALUATOR:** H. L. Clever 1. Neon; Ne; 7440-01-9 Chemistry Department 2. Benzene; C<sub>6</sub>H<sub>6</sub>; 71-43-2 Emory University Atlanta, Georgia 30322 USA January 1978

## CRITICAL EVALUATION:

The solubility of neon in benzene was measured by Lannung (1), by Clever, Battino, Saylor and Gross (2), and by de Wet (3). The three sets of solubility data, when smoothed by a Gibbs energy function linear in temperature, agree within 5.5 per cent at 288.15 K, 6.1 per cent at 298.15 K, and 8.3 per cent at 308.15 K. On combining the three data sets on a one to one weight basis by the method of least squares in a Gibbs energy equation linear in temperature, only one solubility value at 298.35 K (2) was more than two standard deviations from the linear equation. That solubility value was excluded and the data fitted again to obtain the recommended equation.

The recommended thermodynamic values for the transfer of one mole of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \mod^{-1} = - RT \ln X_1 = 10,467 + 40.301 T$ 

Std. Dev.  $\Delta G^{\circ} = 46$ , Coef. Corr. = 0.9945

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 10,467, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -40,301$ 

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes at five degree intervals between 283.15 and 313.15 are in Table 1.

## TABLE 1. Solubility of neon in benzene at 101.325 kPa. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

| т/к    | Mol Fraction $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|--------------------------------|-------------------------|
| 283.15 | 0.920                          | 21,878                  |
| 288.15 | 0.944                          | 22,080                  |
| 293.15 | 1.071                          | 22,281                  |
| 298.15 | 1.151                          | 22,483                  |
| 303.15 | 1.23                           | 22,684                  |
| 308.15 | 1,32                           | 22,886                  |
| 313.15 | 1.41                           | 23,087                  |

1.

Lannung, A. J. <u>Am. Chem. Soc.</u> 1930, <u>52</u>, 68. Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. <u>J. Phys. Chem</u>. 2. 1957, <u>61</u>, 1078.

з. de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9.

| COMPONENTS:  |   | ORIGINAL MEAS  | SUREMENTS:  |          |
|--|---|--|---|----------|
|  |   | Lannung, A.  |   |          |
| 1. Neon; Ne;   | 7440-01-9   |  |   |          |
| 2. Benzene; C  | <sub>5</sub> H <sub>6</sub> ; 71-43-2   |  |   |          |
|  |   | J. Am. Chen  | <u>n. Soc</u> . 1930, <u>52</u> , 68 - 80   | •        |
| VARIABLES:   |   | PREPARED BY:   |   |          |
|  | 283.15 - 310.15<br>101.325 (1 atm)  |  | P. L. Long  |          |
| EXPERIMENTAL VALUE   | S:  |  |   | <u> </u> |
| -  | T/K Mol Fraction  | Dungan   |   |          |
|  | ·   | Bunsen<br>Coefficient  | Ostwald<br>Coefficient  |          |
|  | $x_1 \times 10^4$   | a x 10 <sup>2</sup>  | $L \times 10^2$   |          |
|  | 283.15 0.913  | 2.33   | 2.42  |          |
|  | 283.15 0.936  | 2.39   | 2.48  |          |
|  | 293.15 1.07<br>293.15 1.08  | 2.69<br>2.73   | 2.89<br>2.93  |          |
|  | 310.15 1.35   | 3.33   | 3.78  |          |
| -  | 310.15 1.33   | 3.28   | 3.72  |          |
| Smoothed Data:   | $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$  | x <sub>1</sub> = 10,010  | ) + 41.860 T  |          |
|  | Std. Dev. $\Delta G^{\circ} = 24.2$ ,   | Coef. Corr   | = 0.9989  |          |
| of the solubil:<br>The solubility<br>101.325 kPa (1  | ity of neon in benzene.<br>values were adjusted t<br>atm) by Henry's law.<br>ion solubility and the   | o a partial  | ee the critical evaluatio<br>pressure of neon of<br>ficients were calculated  |          |
|  | AUXILIARY   | INFORMATION  |   |          |
| METHOD:  |   | SOURCE AND PI  | JRITY OF MATERIALS:   |          |
| Gas absorption,<br>rated with solv<br>volume absorbed<br>between initial<br>umes. The amou | The gas is presatu-<br>vent vapor. The gas<br>d is the difference<br>l and final gas vol-<br>int of solvent is deter<br>eight of mercury dis- | <ol> <li>Neon.<br/>tory.<br/>volume</li> <li>Benzen<br/>kularg<br/>m.p. 5</li> </ol> | Linde's Liquid Air Fac-<br>Contained one percent b<br>e helium.<br>ne. Kahlbaum's "Zur Mole<br>gewitchtsbestimmung",<br>5.48°C. | У        |
|  | E: The apparatus is a   | ESTIMATED ERF  |   |          |
|  | that of von Antropoff<br>ted, combined all glas   |  | K = 0.03  |          |
|  | oulb is enclosed in an  |  |   |          |
| air thermostat.  | Mercury is used as  |  |   |          |
| The solvent is ratus. The sol  | a and confining liquid.<br>degassed in the appa-<br>lvent and the gas are<br>until equilibrium is   |  | cropoff, A.<br>ectrochem. 1919, <u>25</u> , 269.  |          |
|  |   |  |   |          |
|  |   | 1  |   |          |

COMPONENTS: ORIGINAL MEASUREMENTS: 1. Neon; Ne; 7440-01-9 Clever, H. L.; Battino, R.; Saylor, J. H.; Gross, P. M. 2. Benzene; C<sub>6</sub>H<sub>6</sub>; 71-43-2 J. Phys. Chem. 1957, 61, 1078 - 1083. VARIABLES: PREPARED BY: T/K: 287.15 - 312.15 P. L. Long EXPERIMENTAL VALUES: T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $X_1 \times 10^4$  $\alpha \times 10^2$  $L \ge 10^2$ 287.15 0.95 2.41 2.53 298.35 1.07 2.68 2.93 3.53 312.15 1.43 4.03 Smoothed Data:  $\Delta G^{\circ}/J \mod^{-1} = -RT \ln X_1 = 12,400 + 34.049 T$ Std. Dev.  $\Delta G^{\circ} = 104$ , Coef. Corr. = 0.9715 For the recommended free energy equation see the critical evaluation of the solubility of neon in benzene. The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. AUXILIARY INFORMATION METHOD: Volumetric. The solvent is sat-SOURCE AND PURITY OF MATERIALS: urated with gas as it flows through 1. Neon. Matheson Co. Both rean 8 mm x 180 cm glass spiral attachsearch and standard grades were used with no difference in reed to a gas buret. The total pressure is maintained at 1 atm as the sults. gas is absorbed. Benzene. Jones and Laughlin Steel Co. Shaken with conc. 2. H<sub>2</sub>SO<sub>4</sub>, washed, dried over sodium, distilled ESTIMATED ERROR: APPARATUS/PROCEDURE: The apparatus is a modification of that of Morrison and Billett (1). The modifications in- $\delta T/K = 0.05$  $\delta P/torr = 3$ clude the addition of a spiral stor- $\delta X_{1}/X_{1} = 0.03$ age for the solvent, a manometer for a constant reference pressure, and an REFERENCES: Morrison, T. J.; Billett, F. J. Chem. Soc. 1948, 2033; Ibid. 1952, 3819. extra buret for highly soluble gases. 1. The solvent is degassed by a modification of the method of Baldwin and Daniel (2). Baldwin, R. R.; Daniel, S. G. 2. J. Appl. Chem. 1952, 2, 161.

| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
| 1. Neon; Ne; 7440-01-9   | de Wet, W. J.  |
| 2. Benzene; C <sub>6</sub> H <sub>6</sub> ; 71-43-2  |  |
|  |  |
|  | J. S. Afr. Chem. Inst. 1964, <u>17</u> ,<br>9 - 13.  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 291.45 - 304.35<br>P/kPa: 101.325 (1 atm)   | P. L. Long   |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol Fraction   | Bunsen Ostwald   |
| $x_1 \times 10^4$  | Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>   |
| 291.45 1.07  | 2.70 2.88  |
| 298.95 1.17<br>304.35 1.23   | 2.92 3.20<br>3.07 3.42   |
|  | J.U/ J.34  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - RT \ln$   | X <sub>1</sub> = 8003.8 + 48.537 т   |
| Std. Dev. ΔG° = 9.8,   | Coef. Corr. = 0.9995   |
| For the recommended free energy equat solubility of neon in benzene.   | ion see the critical evaluation of the   |
| The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.  | o a partial pressure of neon of  |
|  |  |
|  | · ••••••••••••••••••••••••••••••••••••   |
| AUXILIARY  | INFORMATION  |
| METHOD: Volumetric.<br>To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases. | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. No source given. The gas<br>purified over activated charcoal<br>at liquid air temperature. Im-<br>purities estimated to be less<br>than 0.3 percent. |
| To saturate, the solvent is flowed in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an at-<br>tached buret system.         | <ol> <li>Benzene. No source given. Ben-<br/>zene distilled immediately before<br/>use.</li> </ol>  |
| APPARATUS/PROCEDURE:   | ESTIMATED ERROR:   |
| The apparatus is a modification of<br>that used by Morrison and Billett (1)  | δ <b>T/K = 0.05</b>  |
|  |  |
| and others (2). The degassed solvent   |  |
|  | REFERENCES:<br>1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;<br>ibid. 1952, 3819.   |

|                                 | :  |   | JATOR:   |
|---------------------------------|--|---|--|
| 1. Neon;                        | Ne; 7440-01-9  |   | . Clever   |
| 0                               | - ]   / [m - ]   |   | istry Department   |
| 2. Metny<br>108-8               | lbenzene (Toluene  |   | y University<br>Inta, Georgia 30322  |
| 108-0                           |  | U.S.  |  |
|                                 |  |   |  |
|                                 | · · · · · · · · · · · · · · · · · · ·  | Marc  | ch 1978  |
| CRITICAL EV                     | VALUATION:   |   |  |
|                                 | solubility of neo<br>1) and by de Wet  |   | e was measured by Saylor and   |
| energy eq<br>values ra          | uation linear in   | temperature. The<br>nt higher at 288,   | od of least squares to a Gibbs<br>e de Wet smoothed solubility<br>15 to 12 percent higher at<br>med values.                              |
| to obtain deviation             | the recommended  | equation. No poi  | wo laboratories were combined<br>nt fell as much as two standard<br>fit toa Gibbs energy equation  |
|                                 |  |   | for the transfer of neon from the cal unit mole fraction solution  |
|                                 | $\Delta G^{\circ}/J \text{ mol}^{-1} = -1$   | RT ln $X_1 = 7,767$ .   | 3 + 47.522 T   |
|                                 | Std. Dev. $\Delta G^\circ$ =   | 69, Coef. Corr  | . = 0.9943   |
|                                 | $\Delta H^{\circ}/J \text{ mol}^{-1} = 7,$   | 767.3, Δs°/j K <sup>-1</sup>  | $mol^{-1} = -47.522$   |
|                                 | ibbs energy of so  |   | ction solubility at 101.325 kPa<br>as a function of temperature  |
|                                 |  |   |  |
| TABLE 1.                        |  | lubility and Gibb   | ne at 101.325 kPa. Recommended<br>s energy of solution as a func-  |
| TABLE 1.                        | mole fraction so   | lubility and Gibb<br>ure.   | s energy of solution as a func-  |
| TABLE 1.                        | mole fraction so<br>tion of temperat   | lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup>  | S energy of solution as a func-<br><u>AG°/J mol<sup>-1</sup></u>   |
| TABLE 1.                        | mole fraction so<br>tion of temperat<br>   | lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$   | s energy of solution as a func-  |
| TABLE 1.                        | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15  | Lubility and Gibbure.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$<br>1.285  | AG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936  |
| TABLE 1.                        | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15  | Lubility and Gibture.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$<br>1.285<br>1.360<br>1.435<br>1.510   | AG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936<br>22,173  |
| TABLE 1.                        | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15  | Lubility and Gibture.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$<br>1.285<br>1.360<br>1.435<br>1.510<br>1.590  | ΔG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936<br>22,173<br>22,411  |
| TABLE 1.                        | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15  | Lubility and Gibbure.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$<br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670   | ΔG°/J mol-1<br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649  |
| TABLE 1.                        | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15  | Lubility and Gibture.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$<br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750  | ΔG°/J mol-1<br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887  |
| TABLE 1.                        | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15  | Lubility and Gibbure.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$<br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670   | AG°/J mol <sup>-1</sup><br>21,461<br>21,936<br>22,173<br>22,411<br>22,649  |
|                                 | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15                                | Lubility and Gibture.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$<br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910  | ΔG°/J mol-1<br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124  |
|                                 | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15                      | Lubility and Gibture.<br>Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$<br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910  | AG°/J mol <sup>-1</sup><br>21,461<br>21,999<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124                                  |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,999<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,999<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,999<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |
| a <sub>Values</sub><br>1. Saylo | mole fraction so<br>tion of temperat<br>T/K<br>288.15<br>293.15<br>298.15<br>303.15<br>308.15<br>313.15<br>318.15<br>323.15<br>328.15<br>rounded to neares | Lubility and Gibb<br>ure.<br>Mol Fraction <sup>a</sup><br>X <sub>1</sub> x 10 <sup>4</sup><br>1.285<br>1.360<br>1.435<br>1.510<br>1.590<br>1.670<br>1.750<br>1.830<br>1.910<br>t 0.005 x 10 <sup>-4</sup> . | AG°/J mol <sup>-1</sup><br>21,461<br>21,699<br>21,936<br>22,173<br>22,411<br>22,649<br>22,887<br>23,124<br>23,362<br>em. 1958, 62, 1334. |

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| COMPONENTS:  | ORIGINAL MEASUREMENTS:   |
|--|--|
| 1. Neon; Ne; 7440-01-9   | Saylor, J. H.; Battino, R.                                       |
| 2. Methylbenzene (Toluene); C <sub>7</sub> H <sub>8</sub> ;<br>108-88-3                                      |  |
|  | <u>J. Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 1334 - 1337.    |
| VARIABLES:   | PREPARED BY:   |
| T/K: 288.15 - 328.15<br>P/kPa: 101.325 (1 atm)   | H. L. Clever   |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol Fraction   | Bunsen Ostwald   |
|  | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$       |
| 288.15 1.26  | 2.66 2.81  |
|  | 2.94 3.21<br>3.35 3.84   |
| 313.15 1.62<br>328.15 1.91   | 3.35 3.84<br>3.89 4.67   |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln$  |  |
| Std. Dev. $\Delta G^\circ = 25.9$ ,  | -  |
|  | $\Delta s^{\circ}/J K^{-1} mol^{-1} = -46.441$                   |
| ·  | · · · · · · · · · · · · · · · · · · ·                            |
| T/K Mol Fract<br>X <sub>l</sub> x 10   | 4<br>4   |
| 288.15 1.25  | 21,529   |
| 293.15 1.33  | 21,761<br>21,993   |
| 298.15 1.40<br>303.15 1.48   | 22,225   |
| 308.15 1.56  | 22,457   |
| 313.15 1.64  | 22,690   |
| 318.15 1.72  | 22,927   |
| 323.15 1.81<br>328.15 1.89   | 23,154<br>23,386   |
| The solubility values were adjusted to kPa (1 atm) by Henry's law.   | a partial pressure of neon of 101.325                            |
| The Bunsen coefficients were calculate   |  |
|  | INFORMATION  |
| METHOD: Volumetric. The solvent is sat-  | 1  |
| urated with gas as it flows through<br>an 8 mm x 180 cm glass spiral at-<br>tached to a gas buret. The total | <ol> <li>Neon. Matheson Co., Inc.<br/>Research grade.</li> </ol> |
| pressure is maintained at 1 atm as   | 2. Toluene. Mallinckrodt. Reagent                                |
| the gas is absorbed.   | grade. Shaken over conc. H <sub>2</sub> SO <sub>4</sub> ,        |
|  | water washed, dried over   |
|  | Drierite, distilled b.p. 110.40 -<br>110.60° C.                  |
|  |  |
|  |  |
|  | ESTIMATED ERROR:   |
| APPARATUS/PROCEDURE: The apparatus is a  |  |
| modification of that of Morrison and Billett(l). The modifications in-                                       | $\delta T/K = 0.03$<br>$\delta P/torr = 1$                       |
| clude the addition of a spiral stor-   | $\delta X_1 / X_1 = 0.04$  |
| age for the solvent, a manometer for   |  |
| a constant reference pressure, and an  | REFERENCES:  |
| extra buret for highly soluble gases.  | 1. Morrison, T. J.; Billett, F.<br>J. Chem. Soc. 1948, 2033;     |
| The solvent is degassed by a modifi-<br>cation of the method of Baldwin and                                  | ibid. 1952, 3819.  |
| Daniel (2).  | 2. Baldwin, R. R.; Daniel, S. G.                                 |
|  | J. Appl. Chem. 1952, 2, 161.                                     |
| L  |  |

| CONDONENTS -   |  |
|--|--|
| COMPONENTS :   | ORIGINAL MEASUREMENTS:   |
| 1. Neon; Ne; 7440-01-9   | de Wet, W. J.  |
| 2. Methylbenzene (Toluene); C <sub>7</sub> H <sub>8</sub> ;<br>108-88-3  |  |
|  | J. <u>S. Afr. Chem</u> . <u>Inst</u> . 1964, <u>17</u> ,<br>9 - 13.  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 292.15 - 304.15<br>P/kPa: 101.325 (1 atm)   | P. L. Long   |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol Fraction   | Bunsen Ostwald   |
| $x_1 \times 10^4$  | Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$   |
| 292.15 1.35  | 2.85 3.05  |
| 299.35 1.50  | 3.14 3.44  |
| 304.15 1.59  | 3.32 3.70  |
| Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = -RT$ lr   | ах, = 10,115 + 39.447 т  |
| <pre>Std. Dev. ∆G° = 8.0,</pre>  | Coef. Corr. = 0.9994   |
| solubility of meon in toluene.<br>The solubility values were adjusted t<br>101.325 kPa (1 atm) by Henry's law.<br>The mole fraction solubility and the<br>by the compiler.   |  |
| METHOD: Volumetric.  | SOURCE AND PURITY OF MATERIALS:  |
| To degas, the solvent is placed in<br>a large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.<br>To saturate, the solvent is flowed ir<br>a thin film through a glass spiral | <ol> <li>Neon. No source given. The gas<br/>purified over activated charcoal<br/>at liquid air temperature. Im-<br/>purities estimated to be less<br/>than 0.3 percent.</li> </ol> |
| containing the gas. The volume of  | use.   |
| gas absorbed is measured on an at-<br>tached buret system.   |  |
|  | ESTIMATED ERROR:   |
| tached buret system.   | $\delta T/K = 0.05$<br>REFERENCES:   |

| COMPONENTS:   |  |   | ORIGINAL MEAS  | UREMENTS:  |
|---|--|---|--|--|
| 1. Neon; Ne;  | 7440-01-9  |   |  | ; Battino, R.;   |
| 2. 1,2-Dimeth<br>C <sub>8</sub> H <sub>10</sub> ; 95-   | ylbenzene<br>47-6  | ( <u>o</u> -Xylene);  | Wilhelm  | , Е.   |
|   |  |   | J. Chem. Th  | <u>ermodyn</u> . 1975, <u>7</u> , 515-52   |
| VARIABLES:  |  |   | PREPARED BY:   |  |
| P/k:<br>P/kPa:  | 298.13 -<br>101.325  |   |  | H.L. Clever  |
| EXPERIMENTAL VALU   | ES:  |   | <b>_</b>   |  |
|   | T/K  | Mol Fraction  | Bunsen   | Ostwald  |
|   |  |   | Coefficient  |  |
|   |  | $x_1 \times 10^4$   | α x 10 <sup>2</sup>  | L x 10 <sup>2</sup>  |
|   | 298.13   | 1.412   | 2.61   | 2.849  |
|   | 298.15<br>298.19   | 1.352   | 2.50   | 2.729  |
|   | 298.19   | 1.395   | 2.58   | 2.816  |
|   |  |   |  |  |
|   |  |   |  |  |
|   |  |   |  |  |
|   |  | AUXILIARY   | INFORMATION  |  |
| METHOD/APPARATU   | JS/PROCEDU   |   |  | JRITY OF MATERIALS:  |
| The apparat<br>sign by Morris<br>the version us<br>Battino, Evans<br>Degassing.<br>vent is placed<br>that the liqui<br>The liquid is<br>vacuum is appl<br>through a liqu<br>permanent gas | tus is bas<br>son and Bi<br>sed is des<br>s, and Dan<br>Up to 50<br>d in a flas<br>d is abou<br>rapidly s<br>ied intern<br>id N <sub>2</sub> trap  | RE:<br>ed on the de-<br>llett (1) and<br>cribed by<br>forth (2).<br>0 cm <sup>3</sup> of sol-<br>sk of such size<br>t 4 cm deep.<br>tirred, and<br>mittently  | SOURCE AND PL<br>1. Neon.<br>Chemica<br>Inc. 99<br>2. 1,2-Dim  | DRITY OF MATERIALS:<br>Either Air Products &<br>ls,Inc., or Matheson Co.,<br>mol % or better.<br>methylbenzene. Phillips<br>um Co. Pure grade. |
| The apparat<br>sign by Morris<br>the version us<br>Battino, Evans<br>Degassing.<br>vent is placed<br>that the liqui<br>The liquid is<br>vacuum is appl<br>through a liqu                  | tus is bas<br>son and Bi<br>sed is des<br>s, and Dan<br>Up to 50<br>l in a flas<br>d is abour<br>rapidly s<br>ied intern<br>id N <sub>2</sub> trap<br>residual p<br>Determina-<br>tis passes<br>ass spira<br>olute gas<br>at a tota<br>volume of<br>fference I<br>nal volume | RE:<br>ed on the de-<br>llett (1) and<br>cribed by<br>forth (2).<br>0 cm <sup>3</sup> of sol-<br>sk of such size<br>t 4 cm deep.<br>tirred, and<br>mittently<br>o until the<br>pressure drops<br>tion. The de-<br>d in a thin<br>l tube con-<br>and the<br>l pressure of<br>gas absorbed<br>between the<br>es in the<br>ent is col- | SOURCE AND PU<br>1. Neon.<br>Chemica<br>Inc. 99<br>2. 1,2-Dim<br>Petrole<br>ESTIMATED ERI<br>$\delta P$<br>REFERENCES:<br>1. Morriso | Either Air Products &<br>ls,Inc., or Matheson Co.,<br>mol % or better.<br>ethylbenzene. Phillips<br>um Co. Pure grade.                         |

| COMPONENTS:  | EVALUATOR:   |
|--|--|
| <ol> <li>Neon; Ne; 7440-01-9</li> <li>1,3-Dimethylbenzene (m-Xylene);<br/>C<sub>8</sub>H<sub>10</sub>; 108-38-3</li> </ol> | H. L. Clever<br>Chemistry Department<br>Emory University<br>Atlanta, Georgia 30322 U.S.A.<br>USA |
|  | March 1978   |

CRITICAL EVALUATION:

The solubility of neon in 1,3-dimethylbenzene was measured in two laboratories. Three solubility values between 291.65 and 305.25 K were reported by de Wet (1),and two solubility values at 298.17 and 298.18 K were reported by Byrne, Battino, and Wilhelm (2).

The de Wet solubility values at 299.25 K and the average of the Byrne, Battino and Wilhelm values at 298.17 and 298.18 K fall within the expected experimental error of 3 per cent. All data points were combined on a one to one weight basis to obtain the recommended Gibbs energy equation linear in temperature by the method of least squares.

The recommended thermodynamic values for the transfer of one mole of neon from the gas at 101.325 kPa (1 atm) to the hypothetical unit mole fraction solution are

 $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 10,187 + 38.421 T$ 

Std. Dev.  $\Delta G^{\circ} = 49$ , Coef. Corr. = 0.9670

 $\Delta H^{\circ}/J \mod^{-1} = 10,187, \Delta S^{\circ}/J K^{-1} \mod^{-1} = -38.421$ 

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes at five degree intervals between 288.15 and 308.15 K are given in Table 1.

TABLE 1. Solubility of neon in 1,3-dimethylbenzene. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

| т/к    | Mol Fraction <sup>a</sup> $X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|---|-------------------------|
| 288.15 | 1.400                                       | 21,259                  |
| 293.15 | 1.505                                       | 21,451                  |
| 298.15 | 1.615                                       | 21,643                  |
| 303.15 | 1.730                                       | 21,835                  |
| 308.15 | 1.845                                       | 22,027                  |

<sup>a</sup> rounded to the nearest  $0.005 \times 10^{-4}$ .

de Wet, W. J. J. S. Afr. Chem. Inst. 1964, 17, 9.
 Byrne, J. E.; Battino, R.; Wilhelm, E. J. Chem. Thermodyn. 1975, 7, 515.

| COMPONENTS: ORIGINAL MEASUREMENTS:   |             |
|--|-------------|
|  |             |
| 1. Neon; Ne; 7440-01-9 de Wet, W. J.   |             |
| 2. 1,3-Dimethylbenzene (m-Xylene);<br>C <sub>8</sub> H <sub>10</sub> ; 108-38-3  |             |
| $\frac{J. S. Afr. Chem. Inst. 1964,}{9 - 13.}$   | <u>17</u> , |
| VARIABLES: PREPARED BY:  |             |
| T/K: 291.65 - 305.25 P. L. Long<br>P/kPa: 101.325 (1 atm)  |             |
| EXPERIMENTAL VALUES:   | -           |
| T/K Mol Fraction Bunsen Ostwald  |             |
| Coefficient Coefficient  |             |
|  |             |
| 291.65 1.47 2.69 2.87<br>299.25 1.66 3.01 3.30   |             |
| 305.25 1.77 3.19 3.56  |             |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = 10,161 + 38.493 T$                                      |             |
| Std. Dev. ∆G° = 22.5, Coef. Corr. = 0.9963   |             |
| For the recommended free energy equation see the critical evaluation solubility of neon in $\underline{m}$ -xylene.          | n of the    |
| The solubility values were adjusted to a partial pressure of neon o<br>101.325 kPa (1 atm) by Henry's law.                   | f           |
| The mole fraction solubility and the Ostwald coefficients were calc  | ulated      |
| by the compiler.   |             |
|  |             |
|  |             |
|  |             |
|  |             |
|  |             |
| AUXILIARY INFORMATION  |             |
| METHOD: Volumetric.<br>To degas, the solvent is placed in 1. Neon. No source given.  | The das     |
| a large continuously evacuated bulb purified over activated o  | harcoal     |
| until the solvent boils freely with-<br>out further release of dissolved purities estimated to be                            |             |
| gases. than 0.3 percent.   |             |
| To saturate, the solvent is flowed in 2. m-Xylene. No source give  |             |
| a thin film through a glass spiral m-Xylene distilled immedi   | ately       |
| containing the gas. The volume of before use.<br>gas absorbed is measured on an at-  |             |
| tached buret system.   |             |
| ESTIMATED ERROR:   |             |
| APPARATUS/PROCEDURE: $\delta T/K = 0.05$ The apparatus is a modification of $\delta T/K = 0.05$                              |             |
| that used by Morrison and Billett (1)  |             |
| and others (2). The degassed solvent<br>is saturated with gas as it flows  |             |
| through a glass spiral containing the REFERENCES:  | F           |
| gas. The amount of solvent passed 1. Morrison, T. J.; Billett,<br>through the spiral was such that J. Chem. Soc. 1948, 2033; | г.          |
| 10-25 ml of gas was absorbed. <u>ibid. 1952, 3819</u> .  |             |
| 2. Clever, H. L.; Battino, F   |             |
| Saylor, J. H.; Gross, P.<br>J. Phys. Chem. 1957, <u>61</u> ,   | M.<br>1078. |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |
|--|---|--|--|
| 1. Neon; Ne; 7440-01-9   | Byrne, J. E.; Battino, R.;  |  |  |
| 2. 1,3-Dimethylbenzene (m-Xylene);<br>C <sub>8</sub> H <sub>10</sub> ; 108-38-3  | Wilhelm, E.   |  |  |
|  |   |  |  |
| VARIABLES:   | J. Chem. Thermodyn. 1975, 7, 515-522.   |  |  |
| T/K: 298.17 - 298.18   | PREPARED BY:  |  |  |
| P/kPa: 101.325 (1 atm)   | H. L. Clever  |  |  |
| EXPERIMENTAL VALUES:   |   |  |  |
| T/K Mol Fraction<br>$X_1 \times 10^4$  | Bunsen Ostwald<br>Coefficient Coefficient<br>$\alpha \times 10^2$ L x $10^2$  |  |  |
| 298.17 1.654<br>298.18 1.570   | 3.00 3.277<br>2.85 3.109  |  |  |
| The Bunsen coefficients were calcula   |   |  |  |
|  | to neon partial pressure of 101.325 kPa   |  |  |
| (1 atm) by Henry's law.  | to neon partial pressure of 101.025 Ara   |  |  |
|  |   |  |  |
|  |   |  |  |
| AUXILIAR   | Y INFORMATION   |  |  |
|  | Y INFORMATION<br>SOURCE AND PURITY OF MATERIALS:  |  |  |
|  | SOURCE AND PURITY OF MATERIALS:   |  |  |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett(1)<br>and the version used is described by   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products and<br>Chemicals, Inc., or Matheson Co.,  |  |  |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett(1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2).<br>APPARATUS/PROCEDURE: Degassing. Up<br>to 500 cm <sup>3</sup> of solvent is placed in a<br>flask of such size that the liquid i<br>about 4 cm deep. The liquid is rapid<br>ly stirred and vacuum is applied in-<br>termittently through a liquid N2 tra<br>until the permanent gas residual<br>pressure drops to 5 microns.<br>Solubility Determination. The<br>degassed solvent passes in thin film   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products and<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mole % or better.<br>2. m-Xylene. Phillips Petroleum<br>Co., pure grade.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$   |  |  |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett(1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2).<br>APPARATUS/PROCEDURE: Degassing. Up<br>to 500 cm <sup>3</sup> of solvent is placed in a<br>flask of such size that the liquid i<br>about 4 cm deep. The liquid is rapid<br>ly stirred and vacuum is applied in-<br>termittently through a liquid N2 tra<br>until the permanent gas residual<br>pressure drops to 5 microns.<br>Solubility Determination. The<br>degassed solvent passes in thin film<br>down a glass spiral at a total pres-   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products and<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mole % or better.<br>2. m-Xylene. Phillips Petroleum<br>Co., pure grade.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$   |  |  |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett(1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2).<br>APPARATUS/PROCEDURE: Degassing. Up<br>to 500 cm <sup>3</sup> of solvent is placed in a<br>flask of such size that the liquid i<br>about 4 cm deep. The liquid is rapid<br>ly stirred and vacuum is applied in-<br>termittently through a liquid N2 tra<br>until the permanent gas residual<br>pressure drops to 5 microns.<br>Solubility Determination. The<br>degassed solvent passes in thin film<br>down a glass spiral at a total pres-<br>sure of one atm of solute gas plus<br>solvent vapor. Solubility equilibriu<br>is rapidly attained. The volume of | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products and<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mole % or better.<br>2. m-Xylene. Phillips Petroleum<br>Co., pure grade.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:                                      |  |  |
| METHOD: The apparatus is based on the<br>design by Morrison and Billett(1)<br>and the version used is described by<br>Battino, Evans, and Danforth (2).<br>APPARATUS/PROCEDURE: Degassing. Up<br>to 500 cm <sup>3</sup> of solvent is placed in a<br>flask of such size that the liquid i<br>about 4 cm deep. The liquid is rapid<br>ly stirred and vacuum is applied in-<br>termittently through a liquid N2 tra<br>until the permanent gas residual<br>pressure drops to 5 microns.<br>Solubility Determination. The<br>degassed solvent passes in thin film<br>down a glass spiral at a total pres-<br>sure of one atm of solute gas plus<br>solvent vapor. Solubility equilibriu                                       | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Either Air Products and<br>Chemicals, Inc., or Matheson Co.,<br>Inc. 99 mole % or better.<br>2. m-Xylene. Phillips Petroleum<br>Co., pure grade.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>m 1. Morrison, T. J.; Billett, F. |  |  |

| COMPONENTS:<br>1. Neon; Ne; 7440-01-9   |   | 1   |  |
|---|---|---|--|
|   |   | ORIGINAL MEASU  | JREMENTS:<br>; Battino, R.:  |
|   |   | Wilhelm   |  |
| <pre>2. 1,4-Dimethylbenzene (p-Xylene);         C<sub>8</sub>H<sub>10</sub>; 106-42-3</pre>   |   |   |  |
|   |   | J. Chem. The  | <u>ermodyn</u> . 1975, <u>7</u> , 515-522.   |
| VARIABLES:  |   | PREPARED BY:  |  |
| T/K: 298.12 - 298.21<br>P/kPa: 101.325 (1 atm)  |   |   | H.L. Clever  |
| EXPERIMENTAL VALUES:  |   |   |  |
| T/K   | Mol Fraction  | Bunsen  | Ostwald  |
|   |   | Coefficient   |  |
|   | $x_1 \times 10^4$   | α x 10 <sup>2</sup>   | $L \times 10^2$  |
| 298.12  | 1.563   | 2.83  | 3.085  |
| 298.16<br>298.17  | 1.528<br>1.524  | 2.76<br>2.76  | 3.016<br>3.008   |
| 298.17<br>298.21  | 1.524   | 2.81  | 3.066  |
| <u></u>   |   |   |  |
|   |   |   |  |
|   |   |   |  |
|   | AUXILIARY   | INFORMATION   |  |
| METHOD /APPARATUS/PROCEDU   |   |   | RITY OF MATERIALS:   |
| METHOD /APPARATUS/PROCEDU<br>The apparatus is bas<br>design by Morrison and<br>and the version used is<br>Battino, Evans, and Dar<br>Degassing. Up to 50<br>vent is placed in a fla<br>size that the liquid is<br>deep. The liquid is ra<br>and vacuum is applied i<br>through a liquid N <sub>2</sub> tra<br>permanent gas residual<br>to 5 microns. | JRE:<br>Billett (1)'<br>s described by<br>nforth (2).<br>00 cm <sup>3</sup> of sol-<br>ask of such<br>s about 4 cm<br>apidly stirred,<br>intermittently<br>ap until the | SOURCE AND PUI<br>1. Neon.<br>Chemica<br>Inc. 99<br>2. 1,4 Dim<br>Petrole | RITY OF MATERIALS:<br>Either Air Products &<br>.ls, Inc., or Matheson Co.,<br>mol % or better.<br>Methylbenzene. Phillips<br>sum Co. Pure grade. |

|   |  |   | ORIGINAL MEAS   |   |                           |
|---|--|---|---|---|---------------------------|
| 1. Neon; Ne;  | 7440-01-9  |   | Lannung, A.   |   |                           |
| 2. Methanol (Methyl Alcohol); CH <sub>4</sub> O;<br>67-56-1   |  |   | J. Am. Chem. Soc. 1930, 52, 68-80.                        |   |                           |
| VARIABLES:  | <u> </u>   |   | PREPARED BY:  |   |                           |
| T/K:  | 288.15 - 3   |   | FREFARED BI.  | P.L. Long                                     |                           |
|   | 101.325 (1   | atm)  |   |   |                           |
| EXPERIMENTAL VALUES   |  |   |   | 0-1-1-1                                       |                           |
|   | •  |   |   | Ostwald<br>Coefficient<br>L x 10 <sup>2</sup> |                           |
|   | 288.15<br>293.15<br>293.15<br>303.15<br>310.15                         | 0.742<br>0.780<br>0.773<br>0.841<br>0.881   | 4.13<br>4.32<br>4.28<br>4.60<br>4.78                      | 4.36<br>4.64<br>4.59<br>5.11<br>5.43          |                           |
| Smoothed Data:  | ΔG <sup>O</sup> /J mol   | l = - RT ln   | $X_{1} = 5.781.5$   | <u>і + 58,970 т</u>                           |                           |
|   | Std. Dev.<br>AH <sup>O</sup> /J mol <sup>-</sup>                       | $\Delta G^{O} = 10.1,$<br>1 = 5,781.5   | Coef. Corr.<br>, ∆S°/J K-1                                | = 0.9998<br>mol-l = -58.970                   |                           |
|   | T,   | /K Mol Fra  | $\Delta G^{O}/3$  | J mol -                                       |                           |
|   |  | X ×   | 10 -  |   |                           |
|   | 293<br>298<br>303  | .15     0.7       .15     0.7       .15     0.8       .15     0.8       .15     0.8       .15     0.8       .15     0.9 | 775     2       807     2       839     2       870     2 | 2774<br>3068<br>3363<br>3658<br>3953<br>1248  |                           |
| The mole fracti<br>by the compiler  |  |   | Ostwald coef:   | ficients were cald                            | culated                   |
| METUOD.   |  |   | COURCE AND DU   | DITAL OF MATERIAL C.                          |                           |
| METHOD:<br>Gas absorpti<br>saturated with<br>volume absorbed<br>tween initial a<br>The amount of s<br>the weight of m | solvent vap<br>is the dif<br>nd final ga<br>olvent is d                | or. The gas<br>ference be-<br>s volumes.<br>etermined by  | 1. Neon.<br>Factory<br>by volu<br>2. Methand<br>from f    | reshly cut magnes:<br>. First one-third       | er cent<br>stilled<br>ium |
| APPARATUS/PROCEDUR<br>The apparatu  | -  | fication of   | ESTIMATED ERF   | OR:<br>δτ/κ = 0.03                            |                           |
| that of von Ant<br>brated, combine<br>and bulb is enc<br>stat. Mercury<br>bration and con<br>solvent is dega          | ropoff (l).<br>d all glass<br>losed in an<br>is used as<br>fining liqu | A cali-<br>manometer<br>air thermo-<br>the cali-<br>id. The<br>apparatus.   |   | ropoff, A.<br>ctrochem. 1919, <u>2</u> :      | <u>5</u> , 269.           |

| COMPONENTS:   | EVALUATOR:                                      |
|---|---|
| l. Neon; Ne; 7440-01-9  | H. L. Clever<br>Chemistry Department            |
| <pre>2. Ethanol (Ethyl Alcohol); C<sub>2</sub>H<sub>6</sub>O;<br/>64-17-5</pre> | Emory University<br>Atlanta, GA 30322<br>U.S.A. |
|   | April 1978                                      |

CRITICAL EVALUATION:

The solubility of neon in ethanol was measured by Lannung (1) and by Krestov and Patsatsiya (2).

The Krestov and Patsatsiya data were reported as absorption coefficients which were equivalent to Bunsen coefficients at a gas partial pressure of (760-solvent vapor pressure) mmHg. The Krestov and Patsatsiya data were recalculated as mole fraction solubilities at 101.325 kPa (1 atm) assuming that the gas is ideal and that Henry's law is obeyed.

The mole fraction solubilities from each laboratory were smoothed by the method of least squares to a Gibbs energy function linear in temperature. The smoothed solubility values from the two laboratories agree within 2.0 per cent at 288.15 K and 1.6 per cent at 313.15 K. The agree-ment is well within the expected experimental error. All of the solubility values from both laboratories were used on a one to one weight basis to obtain the recommended Gibbs energy equation linear in temperature by the method of least squares.

The recommended thermodynamic values for the transfer of one mole of neon gas at 101.325 kPa to the hypothetical unit mole fraction solution are

> $\Delta G^{\circ}/J \mod^{-1} = - RT \ln X_1 = 6,123.8 + 55.307 T$ Std. Dev. ∆G° = 46.6, Coef. Corr. = 0.9963

 $\Delta H^{\circ}/J \text{ mol}^{-1} = 6,123.8, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -55.307$ 

The recommended mole fraction solubilities at 101.325 kPa and the Gibbs energy changes between 283.15 and 313.15 K are given in Table 1.

TABLE 1. Solubility of neon in ethanol. Recommended mole fraction solubility and Gibbs energy of solution as a function of temperature.

| т/к    | Mol Fraction <sup>a</sup><br>$X_1 \times 10^4$ | ∆G°/J mol <sup>-1</sup> |
|--------|--|-------------------------|
| 283.15 | 0.960  | 21,784                  |
| 288.15 | 1.000  | 22,061                  |
| 293.15 | 1.045  | 22,337                  |
| 298.15 | 1.090  | 22,614                  |
| 303.15 | 1.135  | 22,890                  |
| 308.15 | 1.185  | 23,167                  |
| 313.15 | 1.230  | 23,443                  |

<sup>a</sup>Rounded to the nearest 0.005 x  $10^{-4}$ 

Lannung, A. J. Am. Chem. Soc. 1930, 52, 68. Krestov, G. A.; Patsatsiya, K. M. Izv. Vyssh. Uchebn. Zaved., Khim. 2. Khim. Tekhnol. 1969, 12, 1333.

<sup>1.</sup> 

|   |                        | · · · · · · · · · · · · · · · · · · ·       |                        |                      |                     |
|---|------------------------|---|------------------------|----------------------|---------------------|
| COMPONENTS:   | 440-01 0               |   | ORIGINAL MEASUREMENTS: |                      |                     |
| 1. Neon; Ne; 7  | 440-01-9               |   | Lannung, A.            |                      |                     |
| 2. Ethanol (Ethyl Alcohol); C <sub>2</sub> H <sub>6</sub> O;<br>64-17-5 |                        |   |                        |                      |                     |
|   |                        |   | J. Am. Chem            | . <u>Soc</u> . 1930, | <u>52</u> , 68-80.  |
| VARIABLES:  |                        |   | PREPARED BY:           |                      |                     |
| T/K: 288.15 - 310.15  |                        |   |                        | .L. Long             |                     |
| Ne P/kPa:   | 101.325 (1             | atm)  | -                      |                      |                     |
| EXPERIMENTAL VALUE  | S:                     |   |                        |                      |                     |
|   | T/K M                  | ol Fraction                                 | Bunsen                 | Ostwald              |                     |
|   | -,                     |   | Coefficient            | Coefficient          |                     |
|   | <u> </u>               | $x_{1} \times 10^{4}$                       | α x 10 <sup>2</sup>    | L x 10 <sup>2</sup>  |                     |
|   | 288.15                 | 0.987                                       | 3.81                   | 4.02                 |                     |
|   | 288.15                 |   | 3.80                   | 4.01                 |                     |
|   | 293.15<br>293.15       | 1.04<br>1.06                                | 3.98<br>4.07           | 4.27<br>4.37         |                     |
|   | 298.15                 | 1.09  | 4.17                   | 4.55                 |                     |
|   | 310.15                 | 1.18  | 4.43                   | 5.03                 |                     |
| Smoothed Data:  | ∆G <sup>0</sup> /J mol | -1 = - RT ln                                | $x_1 = 5992.0$         | + 55.820 T           |                     |
|   |                        | $\Delta G^{O} = 29.2,$<br>$^{-1} = 5992.0,$ |                        |                      | 0                   |
|   |                        | T/K Mol Fra                                 | ction $\Delta G^O/J$   | mo1 <sup>-1</sup>    |                     |
|   |                        | I/K MOI HA<br>X <sub>1</sub> x              |                        | MOT                  |                     |
|   |                        |   |                        |                      |                     |
|   |                        | 8.15 0.9<br>3.15 1.0                        | 96 22<br>4 22          | 076<br>356           |                     |
|   |                        | 8.15 1.0                                    | 8 22                   |                      |                     |
|   |                        | 3.15 1.1                                    | 3 22                   | 914                  |                     |
|   |                        | 8.15 1.1<br>3.15 1.2                        |                        | 193<br>472           |                     |
|   |                        |   |                        |                      |                     |
| The mole fraction by the compiler                                       |                        | ity and the O                               | stwald coeff:          | icients were         | calculated          |
| · · · · · · · · · · · ·   |                        | AUXILIARY                                   | INFORMATION            |                      |                     |
| METHOD:   |                        |   | SOURCE AND PUL         | RITY OF MATERIA      | 1.5.                |
| Gas absorpti  | on. The g              | as is pre-                                  |                        | Linde's Ligu         | -                   |
| saturated with  | solvent va             | por. The gas                                | Factory                | . Contained          | 1 per cent          |
| volume absorbed   | is the di              | fference be-                                |                        | me of helium         |                     |
| tween initial a:<br>The amount of s                                     |                        |   | 2. Ethanol             | Alcohol -            | bsolutus, Ph.       |
| the weight of m   |                        |   |                        |                      | e from freshly      |
| · ·   |                        | •   |                        | d calcium ox         |                     |
|   |                        |   |                        |                      |                     |
|   |                        |   |                        |                      |                     |
|   |                        |   |                        |                      |                     |
|   |                        |   |                        |                      |                     |
| APPARATUS/PROCEDUE  | ₹ <b>E</b> :           |   | ESTIMATED ERR          | DR:                  |                     |
| The apparatu  |                        | ification of                                |                        | $\delta T/K = 0$     | .03                 |
| that of von Ant:  | ropoff (1)             | . A cali-                                   |                        |                      |                     |
| brated, combined<br>and bulb is enc.                                    |                        |   |                        |                      |                     |
|   | is used as             |   | <b>REFERENCES</b> :    |                      |                     |
| bration and con:  | fining liq             | uid. The                                    | 1. v. Antro            | opoff, A.            |                     |
| solvent is dega   | ssed in the            | e apparatus.                                |                        | trochem. 191         | 9, <u>25</u> , 269. |
| The solvent and   |                        |   |                        |                      |                     |
| together until (<br>established.  | equilibriu             | . 15  |                        |                      |                     |
|   |                        |   |                        |                      |                     |
|   |                        |   |                        |                      |                     |

| COMPONENT   | <u>.</u>  |   |  | ORIGI                                 | NAL MEASUREMENTS   | •   |
|---|---|---|--|---------------------------------------|--|---|
|   | n; Ne; 74   | 40-01-9   |  |                                       |  | tsatsiya, K.M.  |
| 2. Etha   |   | hyl Alcohol);   | с <sub>2<sup>н</sup>6</sub> о;   | Izv.                                  | Vyssh. Ucheb   | <u>n. Zaved., Khim</u> .<br>69, <u>12</u> , 1333 - 1337.  |
| VARIABLES:<br>T/K: 283.15 -313.15   |   | PREPA   | RED BY:<br>H. L.   | Clever                                |  |   |
| EXPERIMEN   | TAL VALUES  | :   |  | t                                     |  | ····· <u>································</u>   |
| т/к   | Neon<br>P/mmHg  | Bunsen<br>Coefficient<br>$\alpha \times 10^2$   |  | mHg)<br>tion                          |  | P/kPa = 101.325<br>Ostwald<br>Coefficient<br>L x 10 <sup>2</sup>  |
| 293.15  | 736.0<br>715.4<br>680.8<br>625.0  | 3.726<br>3.772<br>3.826<br>3.906  | 0.991<br>1.043<br>1.124<br>1.265   |                                       | 3.848<br>4.007<br>4.271<br>4.750   | 3.989<br>4.300<br>4.740<br>5.446  |
| 101.325<br>taken f<br>Table a<br>760 mmH<br>See the                             | luator ca<br>kPa (760<br>rom Wilho<br>bove were<br>g.<br>e data sho   | on the critica<br>ethanol.<br>alculated the<br>0 mmHg). Ethan<br>Dit and Zwolin<br>e obtained by  | solubilii<br>nol vapor<br>nski (2).<br>subtracti   | tion<br>ty va<br>pres<br>The<br>ing t | of the solubi<br>lues at a pre<br>sure and dens<br>neon partial<br>ne ethanol va | n see the page<br>lity of neon in<br>ssure of neon of<br>ity values were<br>pressures in the<br>por pressure from<br>s of water + ethanol |
|   |   |   | AUXILIARY  | INFORM                                | IATION   |   |
| METHOD:   |   |   |  | SOURC                                 | E AND PURITY OF  | MATERIALS:  |
| the app<br>The a<br>values<br>total p<br>of one<br>some of<br>Evaluat<br>Bunsen | aratus of<br>uthors la<br>as Ostwal<br>ressure o<br>atm. Howe<br>the auth<br>or is cor<br>coefficie<br>pressure | is a modifica<br>Ben-Naim and<br>abel their so<br>d coefficient<br>on gas + solve<br>ever, after re<br>ors'other pap<br>vinced that t<br>ents measured<br>a of (760 - so<br>of They a | Baer (1)<br>Lubility<br>ts at a<br>ent vapor<br>eading<br>bers, the<br>these are<br>at a gas<br>olvent | •                                     | No informat:   | ion given.  |
|   | apor pressure) mmHg. They are so<br>created in the Table above.   |   | ·  |                                       |  |   |
| vapor p   | in the I  |   |  | ESTIM                                 | ATED ERROR:<br>δα/α  | x = 0.01 (Compiler)   |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| 1. Neon; Ne; 7440-01-9  | Battino, R.; Evans, F.D.;  |
| 2. 2-Methyl-l-propanol; C <sub>4</sub> H <sub>10</sub> O;                     | Danforth, W.F.; Wilhelm, E.  |
| 78-83-1   |  |
|   | J. Chem. Thermodyn. 1971, 3, 743-751.                              |
|   |  |
| VARIABLES:  | PREPARED BY:   |
| T/K: 274.07 - 312.77<br>P/kPa: 101.325 (1 atm)                                | H.L. Clever  |
| 1/KIA. 101.525 (1 dcm)  | n.n. cievei  |
| EXPERIMENTAL VALUES:  | L  |
| T/K Mol Fraction  | Bunsen Ostwald   |
| v   | Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup> |
|   |  |
| 274.07 1.31   | 3.23 3.24  |
| 283.01 1.41<br>298.40 1.53  | 3.45 3.57<br>3.70 4.04   |
| 312.77 1.65   | 3.92 4.49  |
| Smoothed Data: $\Delta G^{\circ} = -RT \ln X_1 = 41$                          | 51.4 + 59.127 T  |
| Std. Dev. $\Delta G^{\circ} = 15.5$ ,   |  |
|   | $\Delta s^{\circ}/J \ \kappa^{-1} \ mol^{-1} = -59.127$            |
|   |  |
|   | action $\Delta G^{O}/J \text{ mol}^{-1}$                           |
| X <sub>1</sub> ×  |  |
| 273.15 1.3  |  |
| 278.15 1.<br>283.15 1.  |  |
| 288.15 1.4  | 44 21189   |
| 293.15 1.4  |  |
| 298.15 1.<br>303.15 1.  |  |
| 308.15 1.0  |  |
| 313.15 1.0  |  |
| The solubility values were adjusted to  | o a partial pressure of neon of                                    |
| 101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate | ed by the compiler.  |
|   | INFORMATION  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS;                                    |
| A. Degasser (1). B. Absorption  | 1. Neon. The Matheson Co., Inc.                                    |
| of gas in a thin film of liquid (2, 3).                                       | Greater than 99 mol %.   |
| (2) 5).   | 2. 2-Methyl-l-propanol. Fisher                                     |
| APPARATUS/PROCEDURE:  | Scientific Co. Certified (99 mol %).                               |
| Degassing. The solvent is sprayed   |  |
| into an evacuated chamber of an all   |  |
| glass apparatus; it is stirred and  |  |
| heated until the pressure drops to  |  |
| the vapor pressure of the liquid.<br>Solubility Determination. The de-        |  |
| gassed liquid passes in a thin film   | ESTIMATED ERROR:   |
| down a glass spiral tube at a total   | $\delta T/K = 0.03$  |
| pressure of one atm of solute gas<br>plus solvent vapor. The gas absorbed     | $\delta P/mmHg = 0.5$  |
| is measured in the attached buret   | $\delta x_1 / x_1 = 0.015$   |
| system, and the solvent is collected  | REFERENCES :   |
| in a tared flask and weighed.   | 1. Battino, R.; Evans, D.F.  |
|   | Anal. Chem. 1966, 38, 1627.  |
|   | 2. Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.        |
|   | 3. Clever, H.L.; Battino, R.;                                      |
|   | Saylor, J.H.; Gross, P.M.  |
|   | J. Phys. Chem. 1957, 61, 1078.                                     |

| COMPONENTS:  |  | ORIGINAL MEASUREMENTS:   |
|--|--|--|
| 1. Neon; Ne;   | 7440-01-9  | Wilcock, R.J.; Battino, R.;<br>Danforth, W.F; Wilhelm, E.  |
| 2. 1-Octanol; C <sub>8</sub> H <sub>18</sub> O; 111-87-5   |  |  |
|  |  | <u>J.Chem.Thermodyn</u> . 1978, <u>10</u> , 817-822.   |
|  |  |  |
|  |  |  |
| VARIABLES:   |  | PREPARED BY:   |
| T/K: 298.08<br>P/kPa: 101.325 (1 atm)  |  | A.L. Cramer  |
| ·  | <u></u>  |  |
| EXPERIMENTAL VALUE   | lS:  |  |
|  | T/K Mol Fraction   | Bunsen Ostwald   |
|  | $x_{1} \times 10^{4}$  | Coefficient Coefficient<br>$lpha 	imes 10^2$ L x $10^2$  |
|  | <u> </u>   |  |
|  | 298.08 1.693   | 2.397 2.616  |
|  |  |  |
| The solubility kPa by Henry's  | value was adjusted to a  | a partial pressure of neon of 101.325  |
|  |  |  |
| The Bunsen coe   | fficients were calculate   | ed by the compiler.  |
| A preliminary :  | report of the work appea   | ared in Conf. Int. Thermodyn. Chim.,   |
| {C.R.}, 4th 19   | 75, <u>6</u> , 122 - 128; <u>Chem</u> .  | Abstr. 1977, 86, 22375d.   |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  | INFORMATION  |
| METHOD / APPARATU  | S/PROCEDURE:   | SOURCE AND PURITY OF MATERIALS:  |
| The apparat<br>sign of Morris  | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and  | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.  |
| The apparat<br>sign of Morris<br>the version us  | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by  | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.  |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing   | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure                                      | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co. Inc.<br/>Purest commercially available<br/>grade.</li> <li>2. 1-Octanol. Eastman organic</li> </ul>  |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described                                      | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,              | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.   |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,              | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co. Inc.<br/>Purest commercially available<br/>grade.</li> <li>2. 1-Octanol. Eastman organic</li> </ul>  |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will                 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co. Inc.<br/>Purest commercially available<br/>grade.</li> <li>2. 1-Octanol. Eastman organic</li> </ul>  |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co. Inc.<br/>Purest commercially available<br/>grade.</li> <li>2. 1-Octanol. Eastman organic</li> </ul>  |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co. Inc.<br/>Purest commercially available<br/>grade.</li> <li>2. 1-Octanol. Eastman organic<br/>chemicals. Distilled.</li> </ul>  |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Octanol. Eastman organic chemicals. Distilled.  ESTIMATED ERROR:</pre>   |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Octanol. Eastman organic chemicals. Distilled.  ESTIMATED ERROR:</pre>   |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Octanol. Eastman organic chemicals. Distilled.  ESTIMATED ERROR:</pre>   |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Octanol. Eastman organic chemicals. Distilled.  ESTIMATED ERROR:</pre>   |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.<br>2. 1-Octanol. Eastman organic<br>chemicals. Distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.   |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.<br>2. 1-Octanol. Eastman organic<br>chemicals. Distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.; Evans, F.D.; Danforth, W.F.  |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.<br>2. 1-Octanol. Eastman organic<br>chemicals. Distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.; Evans, F.D.; Danforth, W.F.<br>J.Am.Oil Chem. Soc. 1968, 45, 830.<br>3.Battino,R.; Banzhof, M.; Bogan, M.; |
| The apparat<br>sign of Morris<br>the version us<br>Battino, Evans<br>The degassing<br>are described 1<br>Bogan, and Will<br>See neon + 0 | S/PROCEDURE:<br>us is based on the de-<br>on and Billett (1), and<br>ed is described by<br>, and Danforth (2).<br>apparatus and procedure<br>by Battino, Banzhof,<br>helm (3). | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.<br>2. 1-Octanol. Eastman organic<br>chemicals. Distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.; Evans, F.D.; Danforth, W.F.<br>J.Am.Oil Chem. Soc. 1968, 45, 830.  |

| COMPONENTS:<br>1. Neon; Ne; 7440-01-9   | ORIGINAL MEASUREMENTS:<br>Wilcock, R.J.; Battino, R.;  |  |  |
|---|--|--|--|
|   | Danforth, W.F; Wilhelm, E.   |  |  |
| 2. l-Decanol; C <sub>10</sub> H <sub>22</sub> O; 112-30-1   | T Chem Whouse June 1079 10 917-922   |  |  |
|   | <u>J.Chem.Thermodyn</u> . 1978, 10, 817-822.   |  |  |
|   |  |  |  |
|   |  |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |
| T/K: 298.09<br>P/kPa: 101.325 (1 atm)   | A.L. Cramer  |  |  |
|   |  |  |  |
| EXPERIMENTAL VALUES:  | A  |  |  |
| T/K Mol Fraction  | Bunsen Ostwald   |  |  |
|   | Coefficient Coefficient  |  |  |
| $x_1 \times 10^4$   | $\alpha \times 10^2$ L $\times 10^2$   |  |  |
|   |  |  |  |
| 298.09 1.978  | 2.316 2.527  |  |  |
|   |  |  |  |
| The solubility value was adjusted to a  | a partial pressure of neon of  |  |  |
| 101.325 kPa by Henry's law.   |  |  |  |
| The Bunsen coefficients were calculate  | ed by the compiler.  |  |  |
|   |  |  |  |
| A preliminary report of the work appea  | ared in Conf. Int. Thermodyn. Chim.,   |  |  |
| {C.R.}, 4th 1975, <u>6</u> , 122 - 128; <u>Chem</u> .   |  |  |  |
| (C.R.), 4th 1973, <u>0</u> , 122 – 128, <u>Chem</u> .   |  |  |  |
|   |  |  |  |
| AUXILIARY   | INFORMATION  |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:  |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.  |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by  | SOURCE AND PURITY OF MATERIALS:  |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,  | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).                                     | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Decanol. Eastman Organic</pre>   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Decanol. Eastman Organic</pre>   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Decanol. Eastman Organic</pre>   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).                                     | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Decanol. Eastman Organic</pre>   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Decanol. Eastman Organic Chemicals. Distilled. ESTIMATED ERROR:</pre>  |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co. Inc.<br/>Purest commercially available<br/>grade.</li> <li>2. 1-Decanol. Eastman Organic<br/>Chemicals. Distilled.</li> </ul>  |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Decanol. Eastman Organic Chemicals. Distilled.  ESTIMATED ERROR:</pre>   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Decanol. Eastman Organic Chemicals. Distilled.  ESTIMATED ERROR:</pre>   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.<br>2. 1-Decanol. Eastman Organic<br>Chemicals. Distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co. Inc. Purest commercially available grade. 2. 1-Decanol. Eastman Organic Chemicals. Distilled.  ESTIMATED ERROR:</pre>   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.<br>2. 1-Decanol. Eastman Organic<br>Chemicals. Distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison,T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.;Evans,F.D.;Danforth,W.F.   |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.<br>2. 1-Decanol. Eastman Organic<br>Chemicals. Distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison,T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.; Evans, F.D.; Danforth, W.F.<br>J.Am.Oil Chem. Soc. 1968, 45, 830. |  |  |
| AUXILIARY<br>METHOD/APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>See neon + octane data sheet for | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co. Inc.<br>Purest commercially available<br>grade.<br>2. 1-Decanol. Eastman Organic<br>Chemicals. Distilled.<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison,T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.;Evans,F.D.;Danforth,W.F.   |  |  |

| CONTRAINING   |   |                           | LODIGINAL MELONIA   |  |
|---|---|---------------------------|---|--|
| COMPONENTS:<br>1. Neon: Ne: 7                               | 440-01-0  |                           | ORIGINAL MEASUREMENTS:  |  |
|   |   |                           | Lannung, A.   |  |
| 2. Cyclohexanol; C <sub>6</sub> H <sub>12</sub> O; 108-93-0 |   |                           |   |  |
|   |   |                           | <u>J. Am. Chem. Soc</u> . 1930, <u>52</u> , 68-80.                                |  |
| VARIABLES:  | 200 15 210 15                                       |                           | PREPARED BY:  |  |
| T/K: 298.15 - 310.15<br>Ne P/kPa: 101.325 (1 atm)           |   |                           | P.L. Long   |  |
| EXPERIMENTAL VALUE  | <br>S:  |                           | I   |  |
|   | T/K Mol Fract                                       | ion                       | Bunsen Ostwald  |  |
|   |   |                           | Coefficient Coefficient   |  |
|   | X_10  | 4                         | $\frac{\alpha \times 10^2}{2}  L \times 10^2$                                     |  |
|   | 298.15 0.714  |                           | 1.51 1.65   |  |
|   | 298.15         0.723           303.15         0.759 |                           | 1.53 1.67<br>1.60 1.78  |  |
|   | 310.15 0.807  |                           | 1.69 1.92   |  |
|   | 310.15 0.831  |                           | 1.74 1.98   |  |
| Smoothed Data:  | $\Delta G^{O}/J \text{ mol}^{-1} = -R'$             | T ln                      | $X_1 = 8386.6 + 51.199 T$   |  |
|   |   |                           | L<br>Coef. Corr. = 0.9956   |  |
|   |   |                           | $\Delta S^{O}/J K^{-1} mol^{-1} = -51.199$  |  |
|   |   | -                         | ction $\Delta G^{O}/J \text{ mol}^{-1}$   |  |
|   |   | i Fra<br>X <sub>1</sub> X |   |  |
|   | ·   | -                         |   |  |
|   | 298.15<br>303.15                                    | 0.7                       | 18 23652<br>60 23908  |  |
|   | 308.15  | 0.8                       | 02 24164  |  |
|   | 313.15  | 0.8                       | 45 24420  |  |
| The mole fraction by the compiler.                          |   | the O                     | stwald coefficients were calculated   |  |
|   | of neon in cyclohe<br>unsatisfactory and            |                           | reported by G. Cauquil <u>J</u> . <u>Chim</u> . <u>Phys</u> .<br>uld not be used. |  |
|   | AUXI  | LIARY                     | INFORMATION   |  |
| METHOD:   |   |                           | SOURCE AND PURITY OF MATERIALS:   |  |
|   | on. The gas is pre                                  |                           | 1. Neon. Linde's Liquid Air   |  |
|   | solvent vapor. The is the difference                |                           | Factory, Contained 1 per cent<br>by volume of helium.                             |  |
| tween initial ar  | nd final gas volume                                 | es.                       |   |  |
|   | olvent is determine<br>ercury displaced.            | ed by                     | 2. Cyclohexanol. "pur", Poulenc<br>Freres, fractionated twice in                  |  |
|   |   |                           | vacuo; used portion with $m.p. =$   |  |
|   |   |                           | 23.6 - 23.9 °C.   |  |
|   |   |                           |   |  |
| х.  |   |                           |   |  |
|   |   |                           | ESTIMATED ERROR:  |  |
| APPARATUS/PROCEDUR  |   |                           |   |  |
|   | s is a modification<br>copoff (1). A cali           |                           | $\delta T/K = 0.03$   |  |
| brated, combined  | l all glass manomet                                 | er                        |   |  |
|   | losed in an air the<br>Is used as the cali          |                           | REFERENCES:   |  |
| bration and conf  | ining liquid. The                                   | e                         | 1. v. Antropoff, A.<br><u>Z. Electrochem</u> . 1919, <u>25</u> , 269.             |  |
|   | sed in the apparat<br>the gas are shaker            |                           | 2. <u>Diectiocnem</u> . 1919, 25, 209.  |  |
| together until $\epsilon$                                   |   | ı                         |   |  |
| established.  |   |                           |   |  |
|   |   |                           |   |  |
|   |   |                           |   |  |

| COMPONENTS:   |                        |  | ORIGINAL MEASUREMENTS:   |
|---|------------------------|--|--|
| 1. Neon; Ne; 7  | 440-01-9               |  | Lannung, A.  |
| 2. 2-Propanone (Acetone); C <sub>3</sub> H <sub>6</sub> O;<br>67-64-1 |                        |  |  |
|   |                        |  | <u>J. Am</u> . <u>Chem</u> . <u>Soc</u> . 1930, <u>52</u> , 68-80. |
| VARIABLES:  |                        |  | PREPARED BY:   |
| T/K: 288.15 - 298.15  |                        |  | P.L. Long  |
| Ne P/kPa:   | 101.325 (1             | atm)   | 1 1 20119  |
| EXPERIMENTAL VALUE  | ES:                    |  |  |
|   | T/K M                  | ol Fraction  | Bunsen Ostwald   |
|   |                        |  | Coefficient Coefficient  |
|   |                        | $x_{1} \times 10^{4}$  | $\alpha \times 10^2$ L $\times 10^2$                               |
|   | 288.15                 | 1.39   | 4.28 4.52  |
|   | 288.15                 | 1.33   | 4.10 4.33  |
|   | 293.15                 | 1.49   | 4.56 4.89  |
|   | 293.15                 | 1.54   | 4.70 5.04  |
|   | 293.15                 | 1.41   | 4.30 4.61  |
|   | 298.15<br>298.15       | 1.59   | 4.82 5.26<br>4.98 5.44   |
|   | 298.15                 | 1.48   | 4.50 4.91  |
|   |                        |  |  |
| Smoothed Data:  | ∆G°/J mol              | - = - RT ln  | х <sub>1</sub> = 10072 + 39.025 т                                  |
|   |                        |  | Coef. Corr. = 0.8611   |
|   | ∆H <sup>O</sup> /J mol | $^{-1}$ = 10072, $\Delta$                                    | $s^{o}/J \ \kappa^{-1} \ mol^{-1} = -39.025$                       |
|   |                        | r/K Mol Fra  | ction $\Delta G^{O}/J$ mol <sup>-1</sup>                           |
|   |                        | X <sub>1</sub> X   | 10 <sup>4</sup>  |
|   |                        |  |  |
|   | 281                    | B.15       1.3         3.15       1.4         B.15       1.5 | 7 21317<br>7 21512   |
|   | 29                     | B.15 1.5   |  |
| The mole fracti   | on solubil:            | ity and the O  | stwald coefficients were calculated                                |
| by the compiler   |                        | -  |  |
|   |                        |  |  |
|   |                        | AUXILIARY  | INFORMATION  |
| METHOD:   |                        |  | SOURCE AND PURITY OF MATERIALS:                                    |
| Gas absorpti  | on. The ga             | as is pre-   | 1. Neon. Linde's Liquid Air  |
| saturated with  |                        |  |  |
| volume absorbed   |                        |  | by volume of helium.   |
| tween initial a   |                        |  |  |
| The amount of s   |                        |  | 2. Acetone. Kahlbaum's "Zur<br>Analyse." Used after tests          |
| the weight of m   | ercury aisp            | placed.  | showed absence of water, acid                                      |
|   |                        |  | and aldehyde.  |
|   |                        |  | and aldenyde.  |
|   |                        |  |  |
|   |                        |  |  |
|   |                        |  | ESTIMATED ERROR:   |
| APPARATUS / PROCEDU   |                        | - · · -  |  |
| The apparatu<br>that of von Ant                                       |                        |  | $\delta T/K = 0.03$  |
| brated, combine   | d all glass            | s manometer  |  |
| and bulb is enc   |                        |  | REFERENCES:  |
| stat. Mercury   | is used as             | the cali-  |  |
| bration and con   | IIINING LIQU           | uid. The   | 1. v. Antropoff, A.  |
| solvent is dega   |                        |  | Z. <u>Electrochem</u> . 1919, <u>25</u> , 269.                     |
| The solvent and together until  |                        |  |  |
| lestablished.   | edurtrurru             |  |  |
|   |                        |  |  |
|   |                        |  |  |

| COMPONENTS:  | OPTOTNAL NEAGUDDATION   |
|--|---|
| COMPONENTS:<br>1. Neon; Ne; 7440-01-9  | ORIGINAL MEASUREMENTS:<br>Clever, H.L.; Saylor, J.H.;   |
|  | Gross, P.M.   |
| 2. Undecafluoro(trifluoromethyl)-  |   |
| cyclohexane (Perfluoromethyl-<br>cyclohexane); C <sub>7</sub> F <sub>14</sub> ; 355-02-2   |   |
|  | J. Phys. Chem. 1958, 62, 89-91.   |
|  |   |
| VARIABLES:   | PREPARED BY:  |
| T/K: 289.15 - 316.25<br>P/kPa: 101.325 (1 atm)   | P.L. Long   |
| 17 Kra. 101.525 (1 aun)  | T.T. Dong   |
| EXPERIMENTAL VALUES:   | I   |
| T/K Mol Fraction   | Bunsen Ostwald  |
|  | Coefficient Coefficient   |
| $x_1 \times 10^4$  | $\alpha \times 10^2$ L × $10^2$   |
| 289.15 10.8  | 12.5 13.2   |
| 303.15 11.5  | 13.2 14.6   |
| 316.25 12.2  | 13.6 15.7   |
| Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln In$   | $X_1 = 3420.2 + 44.973 T$   |
| Std. Dev. $\Delta G^{\circ} = 4.2$ , G   |   |
|  | $\Delta S^{O}/J K^{-1} mol^{-1} = -44.973$  |
|  |   |
|  | action $\Delta G^{O}/J \text{ mol}^{-1}$  |
| x <sub>1</sub> ×   | 10 <sup>4</sup>   |
| 288.15 10.   |   |
| 293.15 11.   |   |
| 298.15 11.   | 3 16829   |
|  |   |
| 303.15 11.<br>308.15 11  | 5 17054   |
| 308.15 11.<br>313.15 12.   | 5 17054<br>8 17279<br>0 17503   |
| 308.15 11.   | 5 17054<br>8 17279<br>0 17503   |
| 308.15 11.<br>313.15 12.   | 5       17054         8       17279         0       17503         3       17728   |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.  | 5 17054<br>8 17279<br>0 17503<br>3 17728<br>0 a partial pressure of neon of   |
| 308.15 11.<br>313.15 12.<br>318.15 12.<br>318.15 12.<br>The solubility values were adjusted to   | 5 17054<br>8 17279<br>0 17503<br>3 17728<br>0 a partial pressure of neon of   |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate  | 5 17054<br>8 17279<br>0 17503<br>3 17728<br>0 a partial pressure of neon of<br>2 d by the compiler.   |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate  | 5 17054<br>8 17279<br>0 17503<br>3 17728<br>0 a partial pressure of neon of   |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:  | 5 17054<br>8 17279<br>0 17503<br>3 17728<br>0 a partial pressure of neon of<br>2 by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS:   |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a  | 5 17054<br>8 17279<br>0 17503<br>3 17728<br>0 a partial pressure of neon of<br>2 by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc. Both   |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-   | <pre>5 17054 8 17279 0 17503 3 17728 0 a partial pressure of neon of ed by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Both standard and research grades were used.</pre>   |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-<br>clude the addition of a spiral solvent   | 5 17054<br>8 17279<br>0 17503<br>3 17728<br>0 a partial pressure of neon of<br>2 d by the compiler.<br>INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc. Both<br>standard and research grades<br>were used.   |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-<br>clude the addition of a spiral solvent<br>storage tubing, a manometer for con-   | <pre>5 17054 8 17279 0 17503 3 17728 0 a partial pressure of neon of ed by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Both standard and research grades were used. 2. Perfluoromethylcyclohexane.</pre>  |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-<br>clude the addition of a spiral solvent   | <pre>5 17054 8 17279 0 17503 3 17728 0 a partial pressure of neon of ed by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Both standard and research grades were used. 2. Perfluoromethylcyclohexane.</pre>  |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-<br>clude the addition of a spiral solvent<br>storage tubing, a manometer for con-<br>stant reference pressure, and an extra   | <pre>5 17054 8 17279 0 17503 3 17728 0 a partial pressure of neon of cd by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Both standard and research grades were used. 2. Perfluoromethylcyclohexane. du Pont FCS-326, shaken with con- centrated H<sub>2</sub>SO<sub>4</sub>, washed, dried over Drierite and distilled.</pre>  |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-<br>clude the addition of a spiral solvent<br>storage tubing, a manometer for con-<br>stant reference pressure, and an extra   | <ul> <li>5 17054</li> <li>8 17279</li> <li>0 17503</li> <li>3 17728</li> <li>a partial pressure of neon of</li> <li>a partial pressure of neon of</li> <li>a partial pressure of neon of</li> <li>by the compiler.</li> </ul> INFORMATION SOURCE AND PURITY OF MATERIALS: <ol> <li>Neon. Matheson Co., Inc. Both standard and research grades were used.</li> <li>Perfluoromethylcyclohexane.<br/>du Pont FCS-326, shaken with concentrated H<sub>2</sub>SO<sub>4</sub>, washed, dried over Drierite and distilled.<br/>b.p. 75.95 to 76.05° at 753 mm.,</li></ol>  |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-<br>clude the addition of a spiral solvent<br>storage tubing, a manometer for con-<br>stant reference pressure, and an extra   | <pre>5 17054 8 17279 0 17503 3 17728 0 a partial pressure of neon of cd by the compiler. INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Both standard and research grades were used. 2. Perfluoromethylcyclohexane. du Pont FCS-326, shaken with con- centrated H<sub>2</sub>SO<sub>4</sub>, washed, dried over Drierite and distilled.</pre>  |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-<br>clude the addition of a spiral solvent<br>storage tubing, a manometer for con-<br>stant reference pressure, and an extra   | <ul> <li>5 17054</li> <li>8 17279</li> <li>0 17503</li> <li>3 17728</li> <li>a partial pressure of neon of</li> <li>ed by the compiler.</li> <li>INFORMATION</li> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>I. Neon. Matheson Co., Inc. Both standard and research grades were used.</li> <li>2. Perfluoromethylcyclohexane.<br/>du Pont FCS-326, shaken with concentrated H<sub>2</sub>SO<sub>4</sub>, washed, dried over Drierite and distilled.<br/>b.p. 75.95 to 76.05° at 753 mm., lit. b.p. 76.14 at 760 mm.</li> </ul>  |
| 308.15 11.<br>313.15 12.<br>313.15 12.<br>318.15 12.<br>The solubility values were adjusted to<br>101.325 kPa (1 atm) by Henry's law.<br>The Bunsen coefficients were calculate<br>AUXILIARY<br>METHOD:<br>Volumetric. The apparatus (1) is a<br>modification of that used by Morrison<br>and Billett (2). Modifications in-<br>clude the addition of a spiral solvent<br>storage tubing, a manometer for con-<br>stant reference pressure, and an extra   | <ul> <li>5 17054</li> <li>8 17279</li> <li>0 17503</li> <li>3 17728</li> <li>a partial pressure of neon of</li> <li>by the compiler.</li> </ul> INFORMATION SOURCE AND PURITY OF MATERIALS: <ol> <li>Neon. Matheson Co., Inc. Both standard and research grades were used.</li> <li>Perfluoromethylcyclohexane.<br/>du Pont FCS-326, shaken with concentrated H<sub>2</sub>SO<sub>4</sub>, washed, dried over Drierite and distilled.<br/>b.p. 75.95 to 76.05° at 753 mm., lit. b.p. 76.14 at 760 mm. ESTIMATED ERROR:</li></ol>  |
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|  |  |  | ORIGINAL MEASU   | REMENTS:   |  |  |  |
|--|--|--|--|--|--|--|--|
| 1. Neon; Ne; 7   | 440-01-9   |  | Evans, F.D.  | ; Battino  | , R.   |  |  |
| 2. Hexafluorob   | enzene; C  | F <sub>6</sub> ; 392-56-3  |  |  |  |  |  |
|  |  |  | J. Chem. Th  | ermodyn.   | 1971,  | з,   | 753-760  |
|  |  |  |  | <u> </u>   |  | -'   |  |
|  |  |  |  | · · · · · · · · · · · · · · · · · · ·  |  |  |  |
| VARIABLES:<br>T/K:   | 282.91 - 2   | 98.14  | PREPARED BY:   |  |  |  |  |
|  | 101.325 (1   |  | н  | .L. Cleve  | r  |  |  |
|  |  | ·· · · · ·   | <br>   |  | <del></del>  |  |  |
| EXPERIMENTAL VALUE   |  | lol Fraction   |  | 0.7.1  |  |  |  |
|  | T/K M  |  | Coefficient  | Coeffici   | ent  |  |  |
|  |  | $x_{1} \times 10^{4}$  | α x 10 <sup>2</sup>  | L x 10   | 2  |  |  |
|  | 282.91   | 2.66   | 5.25   | 5.44   |  |  |  |
|  | 283.35   | 2.66<br>2.71<br>3.43   | 5.35   | 5.55<br>7.24   |  |  |  |
|  | 297.83<br>298.14   | 3.43   | 6.64<br>6.71   | 7.24   |  |  |  |
| Smoothed Data:   | ∆G <sup>O</sup> /J mol   | $^{-1} = - RT ln$  | $X_1 = 11850 +$  | 26.514 T   |  |  |  |
|  |  | $\Delta G^{O} = 12.4,$   |  |  |  |  |  |
|  | ΔH <sup>O</sup> /J mol   | -1 = 11850, 4  | AS <sup>O</sup> /J K <sup>-1</sup> mol   | $^{-1} = 26.5$   | 14   |  |  |
|  | · _  |  | action $\Delta G^{O}/J$  |  |  |  |  |
|  |  | X <sub>1</sub> X   | 10 <sup>4</sup>  | IIIOT  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | 27<br>28   | '8.15     2.4       '3.15     2.4  | 45 19  | 225  |  |  |  |
|  |  |  | JJ 1.7   | 357  |  |  |  |
|  | 28   | 8.15 2.9   | 93 19  | 490  |  |  |  |
|  | 28<br>29   | 88.15     2.9       93.15     3.1       98.15     3.4  | 93 19<br>19 19   |  |  |  |  |
| The solubility   | 28<br>29<br>29   | 88.15     2.9       93.15     3.1       98.15     3.4  | 93 19<br>19 19<br>46 19  | 490<br>622<br>755  | f neor   | 1 0  | f  |
| The solubility<br>101.325 kPa (1   | 28<br>29<br>29<br><br>values wer   | 88.15 2.9<br>3.15 3.1<br>88.15 3.4<br>re adjusted to   | 93 19<br>19 19<br>46 19  | 490<br>622<br>755  | f neor   | ı o  | f  |
|  | 28<br>29<br>29<br>values wer<br>atm) by He   | 88.15       2.9         93.15       3.1         98.15       3.4         re adjusted to         enry's law.   | 93 19<br>19 19<br>46 19<br>5 a partial p   | 490<br>622<br>755<br>ressure o   | f neor   | ı o  | f  |
| 101.325 kPa (1   | 28<br>29<br>29<br>values wer<br>atm) by He   | 88.15       2.9         93.15       3.1         98.15       3.4         re adjusted to         enry's law.   | 93 19<br>19 19<br>46 19<br>5 a partial p   | 490<br>622<br>755<br>ressure o   | f neor   | 1 0  | f  |
| 101.325 kPa (1   | 28<br>29<br>29<br>values wer<br>atm) by He   | 18.15       2.9         13.15       3.1         18.15       3.4         re adjusted to         enry's law.         vere calculate  | 93 19<br>19 19<br>46 19<br>5 a partial p   | 490<br>622<br>755<br>ressure o   | f neor   | 1 O  | f  |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:   | 28<br>29<br>29<br>values wer<br>atm) by He<br>Eficients w  | AUXILIARY  | 93 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the com<br>INFORMATION<br>SOURCE AND PUR  | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE  | RIALS:   |  |  |
| 101.325 kPa (1<br>The Bunsen coef  | values wer<br>atm) by He<br>fficients w  | AUXILIARY  | 93 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the com<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.  | 490<br>622<br>755<br>ressure o<br>piler.   | RIALS:<br>r Produ  | licts  | ő  |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use   | values wer<br>atm) by He<br>fficients w<br>s is based<br>on and Bill<br>ed is descr  | AUXILIARY  | 93 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the com<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be  | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than   | RIALS:<br>r Produ<br>or Mat  | icts   | ő  |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso  | values wer<br>atm) by He<br>fficients w<br>s is based<br>on and Bill<br>ed is descr  | AUXILIARY  | 93 19<br>19 19<br>19 19<br>26 19<br>20 a partial p<br>21 by the com<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usuall)   | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>ls, Inc.,<br>tter than<br>y 99.9+).  | RIALS:<br>r Produ<br>or Mat<br>99 mol  | icts<br>thes                                   | &<br>on Co.,                                   |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,  | 28<br>29<br>29<br>values wer<br>atm) by He<br>Eficients w<br>ficients w<br>sis based<br>on and Bill<br>ed is descr<br>and Danfo  | AUXILIARY  | 93 19<br>19 19<br>19 19<br>20 a partial p<br>20 a partial p<br>20 by the com<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usual)<br>2. Hexaflu<br>Smeltin  | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>ls, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av  | RIALS;<br>r Produ<br>or Mat<br>99 mol  | acts<br>thes<br>sheri                          | &<br>on Co.,<br>al                             |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.   | 28<br>29<br>29<br>values wer<br>atm) by He<br>fficients w<br>fficients w<br>sis based<br>on and Bill<br>ed is descr<br>and Danfo<br>EDURE:<br>Up to 500  | AUXILIARY<br>AUXILIARY<br>and the de-<br>cent (1) and<br>by by   | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the comp<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usuall<br>2. Hexaflu<br>Smeltin<br>GC puri   | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.7%,   | RIALS:<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit   | oeri<br>beri<br>y a                            | on Co.,<br>al<br>.K.<br>t 25 <sup>0</sup> C    |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed   | 28<br>29<br>29<br>values wer<br>atm) by He<br>fficients w<br>fficients w<br>and Bill<br>ed is descr<br>and Danfo<br>CDURE:<br>Up to 500<br>in a flask  | AUXILIARY<br>and the de-<br>cent (1) and<br>cent (2).<br>cm <sup>3</sup> of sol-<br>con such   | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the comp<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usuall<br>2. Hexaflu<br>Smeltin<br>GC puri<br>1.60596  | 490<br>622<br>755<br>ressure o<br>piler.<br>Itry OF MATE<br>Either Ai.<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Avo<br>ty 99.7%,<br>g cm <sup>-3</sup> .  | RIALS:<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi   | oeri<br>y a                                    | on Co.,<br>al<br>.K.<br>t 25°C<br>by           |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1<br>deep. The liqu  | 28<br>29<br>29<br>values wer<br>atm) by He<br>fficients w<br>fficients w<br>sis based<br>on and Bill<br>ed is descr<br>and Danfo<br>EDURE:<br>Up to 500<br>in a flask<br>liquid is a<br>bid is rapi  | AUXILIARY<br>and by<br>and by<br>ce adjusted to<br>any's law.<br>are calculate<br>AUXILIARY<br>and the de-<br>ett (1) and<br>bed by<br>orth (2).<br>cm <sup>3</sup> of sol-<br>cof such<br>bout 4 cm<br>dly stirred,   | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the comp<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usuall<br>2. Hexaflu<br>Smeltin<br>GC puri<br>1.60596  | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.7%,   | RIALS:<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi   | oeri<br>y a                                    | on Co.,<br>al<br>.K.<br>t 25°C<br>by           |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1  | 28<br>29<br>29<br>values wer<br>atm) by He<br>fficients w<br>fficients w<br>sis based<br>on and Bill<br>ed is descr<br>and Danfo<br>EDURE:<br>Up to 500<br>in a flask<br>iquid is a<br>hid is rapi   | ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY<br>ANALLIARY | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the com<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usuall<br>2. Hexaflu<br>Smeltin<br>GC puri<br>1.60596<br>see: A   | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.7%,<br>g cm <sup>-3</sup> .<br>nal. Chem  | RIALS:<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi   | oeri<br>y a                                    | on Co.,<br>al<br>.K.<br>t 25°C<br>by           |
| 101.325 kPa (1<br>The Bunsen coeff<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1<br>deep. The liqu<br>and vacuum is a<br>through a liqui<br>permanent gas r  | 28<br>29<br>29<br>values wer<br>atm) by He<br>fficients w<br>fficients w<br>sis based<br>on and Bill<br>d is descr<br>and Danfo<br>DURE:<br>Up to 500<br>in a flask<br>iquid is rapi<br>applied int<br>d N <sub>2</sub> trap   | 28.15 2.9<br>3.15 3.2<br>28.15 3.4<br>re adjusted to<br>re adjusted to<br>re adjusted to<br>re adjusted to<br>avere calculate<br>AUXILIARY<br>1 on the de-<br>ett (1) and<br>ribed by<br>orth (2).<br>cm <sup>3</sup> of sol-<br>to f such<br>addy stirred,<br>rermittently<br>until the   | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the comp<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usuall<br>2. Hexaflu<br>Smeltin<br>GC puri<br>1.60596  | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.7%,<br>g cm <sup>-3</sup> .<br>nal. Chem  | RIALS:<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi<br>. 1968,  | oeri<br>y a                                    | on Co.,<br>al<br>.K.<br>t 25°C<br>by           |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1<br>deep. The liqu<br>and vacuum is a<br>through a liqui<br>permanent gas r<br>to 5 microns.<br>Solubility D  | values wer<br>atm) by He<br>ficients w<br>ficients w<br>ats is based<br>on and Bill<br>ed is descr<br>and Danfo<br>DURE:<br>Up to 500<br>in a flask<br>iquid is a<br>pid is rapi<br>applied int<br>d N <sub>2</sub> trap<br>cesidual pr<br>Determinati   | AUXILIARY<br>and the de-<br>and the   | 93 19<br>19 19<br>19 19<br>20 a partial p<br>20 a part | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.7%,<br>g cm <sup>-3</sup> .<br>nal. Chem<br>R:<br>ôT/K  | RIALS;<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi<br>. 1968,<br>= 0.03<br>= 0.5   | acts<br>thes<br>beri<br>y a<br>ed<br><u>40</u> | on Co.,<br>al<br>.K.<br>t 25°C<br>by           |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1<br>deep. The liqu<br>and vacuum is a<br>through a liqui<br>permanent gas r<br>to 5 microns.<br>Solubility D<br>gassed solvent  | values wer<br>atm) by He<br>fficients w<br>fficients w<br>ats is based<br>on and Bill<br>ed is descr<br>and Danfo<br>Up to 500<br>in a flask<br>iquid is ap<br>id is rapi<br>applied int<br>d N <sub>2</sub> trap<br>cesidual pr<br>peterminati<br>passes in   | AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY<br>AUXILIARY | 93 19<br>19 19<br>19 19<br>20 a partial p<br>20 a part | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.7%,<br>g cm <sup>-3</sup> .<br>nal. Chem<br>R:<br>ôT/K  | RIALS:<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi<br>. 1968,<br>= 0.03  | acts<br>thes<br>beri<br>y a<br>ed<br><u>40</u> | on Co.,<br>al<br>.K.<br>t 25°C<br>by           |
| 101.325 kPa (1<br>The Bunsen coeff<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1<br>deep. The liqui<br>and vacuum is a<br>through a liqui<br>permanent gas r<br>to 5 microns.<br>Solubility D<br>gassed solvent<br>down a glass sp<br>the solute gas   | 28<br>29<br>29<br>29<br>values wer<br>atm) by He<br>ficients w<br>ficients w<br>ficients w<br>sis based<br>on and Bill<br>ed is descr<br>and Danfo<br>Up to 500<br>in a flask<br>iquid is rapi<br>applied int<br>d N <sub>2</sub> trap<br>cesidual pr<br>beterminati<br>passes in<br>piral tube<br>plus the s  | AUXILIARY<br>and by<br>a thin film<br>containing<br>containing<br>colvent vapor  | 93 19<br>19 19<br>19 19<br>20 a partial p<br>20 a part | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.7%,<br>g cm <sup>-3</sup> .<br>nal. Chem<br>R:<br>ôT/K  | RIALS;<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi<br>. 1968,<br>= 0.03<br>= 0.5   | acts<br>thes<br>beri<br>y a<br>ed<br><u>40</u> | on Co.,<br>al<br>.K.<br>t 25°C<br>by           |
| <pre>101.325 kPa (1 The Bunsen coef METHOD:     The apparatu sign by Morriso the version use Battino, Evans, APPARATUS/PROCE     Degassing. vent is placed size that the 1 deep. The liqu and vacuum is a through a liqui permanent gas r to 5 microns.     Solubility D gassed solvent down a glass sp the solute gas at a total pres</pre>   | 28<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>29<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20   | AUXILIARY<br>and by<br>any sirred,<br>ce adjusted to<br>any's law.<br>AUXILIARY<br>AUXILIARY<br>and the de-<br>and the de-<br>a   | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the comp<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usual)<br>2. Hexaflu<br>Smeltin<br>GC puri<br>1.60596<br>see: A<br>ESTIMATED ERRO<br>8<br>REFERENCES:<br>1. Morrison   | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.7%,<br>g cm <sup>-3</sup> .<br>nal. Chem<br>R:<br>$\delta T/K$<br>P/mmHg<br>$\delta X_1/X_1$  | RIALS;<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi<br>. 1968,<br>= 0.03<br>= 0.5<br>= 0.015<br>Billett                       | acts<br>ches<br>beri<br>y a<br>.ed<br>.ed      | on Co.,<br>al<br>.K.<br>t 25°C<br>by<br>, 224. |
| 101.325 kPa (1<br>The Bunsen coeff<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1<br>deep. The liqu<br>and vacuum is a<br>through a liqui<br>permanent gas r<br>to 5 microns.<br>Solubility D<br>gassed solvent<br>down a glass sp<br>the solute gas<br>at a total pres<br>volume of gas a<br>difference betw | values wer<br>atm) by He<br>fficients w<br>fficients w<br>s is based<br>on and Bill<br>ed is descr<br>and Danfo<br>DURE:<br>Up to 500<br>in a flask<br>iquid is rapi<br>applied int<br>d N <sub>2</sub> trap<br>residual pr<br>beterminati<br>passes in<br>biral tube<br>plus the s<br>soure of on<br>bsorbed is<br>zeen the in                        | All states of the second secon   | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the comp<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usual)<br>2. Hexaflu<br>Smeltin<br>GC puri<br>1.60596<br>see: A<br>ESTIMATED ERRO<br>8<br>REFERENCES:<br>1. Morrison   | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai.<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av.<br>ty 99.7%,<br>g cm <sup>-3</sup> .<br>nal. Chem<br>R:<br>$\delta T/K$<br>P/mmHg<br>$\delta X_1/X_1$  | RIALS;<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi<br>. 1968,<br>= 0.03<br>= 0.5<br>= 0.015<br>Billett                       | acts<br>ches<br>beri<br>y a<br>.ed<br>.ed      | on Co.,<br>al<br>.K.<br>t 25°C<br>by<br>, 224. |
| 101.325 kPa (1<br>The Bunsen coeff<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1<br>deep. The liqui<br>permanent gas r<br>to 5 microns.<br>Solubility D<br>gassed solvent<br>down a glass sp<br>the solute gas<br>at a total pres<br>volume of gas a   | values wer<br>atm) by He<br>ficients w<br>ficients w<br>s is based<br>on and Bill<br>d is descr<br>and Danfo<br>Up to 500<br>in a flask<br>iquid is a<br>pid is rapi<br>applied int<br>d N <sub>2</sub> trap<br>residual pr<br>beterminati<br>passes in<br>plus the s<br>sure of on<br>bsorbed is<br>reen the in                                       | AUXILIARY<br>and solve the system.<br>and solve the system.   | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the com<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usuall<br>2. Hexaflu<br>Smeltin<br>GC puri<br>1.60596<br>see: A<br>ESTIMATED ERRO<br>8<br>REFERENCES:<br>1. Morrison<br>J. Chem<br>2. Battino   | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ail<br>1s, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av.<br>ty 99.78,<br>g cm <sup>-3</sup> .<br>nal. Chem<br>R:<br>$\delta T/K$<br>P/mmHg<br>$\delta X_1/X_1$<br>n, T.J.; 1<br>, Soc. 19<br>, R.; Evan | RIALS:<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi<br>. 1968,<br>= 0.03<br>= 0.5<br>= 0.015<br>Billett<br>48, 203<br>ns, F.E | acts<br>chess<br>beri<br>y a<br>ed<br>40       | on Co.,<br>al<br>.K.<br>t 25°C<br>by<br>, 224. |
| 101.325 kPa (1<br>The Bunsen coef<br>METHOD:<br>The apparatu<br>sign by Morriso<br>the version use<br>Battino, Evans,<br>APPARATUS/PROCE<br>Degassing.<br>vent is placed<br>size that the 1<br>deep. The liqu<br>and vacuum is a<br>through a liqui<br>permanent gas r<br>to 5 microns.<br>Solubility D<br>gassed solvent<br>down a glass sp<br>the solute gas<br>at a total pres<br>volume of gas a<br>difference betw  | values wer<br>atm) by He<br>ficients w<br>ficients w<br>sis based<br>on and Bill<br>ed is descr<br>and Danfo<br>DURE:<br>Up to 500<br>in a flask<br>iquid is a<br>pid is rapi<br>applied int<br>d N <sub>2</sub> trap<br>residual pr<br>beterminati<br>passes in<br>biral tube<br>plus the s<br>sure of on<br>bsorbed is<br>cen the in<br>the in the b | AUXILIARY<br>and solve the system.<br>and solve the system.   | 93 19<br>19 19<br>19 19<br>46 19<br>50 a partial p<br>ed by the com<br>INFORMATION<br>SOURCE AND PUR<br>1. Neon.<br>Chemica<br>Inc. Be<br>(usuall<br>2. Hexaflu<br>Smeltin<br>GC puri<br>1.60596<br>see: A<br>ESTIMATED ERRO<br>REFERENCES:<br>1. Morrison<br>J. Chem<br>2. Battino<br>Danfo   | 490<br>622<br>755<br>ressure o<br>piler.<br>ITY OF MATE<br>Either Ai<br>ls, Inc.,<br>tter than<br>y 99.9+).<br>orobenzen<br>g Co., Av<br>ty 99.73,<br>g cm <sup>-3</sup> .<br>nal. Chem<br>R:<br>$\delta T/K$<br>P/mmHg<br>$\delta X_1/X_1$<br>n, T.J.; I<br>. Soc. 19                 | RIALS:<br>r Produ<br>or Mat<br>99 mol<br>e. Imp<br>onmouth<br>densit<br>Purifi<br>. 1968,<br>= 0.03<br>= 0.5<br>= 0.015<br>Billett<br>48, 203<br>ns, F.E | $\frac{1}{2}$                                  | on Co.,<br>al<br>.K.<br>t 25°C<br>by<br>, 224. |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |
|--|---|
| 1. Neon; Ne; 7440-01-9   | Saylor, J. H.; Battino, R.  |
|  | Li Lory of any Battino, K.  |
| 2. Fluorobenzene; C <sub>6</sub> H <sub>5</sub> F; 462-06-6  | <u>J. Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 1334-1337.                                       |
| VARIABLES:   | PREPARED BY:  |
| T/K: 288.15 - 328.15<br>P/kPa: 101.325 (1 atm)   | H.L. Clever   |
| EXPERIMENTAL VALUES:   |   |
|  | Bunsen Ostwald<br>Coefficient Coefficient<br>α x 10 <sup>2</sup> L x 10 <sup>2</sup>              |
| ······   |   |
| 288.15 1.46<br>298.15 1.52   | 3.50 3.69<br>3.62 3.95  |
| 313.15 1.84<br>328.15 2.07   | 4.28 4.91<br>4.72 5.67  |
|  |   |
| Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln J$  | -   |
| Std. Dev. $\Delta G^{O} = 66.2$ ,  |   |
|  | $\Delta S^{\circ}/J K^{-1} mol^{-1} = -48.254$  |
| T/K Mol Fra  | ction $\Delta G^{O}/J \text{ mol}^{-1}$   |
| x <sub>1</sub> x i   | 10 <sup>4</sup>   |
| 288.15 1.4   |   |
| 293.15 1.5<br>298.15 1.5   |   |
| 303.15 1.6   | 6 21941 ·   |
| 308.15<br>313.15<br>1.8  |   |
| 318.15 1.9   | 0 22665   |
| 323.15<br>328.15<br>2.0  |   |
|  |   |
|  | TNEODWATTON   |
|  | INFORMATION   |
| METHOD:<br>The apparatus is based on the de-<br>sign by Morrison and Billett (1) and<br>the version used is described by               | SOURCE AND PURITY OF MATERIALS;<br>1. Neon. Matheson Co., Research<br>grade.                      |
| Clever, Battino, Saylor, and Gross (2).  | 2. Fluorobenzene. Eastman White<br>label. Dried over P <sub>4</sub> 0 <sub>10</sub> , dis-        |
| The solubility values were adjusted to<br>a partial pressure of neon of<br>101.325 kPa (1 atm) by Henry's law.                         | tilled, b.p. 84.28-84.68 <sup>o</sup> C.  |
| The Bunsen coefficients were calcu-<br>lated by the compiler.  |   |
|  | ESTIMATED ERROR:  |
| APPARATUS/PROCEDURE:<br>The degassed solvent is passed<br>through a glass spiral tube containing<br>the gas. The gas dissolves rapidly | $\begin{array}{rcl} \delta T/K &= 0.03\\ \delta P/mmHg &= 1\\ \delta X_1/X_1 &= 0.04 \end{array}$ |
| and the saturated liquid flows into a<br>buret system. The volume of gas dis-<br>solved is determined by the increase                  | REFERENCES:<br>1. Morrison, T.J.; Billett, F.   |
| in the solution level at constant pressure. The volume of liquid is  | <u>J</u> . <u>Chem</u> . <u>Soc</u> . 1948, 2033.   |
| determined in the burets. For low solubilities extra solvent is run  | <ol> <li>Clever, H.L.: Battino, R.;<br/>Saylor, J.H.; Gross, P.M.</li> </ol>                      |
| through the buret system and weighed.  | J. Phys. Chem. 1957, <u>61</u> , 1078.  |
|  |   |

| CONTROLING  |   |                                  | ODTOTIVAL                          |  |
|---|---|----------------------------------|------------------------------------|--|
| COMPONENTS:   |   |                                  | ORIGINAL MEASURE                   |  |
| 1. Neon; Ne; 744  | j   |                                  |                                    | ; Hildebrand, J.H.   |
| 2. 1,1,2-Trichlo<br>ethane (Free<br>76-13-1                         | oro-1,2,2<br>on 113);                             |                                  | <u>Trans</u> . Farada              | ay <u>Soc</u> . 1970, <u>66</u> , 577-581.                                   |
| VARIABLES:  |   | ·                                | PREPARED BY:                       |  |
|   | T/K: 279.25 - 298.15<br>Ne P/kPa: 101.325 (1 atm) |                                  |                                    | P. L. Long   |
| EXPERIMENTAL VALUES:  |   | <u></u>                          | l                                  |  |
|   | т/к и   | Mol Fraction                     | Bunsen                             | Ostwald  |
|   |   | $x_1 \times 10^4$                | Coefficient<br>a x 10 <sup>2</sup> |  |
|   | 279.25<br>283.81                                  | 4.22<br>4.37<br>4.46             | 8.11<br>8.34<br>8.48               | 8.29<br>8.67<br>8.91   |
|   | 287.05  | 4.40                             | 8.64                               | 9.18   |
|   | 292.37<br>294.55                                  |                                  | 8.76                               | 9.38   |
|   | 294.55<br>298.15                                  | 4.73<br>4.86                     | 8.89<br>9.09                       | 9.59<br>9.92   |
| Smoothed Data:  |   |                                  | $X_1 = 5160.2 +$                   | 46.145 T   |
|   | Std. Dev.   | ∆G° = 5.5,                       | Coef. Corr.                        | = 0.9998   |
|   | ∆H°/J mol   | -1 = 5160.2,                     | ∆s°/J K <sup>-1</sup> m            | $ol^{-1} = -46.145$  |
|   | т/  | K Mol Frac<br>X <sub>1</sub> x 1 |                                    | mol <sup>-1</sup>  |
| 278.15 4.17<br>283.15 4.34  |   |                                  |                                    |  |
|   |   |                                  |                                    |  |
| 288.15 4.51<br>293.15 4.68  |   |                                  |                                    |  |
|   | 298.15 4.85                                       |                                  | 18,9                               | 18   |
| The Bunsen and  | l Ostwald   | coefficients                     | were calculat                      | ed by the compiler.  |
|   |   | AUXILIARY                        | INFORMATION                        |  |
| METHOD:<br>Saturation of 1<br>partial pressur<br>l atm.             | iquid wit<br>e of gas                             | h gas at a<br>equal to           | 1. Neon. Se                        | TY OF MATERIALS;<br>ource not given. Purest<br>ally obtainable, dried<br>se. |
|   |   |                                  | ethane.                            | ichloro-1,2,2-trifluoro-<br>Matheson, Coleman and<br>pectroquality.          |
|   |   |                                  |                                    |  |
| APPARATUS/PROCEDURE   |   |                                  | ESTIMATED ERROR                    | :  |
| Dymond-Hildebra<br>uses an all-gla                                  | nd appara<br>ss pumpin                            | g system to                      |                                    | $\delta X_1 / X_1 = 0.01$<br>(Evaluator)                                     |
| spray slugs of a<br>the gas. The a<br>is calculated f<br>pressures. | mount of  | gas dissolved                    | 1. Dymond,                         | J. H.; Hildebrand, J. H.<br>. <u>Chem</u> . <u>Fundam</u> . 1967, <u>6</u> , |
|   |   |                                  | 130.                               |  |

| COMPONENTS:<br>1. Neon; Ne; 7440-01-9  | ORIGINAL MEASUREMENTS:<br>de Wet, W.J.   |
|--|--|
|  |  |
| 1  |  |
| <pre>2. 1,1,2,2-Tetrachloroethane;<br/>C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub>; 79-34-5</pre>   |  |
|  | <u>J. S. Afr. Chem. Inst</u> . 1964, <u>17</u> ,9-13.  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 291.45 - 304.95<br>P/kPa: 101.325 (1 atm)   | P.L. Long  |
| EXPERIMENTAL VALUES:   |  |
|  | Bunsen Ostwald<br>Coefficient Coefficient  |
| $ x_1 \times 10^4 $  | $\frac{\alpha \times 10^2}{L \times 10^2}$   |
| 291.45 1.39  | 2.96 3.16  |
| 298.85 1.50<br>304.95 1.61   | 3.17 3.47<br>3.40 3.80   |
|  |  |
| Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln I$  |  |
| Std. Dev. $\Delta G^{O} = 8.6$ ,   |  |
| $\Delta H^{O}/J \text{ mol}^{-1} = 8026.4,$  | $\Delta s / J K^{-1} mol^{-1} = -46.315$   |
| T/K Mol Fr   | action $\Delta G^{O}/J \text{ mol}^{-1}$   |
| X <sub>1</sub> ×   |  |
|  | 34 21372   |
| 293.15 1.<br>298.15 1.   | 41 21604<br>49 21835   |
| 303.15 1.  | 58 22067   |
| 308.15 1.  | 66 22299 .   |
| The solubility values were adjusted t<br>101.325 kPa (l atm) by Henry's law.   | o a partial pressure of neon of  |
| The mole fraction solubility and Ostw<br>by the compiler.  | ald coefficients were calculated   |
| AUXILIARY  | INFORMATION  |
| METHOD: Volumetric.  | SOURCE AND PURITY OF MATERIALS:  |
| To degas, the solvent is placed in a<br>large continuously evacuated bulb<br>until the solvent boils freely with-<br>out further release of dissolved<br>gases.          | <ol> <li>Neon. No source given. The gas<br/>purified over activated charcoal<br/>at liquid air temperature.<br/>Impurities estimated to be less<br/>than 0.3 percent.</li> </ol> |
| To saturate, the solvent flows in<br>a thin film through a glass spiral<br>containing the gas. The volume of<br>gas absorbed is measured on an<br>attached buret system. | 2. 1,1,2,2,-Tetrachloroethane. No<br>source given. 1,1,2,2,-Tetra-<br>chloroethane distilled imme-<br>diately before use.  |
|  | ESTIMATED ERROR:   |
| APPARATUS/PROCEDURE:<br>The apparatus is a modification of<br>that used by Morrison and Billett (1)<br>and others (2). The degassed solvent                              | $\delta T/K = 0.05$  |
| is saturated with gas as it flows<br>through a glass spiral containing the   | REFERENCES:  |
| gas. The amount of solvent passing<br>through the spiral is such that 10-<br>25 ml of gas was absorbed.  | <ol> <li>Morrison, T.J.; Billett, F.<br/>J. Chem. Soc. 1948, 2033;<br/><u>ibid</u>. 1952, 3819.</li> </ol>   |
| -  | <ol> <li>Clever, H.L.; Battino, R.;<br/>Saylor, J.H.; Gross, P.M.<br/><u>J. Phys. Chem. 1957, 61</u>, 1078.</li> </ol>   |

ORIGINAL MEASUREMENTS: COMPONENTS: 1. Neon; Ne; 7440-01-9 Saylor, J.H.; Battino, R. 2. Chlorobenzene; C<sub>6</sub>H<sub>5</sub>Cl; 108-90-7 J. Phys. Chem. 1958, 62, 1334-1337. VARIABLES: PREPARED BY: T/K: 288.15 - 328.15 H.L. Clever P/kPa: 101.325 (l atm) EXPERIMENTAL VALUES: T/K Mol Fraction Bunsen Ostwald Coefficient Coefficient  $x_1 \times 10^4$  $\alpha \times 10^2$  $L \times 10^2$ 288.15 0.853 1.89 1.99 298.15 0.986 2.16 2.36 1.17 2.53 2.90 313.15 328.15 2.97 1.40 3.57  $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln X_{1} = 9630.0 + 44.457 T$ Smoothed Data: Std. Dev.  $\Delta G^{O} = 16.6$ , Coef. Corr. = 0.9998  $\Delta H^{O}/J \text{ mol}^{-1} = 9630.0, \Delta S^{O}/J \text{ K}^{-1} \text{ mol}^{-1} = -44.457$ Mol Fraction  $\Delta G^{O}/J \text{ mol}^{-1}$ T/K  $x_1 \times 10^4$ 22440 288.15 0.86 0.92 293.15 22663 0.98 298.15 22885 303.15 1.04 23107 1.11 308.15 23329 313.15 23552 1.18 318.15 23774 1.25 323.15 1.32 23996 328.15 1.40 24219 AUXILIARY INFORMATION METHOD: SOURCE AND PURITY OF MATERIALS: The apparatus is based on the de-1. Neon. Matheson Co., Research sign by Morrison and Billett(1) and grade. the version used is described by Clever, Battino, Saylor, and Gross (2) 2. Chlorobenzene, Eastman white label. Dried over P<sub>4</sub>O<sub>10</sub>, distilled, b.p. 131.67 - 131.71 °C. The solubility values were adjusted to a partial pressure of neon of 101.325 kPa (1 atm) by Henry's law. The Bunsen coefficients were calculated by the compiler. ESTIMATED ERROR: **APPARATUS / PROCEDURE :** δΤ/Κ = 0.03 The degassed solvent is passed δP/mmHg = 1 through a glass spiral tube containing = 0.04  $\delta X_1 / X_1$ the gas. The gas dissolves rapidly and the saturated liquid flows into a **REFERENCES**: buret system. The volume of gas dissolved is determined by the increase 1. Morrison, T.J.; Billett, F. in the solution level at constant J. Chem. Soc. 1948, 2033. pressure. The volume of liquid is determined in the burets. For low 2. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. J. Phys. Chem. 1957, <u>61</u>, 1078. solubilities extra solvent is run through the buret system and weighed.

| CONTRACTOR   |  |                        |                       |   |
|--|--|------------------------|-----------------------|---|
| COMPONENTS:  | L. Neon; Ne; 7440-01-9                           |                        |                       | SUREMENTS:<br>.H.; Battino, R.  |
|  |  |                        | bayror, U.            | , Dattino, K.   |
| 2. Bromobenzen   | e; C <sub>6</sub> <sup>H</sup> 5 <sup>Br</sup> ; | 108-86-1               |                       |   |
|  |  |                        | J. Phys. C            | <u>Chem</u> . 1958, <u>62</u> , 1334-1337.                                    |
|  |  |                        |                       |   |
|  |  |                        |                       |   |
| VARIABLES:   | 288.15 - 3                                       | 28.15                  | PREPARED BY:          |   |
| 1/1:   | 200.15 - 5                                       | 20.13                  |                       | H.L. Clever   |
| P/kPa:   | 101.325 (1                                       | atm)                   |                       |   |
| EXPERIMENTAL VALUE                                     | S:   |                        |                       |   |
|  | T/K M  | ol Fraction            | Bunsen                | Ostwald   |
|  |  | x x 10 <sup>4</sup>    | Coefficient           | Ostwald<br>t Coefficient<br>L x 10 <sup>2</sup>                               |
|  |  |                        |                       |   |
|  | 288.15<br>298.15                                 | 0.706<br>0.771         | 1.52<br>1.64          | 1.60<br>1.79  |
|  | 313.15   | 0.932                  | 1.95                  | 2.24  |
|  | 328.15   | 1.07                   | 2.21                  | 2.66  |
| Smoothed Data:   | ∆G <sup>O</sup> /J mol                           | $^{-1}$ = - RT ln      | $X_1 = 8405.2$        | 2 + 50.394 T  |
|  |  | $\Delta G^{O} = 33.3,$ | -                     |   |
| Į  |  |                        |                       | $no1^{-1} = -50.394$  |
|  | ·  |                        | _                     |   |
|  |  |                        | action $\Delta G^{O}$ | /J mol -  |
|  |  | x ×                    | 10*                   |   |
|  | 28   | 8.15 0.6               |                       | 22926   |
|  |  |                        |                       | 23178<br>23430  |
|  |  |                        |                       | 23430   |
|  | 30   | 8.15 0.8               | 377 2                 | 23934   |
|  |  | 3.15 0.9<br>8.15 0.9   |                       | 24186<br>24438  |
|  | 32   | 3.15 1.0               | )2 2                  | 24690   |
|  | 32   | 8.15 1.0               |                       | 24942   |
|  |  |                        |                       |   |
|  |  |                        |                       |   |
|  |  | AUXILIARY              | INFORMATION           |   |
| METHOD:<br>The apparatu                                | is based   | on the do-             |                       | PURITY OF MATERIALS;<br>Matheson Co., Research                                |
| sign by Morriso  | on and Bill                                      | ett(1) and             | grade.                | -   |
| the version use  | d is descr                                       | ibed by                | 2 Bromet              | -<br>   |
| Clever, Battino  | , sayior,  | anu Gross (2)          | label.                | penzene. Eastman, white<br>. Dried over P <sub>4</sub> 0 <sub>10</sub> , dis- |
| mha galubilit  | ***  | o odduot-2 to          | +11100                | 4 10<br>1, b.p. 155.86 - 155.90 °C.   |
| The solubility<br>a partial press                      | warues wer<br>sure of ne                         | e aujusted to<br>on of | Ϋ́                    |   |
| 101.325 kPa (1   |  |                        |                       |   |
| The Bunsen coef  |  | ere calcu-             |                       |   |
| lated by the co  | mpiler.  |                        |                       |   |
|  |  | ESTIMATED ER           | RROR:                 |   |
| APPARATUS/PROCEDURE:<br>The degassed solvent is passed |  |                        | $\delta T/K = 0.03$   |   |
| through a glass  | spiral tu  | be containing          | Ţ                     | $\begin{array}{llllllllllllllllllllllllllllllllllll$                          |
| the gas. The g<br>and the saturat                      |  |                        |                       |   |
| buret system.  |  |                        | REFERENCES:           | ·   |
| solved is deter  | mined by t                                       | he increase            | 1. Morris             | son, T.J.; Billett, F.  |
| in the solution pressure. The                          | volume of  |                        | $\int \frac{J}{Che}$  | em. <u>Soc</u> . 1948, 2033.  |
| determined in t  | he burets.                                       | For low                |                       | r, H.L.; Battino, R.;   |
| solubilities ex<br>through the bur                     |  |                        | Saylor                | r, J.H.; Gross, P.M.<br>ys. <u>Chem</u> . 1957, <u>61</u> , 1078.             |
| chrough the bur  | et system  | anu wergneu.           | U. Phy                | yo. <u>Chem</u> . 1997, <u>01</u> , 1078.                                     |
|  |  |                        | 1                     |   |

| COMPONENTS:<br>1. Neon; Ne; 7 | 440-01-9                                    |                  | ORIGINAL MEASUREMENTS:<br>Saylor, J.H.; Battino, R.   |
|-------------------------------|---|------------------|---|
|                               |   |                  | Saylor, U.M., Batcino, K.   |
| 2. Iodobenzene                | ; C <sub>6</sub> H <sub>5</sub> I; 591-50-4 |                  |   |
|                               |   |                  | J. Phys. Chem. 1958, 62, 1334-1337.   |
|                               |   |                  |   |
|                               |   |                  |   |
| VARIABLES:<br>T/K:            | 288.15 - 328.15                             |                  | PREPARED BY:  |
|                               |   |                  | H.L. Clever   |
| P/kPa:                        | 101.325 (l atm)                             |                  |   |
| EXPERIMENTAL VALUE            | S:  |                  |   |
|                               | T/K Mol Frac                                | tion             | Bunsen Ostwald<br>Coefficient Coefficient   |
|                               | v v l                                       |                  | $\alpha \times 10^2$ L × 10 <sup>2</sup>  |
|                               | <u></u>                                     |                  | **************************************  |
| l                             | 288.15 0.45<br>298.15 0.53                  | 2<br>9           | 0.910 0.960<br>1.08 1.18  |
|                               | 313.15 0.62                                 | 1                |   |
| ]                             | 328.15 0.78                                 | 7                | 1.23 1.41<br>1.53 1.84  |
| Smoothed Data:                | $\Delta G^{O}/J \text{ mol}^{-1} = -$       | RT ln            | $x_1 = 10497 + 46.715 T$  |
|                               |   |                  | Coef. Corr. = 0.9963  |
| 1                             |   |                  | $s^{o}/J \ \kappa^{-1} \ mol^{-1} = -46.715$  |
|                               |   |                  | $\frac{1}{100} \Delta G^{0}/J \text{ mol}^{-1}$   |
| 1                             | т/к м                                       |                  |   |
|                               |   | X <sub>1</sub> × |   |
|                               | 288.15                                      |                  |   |
|                               | 293.15<br>298.15                            | 0.4              | 89 24191<br>26 24425  |
|                               | 303.15                                      | 0.5              | 64 24659  |
|                               | 308.15<br>313.15                            | 0 6              | 44 25126  |
|                               | 318.15                                      | 0.6              | 86 25359  |
|                               | 323.15<br>328.15                            | 0.7<br>0.7       |   |
|                               |   |                  | · · · · · · · · · · · · · · · · · · ·   |
|                               | - <u></u>                                   |                  | ······································  |
|                               | AUX   | <b>(ILIARY</b>   | INFORMATION   |
| METHOD:                       | ·····                                       |                  | SOURCE AND PURITY OF MATERIALS:   |
|                               | s is based on the n and Billett(1)          |                  | 1. Neon. Matheson Co., Research   |
|                               | d is described by                           |                  | grade.  |
| Clever, Batting               | , Saylor, and Gro                           | ss (2)           | 2. Iodobenzene. Eastman, white<br>label. Shaken with dil. ag.                               |
|                               |   |                  | thiosulfate, washed with water,   |
|                               | values were adjus<br>ure of neon of         | ted to           | 4 10  |
|                               | atm) by Henry's 1                           | aw.              | 77.40 - 77.60 °C (20 mmHg).   |
| The Bunsen coef               | ficients were cal                           |                  |   |
| lated by the co               | mpiler.                                     |                  |   |
|                               |   |                  | ESTIMATED ERROR:  |
| APPARATUS/PROCEDUR            | E:<br>solvent is passe                      | a                | $\delta T/K = 0.03$   |
| through a glass               | spiral tube cont                            | aining           | $\begin{array}{rcl} \delta P/mmHg &= 1\\ \delta X_{1}/X_{1} &= 0.04 \end{array}$            |
| the gas. The g                | as dissolves rapi                           | dly              | $\delta x_{1}/x_{1} = 0.04$   |
|                               | ed liquid flows i<br>The volume of gas      |                  | REFERENCES:   |
| solved is deter               | mined by the incr<br>level at constan       | ease             | 1. Morrison, T.J.; Billett, F.  |
|                               | volume of liquid                            |                  | <u>J</u> . <u>Chem</u> . <u>Soc</u> . 1948, 2033.   |
|                               | he burets. For l<br>tra solvent is ru       |                  | 2. Clever, H.L.; Battino, R.;<br>Saylor, J.H.; Gross, P.M.                                  |
|                               | et system and wei                           |                  | Saylor, J.H.; Gross, P.M.<br><u>J</u> . <u>Phys</u> . <u>Chem</u> . 1957, <u>61</u> , 1078. |
|                               |   |                  |   |
|                               |   |                  |   |

| COMPONENTS:   |   | ORIGINAL MEASUREMENTS:  |
|---|---|---|
| 1. Neon; Ne; 7440-01-9  |   | Powell, R.J.  |
| 2. Carbon Disulfide; CS <sub>2</sub> ; 75   | -15-0   | <u>J. Chem. Eng. Data</u> 1972, <u>17</u> , 302-304.  |
| VARIABLES:  |   | PREPARED BY:  |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm  | )   | P.L. Long   |
| EXPERIMENTAL VALUES:  |   | · · · · · · · · · · · · · · · · · · ·   |
| T/K Mol Fraction<br>$x_1 \times 10^4$   | Coeffici  | $\begin{array}{llllllllllllllllllllllllllllllllllll$  |
| 298.15 0.59   | 2.18  | 2.38 ~8.0   |
| 313.15 K, but only the solubit slope $R(\Delta \log X_1/\Delta \log T)$ was giby the compiler from the slope  | lity at 2<br>iven. Th<br>e in the   | surements were made between 288.15 and<br>298.15 K was given in the paper. The<br>he smoothed data below were calculated<br>form:<br>-4) + (8.0/R) log (T/298.15)                 |
| with R = 1.9872 cal K <sup>-1</sup> mol <sup>-1</sup>   |   | ,   |
| with R = 1.9872 cal K mol m<br>Smoothed Data:   |   | Mol Fraction  |
| Smoothed Data:  | T/K M   | $x_1 \times 10^4$   |
|   | 273.15<br>278.15<br>283.15<br>288.15<br>293.15<br>298.15<br>303.15<br>cients we | 0.41<br>0.45<br>0.48<br>0.51<br>0.55<br>0.59<br>0.63<br>ere calculated by the compiler.   |
|   | AUXILIARY   | INFORMATION   |
| METHOD:   |   | SOURCE AND PURITY OF MATERIALS:   |
|   |   | <ol> <li>Neon. No source given. Research<br/>grade, dried over CaCl<sub>2</sub> before<br/>use.</li> <li>Carbon disulfide. No source<br/>given. Spectrochemical grade.</li> </ol> |
| APPARATUS/PROCEDURE:<br>Dymond and Hildebrand (1) a<br>which uses an all glass pumpir<br>to spray slugs of degassed sol<br>into the gas. The amount of g<br>solved is calculated from the | ng system<br>lvent<br>gas dis-  |   |
| and final gas pressures. The<br>is degassed by freezing and pu<br>followed by boiling under redu<br>pressure.   | solvent<br>mping<br>iced  | <ol> <li>Dymond, J.H.; Hildebrand, J.H.<br/><u>Ind. Eng. Chem</u>. Fundam. 1967, <u>6</u>,<br/>130.</li> </ol>  |
|   |   |   |

| COMPONENTS :   | ORIGINAL MEASUREMENTS:   |
|--|--|
| 1. Neon; Ne; 7440-01-9   | Dymond, J.H.   |
| <pre>2. Sulfinylbismethane (Dimethyl Sulfoxide); C2H6OS (CH3SOCH3); 67-68-5</pre>  | <u>J. Phys</u> . <u>Chem</u> . 1967, <u>71</u> ,1829-1831.   |
| VARIABLES:   | PREPARED BY:   |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)  | M.E. Derrick   |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol Fraction   | Bunsen Ostwald   |
| -  | Coefficient Coefficient  |
| $\qquad \qquad $  | $\frac{\alpha \times 10^2}{2} \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad$  |
| 298.15 0.368   | 1.16 1.27  |
|  |  |
| AUXILIARY  | INFORMATION  |
| METHOD /APPARATUS/PROCEDURE:   | SOURCE AND PURITY OF MATERIALS:  |
| The liquid is saturated with the<br>gas at a gas partial pressure of<br>1 atm.<br>The apparatus is that described by<br>Dymond and Hildebrand (1). The<br>apparatus uses an all-glass pumping<br>system to spray slugs of degassed<br>solvent into the gas. The amount of<br>gas dissolved is calculated from the<br>initial and final gas pressure. | <ol> <li>Neon. Matheson Co. Dried.</li> <li>Dimethyl Sulfoxide. Matheson,<br/>Coleman, and Bell Co. Spectro-<br/>quality reagent, dried, and a<br/>fraction frozen out. Melting<br/>pt.: 18.37°C.</li> </ol> |
|  | ESTIMATED ERROR:   |
|  |  |
|  | REFERENCES:  |
|  | <pre>1. Dymond., J.; Hildebrand. J.H.<br/>Ind. Eng. Chem. Fundam. 1967,<br/><u>6</u>, 130.</pre>   |
|  |  |

| COMPONENTS :   |  |  | ORIGINAL MEAS  | IIDEMENITC .   |  |     |
|--|--|--|--|--|--|-----|
| 1. Neon; Ne;   | 7440-01-   | 9  | Friedman,  |  |  |     |
|  |  | 0 <sub>2</sub> ; 75-52-5   |  |  |  |     |
|  |  |  | <u>J</u> . <u>Am</u> . <u>Che</u>  | <u>m. Soc</u> . 1954   | , <u>76</u> , 3294-3   | 297 |
| VARIABLES:   |  |  | PREPARED BY:   |  |  |     |
| T/K:<br>P/kPa:   | 298.00<br>101.325  | (1 atm)  |  | P.L. Long  |  |     |
| EXPERIMENTAL VALU  | ES:  |  |  | · · · · · · · · · · · · · · · · · · ·  |  |     |
|  | Т/К  | Mol Fraction   | Bunsen   | Ostwald  |  |     |
|  | ·  |  | Coefficient  |  |  |     |
|  |  | $x_{1} \times 10^{4}$  | α x 10 <sup>2</sup>  | L x 10 <sup>2</sup>  |  |     |
|  | 298.00   |  |  | 2.41<br>2.49   |  |     |
|  |  | 0.540  | 0.225  | 2.45 av.   |  |     |
|  |  |  |  |  |  |     |
|  |  |  |  |  |  |     |
|  |  | AUXILIARY  | INFORMATION  |  |  |     |
| METHOD:<br>Gas absorpt<br>essentially th<br>and Herzberg (<br>cluded a magne<br>stead of shakin<br>sel, and balan<br>against a colum<br>electrical con<br>ing the gas po<br>atmosphere.  | at employ<br>l). Modi<br>tic stirr<br>ng the sa<br>cing the<br>nn of mer<br>tacts ins  | e method was<br>red by Eucken<br>fications in-<br>ring device in-<br>turation ves-<br>gas pressure<br>cury with<br>stead of balanc   | SOURCE AND PL<br>1. Neon.<br>grade,<br>spectr<br>2. Nitrom<br>Distil<br>253 K.   | RITY OF MATERIA<br>Air Reductio<br>99.8 per cer<br>oscopy.<br>ethane. Sour<br>led, dried by                              | on Co. Reager<br>nt pure by ma<br>rce not giver                                      | iss |
| Gas absorpt.<br>essentially the<br>and Herzberg (<br>cluded a magne-<br>stead of shakin<br>sel, and baland<br>against a colum<br>electrical con-<br>ing the gas pr<br>atmosphere.  | at employ<br>1). Modi<br>tic stirr<br>ng the sa<br>cing the<br>nn of mer<br>tacts ins<br>ressure a   | e method was<br>yed by Eucken<br>fications in-<br>ting device in-<br>turation ves-<br>gas pressure<br>cury with<br>tead of balanc<br>gainst the  | SOURCE AND PL<br>1. Neon.<br>grade,<br>spectr<br>2. Nitrom<br>Distil<br>253 K.   | Air Reductio<br>99.8 per cer<br>oscopy.<br>ethane. Soun<br>led, dried by   | on Co. Reager<br>nt pure by ma<br>rce not giver<br>y filtering a                     | 155 |
| Gas absorpt.<br>essentially the<br>and Herzberg (<br>cluded a magner<br>stead of shakin<br>sel, and baland<br>against a colum<br>electrical con-<br>ing the gas pr<br>atmosphere.  | at employ<br>1). Modi<br>tic stirr<br>ng the sa<br>cing the<br>nn of mer<br>tacts ins<br>ressure a<br>RE: The s<br>um. The   | e method was<br>yed by Eucken<br>fications in-<br>ting device in-<br>turation ves-<br>gas pressure<br>cury with<br>tead of balanc<br>gainst the<br>colvent was de-<br>procedure, re-   | SOURCE AND PL<br>1. Neon.<br>grade,<br>spectr<br>2. Nitrom<br>Distil<br>253 K.<br>-<br>ESTIMATED ERF   | Air Reduction<br>99.8 per cent<br>oscopy.<br>ethane. Sound<br>led, dried by<br>$\delta T/K = 0.$<br>$\delta P/mmHg = 0.$ | on Co. Reager<br>nt pure by ma<br>rce not giver<br>y filtering a<br>.05<br>.3        | 159 |
| Gas absorpt.<br>essentially the<br>and Herzberg (<br>cluded a magne-<br>stead of shaking<br>sel, and baland<br>against a colum<br>electrical con-<br>ing the gas pro-<br>atmosphere.<br>APPARATUS/PROCEDUN<br>gassed by vacuum<br>peated 5-10 tim<br>5-15 s evacuat:   | at employ<br>1). Modi<br>tic stirr<br>ng the sa<br>cing the<br>nn of mer<br>tacts ins<br>ressure a<br>RE: The s<br>m. The<br>nes, was<br>ion and r   | e method was<br>red by Eucken<br>fications in-<br>ting device in-<br>turation ves-<br>gas pressure<br>cury with<br>tead of balanc<br>gainst the<br>rolvent was de-<br>procedure, re-<br>to alternate<br>apid stirring  | SOURCE AND PL<br>1. Neon.<br>grade,<br>spectr<br>2. Nitrom<br>Distil<br>253 K.<br>-<br>ESTIMATED ERF   | Air Reduction<br>99.8 per cert<br>oscopy.<br>ethane. Sour<br>led, dried by<br>$\overline{\delta T/K} = 0$ .              | on Co. Reager<br>nt pure by ma<br>rce not giver<br>y filtering a<br>.05<br>.3        | 159 |
| Gas absorpt<br>essentially the<br>and Herzberg (<br>cluded a magner<br>stead of shaking<br>sel, and baland<br>against a colum<br>electrical con-<br>ing the gas pr<br>atmosphere.<br>APPARATUS/PROCEDUN<br>gassed by vacuum<br>peated 5-10 tim<br>5-15 s evacuat:<br>to produce cave                                     | at employ<br>1). Modi<br>tic stirr<br>ng the sa<br>cing the<br>nn of mer<br>tacts ins<br>ressure a<br>RE: The s<br>m. The<br>mes, was<br>ion and r<br>itation.   | e method was<br>red by Eucken<br>fications in-<br>ting device in-<br>turation ves-<br>gas pressure<br>roury with<br>tead of balanc<br>gainst the<br>rolvent was de-<br>procedure, re-<br>to alternate<br>apid stirring<br>In the solu-   | SOURCE AND PL<br>1. Neon.<br>grade,<br>spectr<br>2. Nitrom<br>Distil<br>253 K.<br>-<br>ESTIMATED ERF   | Air Reduction<br>99.8 per cent<br>oscopy.<br>ethane. Sound<br>led, dried by<br>$\delta T/K = 0.$<br>$\delta P/mmHg = 0.$ | on Co. Reager<br>nt pure by ma<br>rce not giver<br>y filtering a<br>.05<br>.3        | 159 |
| Gas absorpt.<br>essentially the<br>and Herzberg (<br>cluded a magne<br>stead of shakin<br>sel, and baland<br>electrical con-<br>ing the gas pa<br>atmosphere.<br>APPARATUS/PROCEDUN<br>gassed by vacuu<br>peated 5-10 tir<br>5-15 s evacuat:<br>to produce cave<br>bility measurer<br>with solvent va<br>contact with ab | at employ<br>1). Modi<br>tic stirr<br>ng the sa<br>cing the<br>mn of mer<br>tacts ins<br>ressure a<br>RE: The s<br>ins. The<br>mes, was<br>ion and r<br>itation.<br>ment, gas<br>pout 80 m<br>vessel.<br>ablished<br>Solubilit | e method was<br>red by Eucken<br>fications in-<br>turation ves-<br>gas pressure<br>cury with<br>tead of balanc<br>gainst the<br>rolvent was de-<br>procedure, re-<br>to alternate<br>apid stirring<br>In the solu-<br>, pre-saturated<br>brought into<br>1 of solvent in<br>Initial condi-<br>by a time ex-<br>y equilibrium | SOURCE AND PL<br>1. Neon.<br>grade,<br>spectr<br>2. Nitrom<br>Distil<br>253 K.<br>-<br>-<br>ESTIMATED ERF<br>REFERENCES:<br>1. Euken,<br>Z. Phys | Air Reduction<br>99.8 per cent<br>oscopy.<br>ethane. Sound<br>led, dried by<br>$\delta T/K = 0.$<br>$\delta P/mmHg = 0.$ | on Co. Reager<br>nt pure by ma<br>rce not giver<br>y filtering a<br>.05<br>.3<br>.03 | 15: |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| 1. Neon; Ne; 7440-01-9  | Saylor, J.H.; Battino, R.  |
| 2. Nitrobenzene; C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> ; 98-95-3          |  |
| 2. Nitrobenzene, C <sub>6</sub> <sub>5</sub> <sub>2</sub> , 50-55 5               | T Dave Cham 1059 62 1224-1227  |
|   | <u>J</u> . <u>Phys</u> . <u>Chem</u> . 1958, <u>62</u> , 1334-1337.                        |
|   |  |
| VARIABLES:<br>T/K: 288.15 - 328.15  | PREPARED BY:   |
|   | H.L. Clever  |
| P/kPa: 101.325 (1 atm)  |  |
| EXPERIMENTAL VALUES:  |  |
| T/K Mol Fraction  | Bunsen Ostwald<br>Coefficient Coefficient  |
| $x_1 \times 10^4$   | $\alpha \times 10^2$ L × $10^2$  |
|   | 0.698 0.736  |
| 298.15 0.509  | 1.12 1.22  |
| 313.15 0.575<br>328.15 0.676  | 1.24 1.42<br>1.44 1.73   |
| Smoothed Data: $\Delta G^{O}/J \text{ mol}^{-1} = - RT \ln In$                    | $X_{-} = 13274 + 38.974 T$   |
|   | -  |
| Std. Dev. $\Delta G^{\circ} = 300.4$ ,<br>$\Delta H^{\circ} (I mol^{-1} = 13274)$ | $AS^{/}J K^{-1} mol^{-1} = -38.974$  |
|   |  |
| T/K Mol Fra   | action $\Delta G^{O}/J \text{ mol}^{-1}$   |
| <u> </u>  | 10   |
| 288.15 0.3<br>293.15 0.3  |  |
| 298.15 0.4  | 435 24895  |
| 303.15 0.4<br>308.15 0.5  |  |
| 313.15 0.5<br>318.15 0.6  |  |
| 323.15 0.6  | 558 25869  |
| 328.15 0.7  | 710 26064  |
|   |  |
| AUXILIARY   | INFORMATION  |
| METHOD:   | SOURCE AND PURITY OF MATERIALS;  |
| The apparatus is based on the de-   | 1. Neon. Matheson Co., Research  |
| sign by Morrison and Billett(1) and the version used is described by              | grade.   |
| Clever, Battino, Saylor, and Gross (2)  | .2. Nitrobenzene. Eastman, white<br>label. Distilled from P <sub>4</sub> O <sub>10</sub> , |
| The solubility values were adjusted to<br>a partial pressure of neon of           | reduced pressure of 10 mm of Hg,<br>b.p. 81.0 - 81.2°C.                                    |
| 101.325 kPa (1 atm) by Henry's law.   | 1  |
| The Bunsen coefficients were calcu-<br>lated by the compiler.                     |  |
| APPARATUS/PROCEDURE:  | ESTIMATED ERROR: $\delta T/K = 0.03$   |
| The degassed solvent is passed  | $\delta P/mmHg = 1$  |
| through a glass spiral tube containing<br>the gas. The gas dissolves rapidly      | $\delta x_1 / x_1 = 0.04$  |
| and the saturated liquid flows into a   | REFERENCES :   |
| buret system. The volume of gas dis-<br>solved is determined by the increase      | 1. Morrison, T.J.; Billett, F.<br>J. <u>Chem</u> . <u>Soc</u> . 1948, 2033.                |
| in the solution level at constant pressure. The volume of liquid is               |  |
| determined in the burets. For low   | 2. Clever, H.L.; Battino, R.;<br>Saylor, J.H.; Gross, P.M.                                 |
| solubilities extra solvent is run through the buret system and weighed.           | J. Phys. Chem. 1957, <u>61</u> , 1078.   |
|   |  |

| COMPONENTS :   | ORIGINAL MEASUREMENTS:   |
|--|--|
| 1. Neon; Ne; 7440-01-9   | Powell, R.J.   |
| <ol> <li>Neon; Ne; 7440-01-5</li> <li>1,1,2,2,3,3,4,4,4-nonafluoro-N,N-<br/>bis(nonafluorobutyl)-1-butanamine<br/>(Perfluorotributylamine);C12F27N;</li> </ol>   | <u>J. Chem. Eng. Data</u> 1972, <u>17</u> , 302-304.   |
| 311-89-7.  |  |
| VARIABLES:   | PREPARED BY:   |
| T/K: 298.15<br>P/kPa: 101.325 (1 atm)  | P.L. Long  |
| EXPERIMENTAL VALUES:   |  |
| T/K Mol Fraction Bunsen<br>Coefficie<br>$X_1 \times 10^4$ $\alpha \times 10^6$   | $\begin{array}{c} \text{Ostwald} \\ \text{ent Coefficient} \\ \text{Coefficient} \\ \text{L x 10}^2 \\ \end{array} \begin{array}{c} \frac{\Delta \log X_1}{\Delta \log T} = N \\ \text{L x 10}^2 \end{array}$                              |
| 298.15 16.79 10.5  | 11.5 2.76  |
| The author states that solubility meass<br>313.15 K, but only the solubility at 21<br>slope $R(\Delta \log X_1/\Delta \log T)$ was given. The<br>by the compiler from the slope in the s                                       | 98.15 K was given in the paper. The<br>e smoothed data below were calculated   |
| with $R = 1.9872$ cal $K^{-1}$ mol <sup>-1</sup> .   | / '(2.70/K) i0g(i/298.15)  |
| Smoothed Data:   |  |
|  | ol Fraction  |
|  | $x_1 \times 10^4$  |
| 288.15<br>293.15   | 16.0<br>16.4   |
| 293.15   | 16.8   |
| 303.15<br>308.15   | 17.2<br>17.6   |
| 313.15   | 18.0   |
| 318.15   | 18.4   |
| The Bunsen and Ostwald coefficients we   | re calculated by the compiler.   |
| AUXILIARY  | INFORMATION  |
| METHOD:  | SOURCE AND PURITY OF MATERIALS;<br>1. Neon. No source given. Research<br>grade, dried over CaCl <sub>2</sub> before<br>use.  |
|  | <pre>2. Perfluorotributylamine. Minnesota<br/>Mining &amp; Manufacturing Co. Dis-<br/>tilled, used portion boiling be-<br/>tween 447.85-448.64 K which gave<br/>a single GLC peak.<br/>d<sub>298.15</sub> = 1.880 g cm<sup>-3</sup>.</pre> |
| APPARATUS/PROCEDURE:<br>Dymond and Hildebrand (1) apparatus<br>which uses an all glass pumping system<br>to spray slugs of degassed solvent in-<br>to the gas. The amount of gas dis-<br>solved is calculated from the initial | ESTIMATED ERROR:<br>$\delta$ N/cal K <sup>-1</sup> mol <sup>-1</sup> = 0.1<br>$\delta X_1/X_1$ = 0.002<br>REFERENCES:  |
| and final gas pressures. The solvent<br>is degassed by freezing and pumping<br>followed by boiling under reduced<br>pressure.  | <ol> <li>Dymond, J.H.; Hildebrand, J.H.<br/><u>Ind. Eng. Chem. Fundam. 1967, 6</u>,<br/>130.</li> </ol>  |
|  |  |

|   | ORIGINAL MEASUREMENTS:   |  |  |
|---|--|--|--|
| 1. Neon; Ne; 7440-01-9  | Wilcock, R.J.; McHale, J.L.;<br>Battino, B.; Wilhelm, E.   |  |  |
| 2. Octamethylcyclotetrasiloxane;<br>C <sub>8</sub> H <sub>24</sub> O <sub>4</sub> Si <sub>4</sub> ; 556-67-2  | <u>Fluid</u> <u>Phase</u> <u>Equilib</u> .1978, <u>2</u> , 225-230.  |  |  |
|   |  |  |  |
| VARIABLES:  | PREPARED BY:   |  |  |
| T/K: 298.13   | H.L. Clever  |  |  |
| P/kPa: 101.325 (1 atm)  |  |  |  |
| EXPERIMENTAL VALUES:  |  |  |  |
| T/K Mol Fraction<br>X <sub>1</sub> x 10 <sup>4</sup>  | Bunsen Ostwald<br>Coefficient Coefficient  |  |  |
|   | $\underline{\alpha \times 10^2} \underline{L \times 10^2}$   |  |  |
| 298.13 9.19   | 6.609 7.213  |  |  |
| The solubility values were adjusted t kPa by Henry's law.   | o a gas partial pressure of 101.325  |  |  |
| The Bunsen coefficients were calculat   | ed by the compiler.  |  |  |
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| AUXILIARY   | INFORMATION  |  |  |
| AUXILIARY<br>METHOD /APPARATUS/PROCEDURE:   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS;   |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc.   |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by  | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc.   |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure  | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co., Inc.<br/>Minimum mole per cent purity<br/>99.99.</li> <li>2. Octamethylcyclotetrasiloxane.</li> </ul>   |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).   | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co., Inc.<br/>Minimum mole per cent purity<br/>99.99.</li> <li>2. Octamethylcyclotetrasiloxane.<br/>General Electric Co. Distilled<br/>density of 298.15 K was 0.9500</li> </ul>   |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-   | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co., Inc.<br/>Minimum mole per cent purity<br/>99.99.</li> <li>2. Octamethylcyclotetrasiloxane.<br/>General Electric Co. Distilled</li> </ul>  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such  | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co., Inc.<br/>Minimum mole per cent purity<br/>99.99.</li> <li>2. Octamethylcyclotetrasiloxane.<br/>General Electric Co. Distilled<br/>density of 298.15 K was 0.9500</li> </ul>   |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,   | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co., Inc.<br/>Minimum mole per cent purity<br/>99.99.</li> <li>2. Octamethylcyclotetrasiloxane.<br/>General Electric Co. Distilled<br/>density of 298.15 K was 0.9500</li> </ul>   |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm  | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Neon. Matheson Co., Inc.<br/>Minimum mole per cent purity<br/>99.99.</li> <li>2. Octamethylcyclotetrasiloxane.<br/>General Electric Co. Distilled<br/>density of 298.15 K was 0.9500</li> </ul>   |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,<br>and vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure  | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Minimum mole per cent purity 99.99. 2. Octamethylcyclotetrasiloxane. General Electric Co. Distilled density of 298.15 K was 0.9500 g cm<sup>-3</sup>. ESTIMATED ERROR:</pre>  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,<br>and vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure<br>drops to 5 microns.<br>Solubility Determination. The de-  | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Minimum mole per cent purity 99.99. 2. Octamethylcyclotetrasiloxane. General Electric Co. Distilled density of 298.15 K was 0.9500 g cm<sup>-3</sup>. ESTIMATED ERROR:</pre>  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,<br>and vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure<br>drops to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc.<br>Minimum mole per cent purity<br>99.99.<br>2. Octamethylcyclotetrasiloxane.<br>General Electric Co. Distilled<br>density of 298.15 K was 0.9500<br>g cm <sup>-3</sup> .<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,<br>and vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure<br>drops to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-   | <pre>SOURCE AND PURITY OF MATERIALS: 1. Neon. Matheson Co., Inc. Minimum mole per cent purity 99.99. 2. Octamethylcyclotetrasiloxane. General Electric Co. Distilled density of 298.15 K was 0.9500 g cm<sup>-3</sup>. ESTIMATED ERROR:</pre>  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,<br>and vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure<br>drops to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-   | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc.<br>Minimum mole per cent purity<br>99.99.<br>2. Octamethylcyclotetrasiloxane.<br>General Electric Co. Distilled<br>density of 298.15 K was 0.9500<br>g cm <sup>-3</sup> .<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1. Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,<br>and vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure<br>drops to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-<br>vent vapor at a total pressure of<br>one atm. The volume of gas absorbed<br>is found by difference between the | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc.<br>Minimum mole per cent purity<br>99.99.<br>2. Octamethylcyclotetrasiloxane.<br>General Electric Co. Distilled<br>density of 298.15 K was 0.9500<br>g cm <sup>-3</sup> .<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.; Evans, F.D.; Danforth, W.F.<br>J.Am.Oil Chem.Soc. 1968, 45, 830. |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>The apparatus is based on the de-<br>sign of Morrison and Billett (1), and<br>the version used is described by<br>Battino, Evans, and Danforth (2).<br>The degassing apparatus and procedure<br>are described by Battino, Banzhof,<br>Bogan, and Wilhelm (3).<br>Degassing. Up to 500 cm <sup>3</sup> of sol-<br>vent is placed in a flask of such<br>size that the liquid is about 4 cm<br>deep. The liquid is rapidly stirred,<br>and vacuum is applied intermittently<br>through a liquid N <sub>2</sub> trap until the<br>permanent gas residual pressure<br>drops to 5 microns.<br>Solubility Determination. The de-<br>gassed solvent is passed in a thin<br>film down a glass spiral tube con-<br>taining the solute gas plus the sol-<br>vent vapor at a total pressure of<br>one atm. The volume of gas absorbed                                       | SOURCE AND PURITY OF MATERIALS:<br>1. Neon. Matheson Co., Inc.<br>Minimum mole per cent purity<br>99.99.<br>2. Octamethylcyclotetrasiloxane.<br>General Electric Co. Distilled<br>density of 298.15 K was 0.9500<br>g cm <sup>-3</sup> .<br>ESTIMATED ERROR:<br>$\delta T/K = 0.03$<br>$\delta P/mmHg = 0.5$<br>$\delta X_1/X_1 = 0.02$<br>REFERENCES:<br>1.Morrison, T.J.; Billett, F.<br>J. Chem. Soc. 1948, 2033.<br>2.Battino,R.;Evans,F.D.;Danforth,W.F.  |  |  |

| CONDONINUTC  |   | ODICINAL MELCON   |   |  |  |  |
|--|---|---|---|--|--|--|
| COMPONENTS:  |   | ORIGINAL MEASUREMENTS:  |   |  |  |  |
| 1. Neon; Ne; 7440-01   | L-9   | Karasz, F.E.; Halsey, G.D.Jr.   |   |  |  |  |
| 2. Argon; Ar; 7440-3   | 37-1  |   |   |  |  |  |
|  |   |   | J. Chem. Phys. 1958, 29, 173 - 179.   |  |  |  |
|  |   |   | <u> </u>  |  |  |  |
|  | <u></u>   |   |   |  |  |  |
| VARIABLES:   | 07 45   | PREPARED BY:  |   |  |  |  |
| T/K: 83.91 -<br>P/kPa: 5.333 -   | - 18.665  | Р. Ц  | . Long  |  |  |  |
| (4 - 14  | cmHg)   |   |   |  |  |  |
| EXPERIMENTAL VALUES:   |   |   |   |  |  |  |
| T/K  | Henry's Constant  |   | action  |  |  |  |
|  | $10^{-4}$ K/cmHq  | l cmHg  | At Ne Pressure<br>76 cmHg   |  |  |  |
|  |   | $x_1 \times 10^4$   | $x_1 \times 10^4$   |  |  |  |
|  | <u></u>   |   |   |  |  |  |
| 83.91<br>84.54   |   | 0.119   | 9.04  |  |  |  |
| 86.11  |   | 0.119<br>0.125  | 9.04<br>9.50  |  |  |  |
| 86.89  |   | 0.128   | 9.73  |  |  |  |
| 87.45  | 7.66  | 0.131   | 9.96  |  |  |  |
| against Ne mole frac<br>1/T plot. The compil<br>graph to obtain the<br>compiler calculated<br>pressures of one and<br>The Henry's constant<br>Smoothed Data: For t<br>$\Delta G^0/J$<br>Std. | tion dissolved in<br>er took log K values of Henry's<br>the mole fraction<br>76 cmHg from Henri<br>is K/cmHg = $(P_1/cm)$ | argon; the other<br>les from the point<br>constant given in<br>solubility of new<br>cy's law.<br>htg)/X1.<br>solubility values<br>= 1,731.5 + 37<br>ef. Corr. = 0.995 | n the Table above. The<br>on in liquid argon at<br>at 76 cmHg.<br>.716 T<br>6   |  |  |  |
|  | AUXILIARY   | INFORMATION   |   |  |  |  |
| METHOD:  |   | SOURCE AND PURITY O   | F MATERIALS:  |  |  |  |
| A measured amount<br>placed in the cell w<br>amount of liquid arg<br>was recorded as a fu<br>amount of gas (isoth<br>function of temperat  | ith a measured<br>on. The pressure<br>nction of the<br>erm) or as a<br>ure (isostere).                                    | received in o<br>2. Argon. Air Ro<br>received in o<br>the reference   | duction Co. Used as<br>glass sealed bulbs.<br>eduction Co. Used as<br>glass sealed bulbs for<br>e. The actual solvent |  |  |  |
| Only the results from<br>runs are given above  | m the isotherm  | titanium meta   | on purified with<br>al.   |  |  |  |
| APPARATUS/PROCEDURE:   |   | ESTIMATED ERROR:  |   |  |  |  |
| A stainless steel  | cell with one   |   | /K = 0.01<br>Hg = 0.002   |  |  |  |
| compartment for the compartment for pure   | solution and one  |   | $x_1 = 0.001$   |  |  |  |
| a reference. The cel<br>that movement in one<br>electromagnet agitat<br>The argon vapor pres<br>literature values (1   | l was suspended so<br>direction by an<br>ed the solution.<br>sure checked with  | 1. Mallett, M. W  | n. 1950, <u>42</u> , 2045.  |  |  |  |
|  |   |   |   |  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
|   |  |
| 1. Neon; Ne; 7440-01-9  | Ikels, K. G.   |
| 2. Olive Oil  |  |
|   | Technical Report   |
|   | SAM-TDR-64-28, May 1964  |
| VARIABLES:  | PREPARED BY:   |
| T/K: 310.75<br>Total P/kPa: 101.325 (1 atm)                                 | P. L. Long   |
|   |  |
| EXPERIMENTAL VALUES:  | Ostupld  |
|   | Ostwald<br>nt Coefficient                                      |
| $\frac{\alpha \times 10^2}{310.75 \ 1.930 \ \pm \ .0}$                      |  |
|   |  |
| The Bunsen coefficient uncertainty is                                       | the standard deviation.  |
| The Ostwald coefficient was calculate                                       | d by the compiler.   |
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| AUXILIARY   | INFORMATION  |
| ME THOD:  | SOURCE AND PURITY OF MATERIALS:                                |
|   |  |
| Van Slyke-gas chromatograph appa-<br>ratus (1). Equilibration apparatus     | <ol> <li>Neon. No source given. Research<br/>grade.</li> </ol> |
| was a standard Van Slyke instrument<br>to which a small water manometer was | 2. Olive oil.  |
| attached. The sample material was   | 2. 011/6 011.  |
| degassed in vacuo in the Van Slyke<br>apparatus, gas was added, and the     |  |
| system agitated until equilibrium was reached. The saturated gas-liquid     |  |
| sample was passed from the Van Slyke  |  |
| apparatus to the gas chromatograph<br>where the solubility was measured by  | ESTIMATED ERROR:   |
| the peak size. Known volumes of a reference gas were used before and        | ESTIMATED ERROR:   |
| after each run, The chromatograph   |  |
| was calibrated with water.  |  |
|   | REFERENCES:<br>1. Ikels, K. G.                                 |
|   | SAM-TDR-64-1. February 1964.                                   |
|   |  |
|   |  |
|   |  |

| COMPONENTS:       ORIGINAL MEASUREMENTS:         1. Neon; Ne; 7440-01-9       Battino, R.; Evans, F.         2. Olive Oil       J. Am. Oil Chem. Soc.         Battino, R.; Evans, F.       Danforth, W. F.         VARIABLES:       T/K: 297.67 - 328.00         P/kPa:       101.325 (1 atm)         FXPERIMENTAL VALUES:       PREPARED EY:         T/K       Mol Fraction       Bunsen       Ostwald         Coefficient       Coefficient       Coefficient       Coefficient         297.67       8.54       1.957       2.133         297.97       8.64       1.980       2.160         308.15       8.43       1.922       2.160         308.15       8.43       1.922       2.160         318.65       8.30       1.882       2.196         328.00       8.17       1.844       2.207         Smoothed Data:       AG°/J mol <sup>-1</sup> = - RT In X <sub>1</sub> = -1359.7 + 63.245 T       Std. Dev. AG° = 14.8, Coef. Corr. = 0.9998 $\Delta H^o/J mol^{-1} = -1359.7, \Delta S^o/J K^{-1} mol^{-1} = -6       T/K       Mol Fraction AG°/J mol^{-1}         293.15       8.68       17,497       303.15       8.38       18,445         303.15       8.38       18,445       318.15       8.31   $   | D.;                        |  |  |
|--|----------------------------|--|--|
| Danforth, W. F.<br>2. Olive Oil<br>Danforth, W. F.<br>2. Olive Oil<br>J. Am. Oil Chem. Soc.<br>830 - 833.<br>VARIABLES:<br>T/K: 297.67 - 328.00<br>P/kPa: 101.325 (1 atm)<br>EXPERIMENTAL VALUES:<br>T/K MOI Fraction<br>$x_1 \times 10^4$<br>$x_1 \times 10^4$<br>$x_1 \times 10^4$<br>$x_1 \times 10^2$<br>Description<br>$x_1 \times 10^4$<br>$x_1 \times 10^2$<br>$x_1 \times 10^2$<br>Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - \operatorname{RT} \ln X_1 = -1359.7 + 63.245 \operatorname{T}$<br>Std. Dev. $\Delta G^{\circ} = 14.8$ , Coef. Corr. = 0.9998<br>$\Delta H^{\circ}/J \mod^{-1} = -1359.7$ , $\Delta S^{\circ}/J \operatorname{K^{-1}} \mod^{-1} = -6$<br>$\overline{X_1 \times 10^4}$<br>$\overline{X_1 \times 10^4}$<br>$X_1 \times 1$ | -                          |  |  |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $   |                            |  |  |
| VARIABLES:<br>T/K: 297.67 - 328.00<br>P/kPa: 101.325 (1 atm)<br>EXPERIMENTAL VALUES:<br>T/K Mol Fraction Bunsen Ostwald<br>Coefficient Coefficient<br>$x_1 \times 10^4$ Coefficient Coefficient<br>$x_1 \times 10^4$ Coefficient Coefficient<br>$x_1 \times 10^2$ 2133<br>297.67 8.54 1.980 2.160<br>307.90 8.53 1.944 2.191<br>308.15 8.43 1.922 2.166<br>318.65 8.30 1.882 2.196<br>328.00 8.17 1.884 2.207<br>Smoothed Data: $\Delta G^o/J \mod^{-1} = - \operatorname{RT} \ln X_1 = -1359.7 + 63.245 \operatorname{T}$<br>Std. Dev. $\Delta G^o = 14.8$ , Coef. Corr. = 0.9998<br>$\Delta H^o/J \mod^{-1} = -1359.7$ , $\Delta S^o/J \operatorname{K}^{-1} \mod^{-1} = -6$<br>T/K Mol Fraction $\Delta G^o/J \mod^{-1}$<br>$x_1 \times 10^4$<br>293.15 8.68 17,181<br>298.15 8.45 18,129<br>313.15 8.38 18,445<br>318.15 8.45 18,129<br>313.15 8.38 18,445<br>318.15 8.31 18,762<br>328.15 8.18 19,394<br>AUXILIARY INFORMATION<br>METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERN   |                            |  |  |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | 1968, <u>45</u> ,          |  |  |
| P/kPa: 101.325 (1 atm) EXPERIMENTAL VALUES:<br>$\frac{T/K \text{ Mol Fraction Bunsen Coefficient Coefficient X 10^2 L x 10^2}{297.67 & 8.54 & 1.957 & 2.133 \\ 297.97 & 8.64 & 1.980 & 2.160 \\ 307.90 & 8.53 & 1.944 & 2.191 \\ 308.15 & 8.43 & 1.922 & 2.169 \\ 318.65 & 8.30 & 1.882 & 2.196 \\ 328.00 & 8.17 & 1.844 & 2.207 \\ Smoothed Data: \Delta G^{\circ}/J \text{ mol}^{-1} = - RT \ln X_1 = -1359.7 + 63.245 T \\ Std. Dev. \Delta G^{\circ} = 14.8, Coef. Corr. = 0.9998 \Delta H^{\circ}/J \text{ mol}^{-1} = -1359.7, \Delta S^{\circ}/J K^{-1} \text{ mol}^{-1} = -6 \\ \hline T/K & Mol Fraction \Delta G^{\circ}/J \text{ mol}^{-1} = -6 \\ \hline T/K & Mol Fraction \Delta G^{\circ}/J \text{ mol}^{-1} = -6 \\ \hline T/K & Mol Fraction \Delta G^{\circ}/J \text{ mol}^{-1} = -6 \\ \hline T/K & Mol Fraction \Delta G^{\circ}/J \text{ mol}^{-1} = -6 \\ \hline T/K & Mol Fraction \Delta G^{\circ}/J \text{ mol}^{-1} = -6 \\ \hline Mol Fraction X + 10^4 \\ \hline 293.15 & 8.68 & 17,181 \\ 308.15 & 8.31 & 18,129 \\ 313.15 & 8.38 & 18,445 \\ 318.15 & 8.31 & 18,762 \\ \hline 328.15 & 8.18 & 19,394 \\ \hline AUXILLARY INFORMATION \\ \hline METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERN$  | PREPARED BY:               |  |  |
| $\frac{T/K  Mol \ Fraction  Bunsen \\ X_1 \ x \ 10^4 \qquad \alpha \ x \ 10^2 \qquad Coefficient \\ X_1 \ x \ 10^4 \qquad \alpha \ x \ 10^2 \qquad L \ x \ 10^2 \\ \hline 297.67  8.54 \qquad 1.95_7 \qquad 2.13_3 \\ 297.97  8.64 \qquad 1.98_0 \qquad 2.16_0 \\ 307.90  8.53 \qquad 1.94_4 \qquad 2.19_1 \\ 308.15  8.43 \qquad 1.92_2 \qquad 2.16_9 \\ 318.65  8.30 \qquad 1.88_2 \qquad 2.19_6 \\ 328.00  8.17 \qquad 1.84_4 \qquad 2.20_7 \\ \hline Smoothed \ Data: \ \Delta G^\circ/J \ mol^{-1} = - RT \ ln \ X_1 = -1359.7 + \ 63.245 \ T \\ Std. \ Dev. \ \Delta G^\circ = 14.8,  Coef. \ Corr. = 0.9998 \\ \Delta H^\circ/J \ mol^{-1} = -1359.7, \ \Delta S^\circ/J \ K^{-1} \ mol^{-1} = -6 \\ \hline \hline T/K \qquad Mol \ Fraction \ \Delta G^\circ/J \ mol^{-1} \\ \hline 293.15 \qquad 8.60 \qquad 17,497 \\ 303.15 \qquad 8.60 \qquad 17,497 \\ 303.15 \qquad 8.53 \qquad 17,813 \\ 308.15 \qquad 8.45 \qquad 18,129 \\ 313.15 \qquad 8.38 \qquad 18,445 \\ 318.15 \qquad 8.31 \qquad 1.67.62 \\ \hline 323.15 \qquad 8.25 \qquad 19,078 \\ \hline 328.15 \qquad 8.18 \ 19,394 \\ \hline AUXILLARY \ INFORMATION \\ \hline METHOD: \ The \ apparatus \ is \ based \ on \ the \ SOURCE \ AND \ PURITY \ OF \ MATERN} \\ \hline$   | r                          |  |  |
| $\frac{X_{1} \times 10^{4}}{297.67 + 8.54 + 1.980} + \frac{Coefficient}{a \times 10^{2}} + \frac{Coefficient}{1 \times 10^{2}} + \frac{Coefficient}{2 \times 10^{2}} + $   |                            |  |  |
| $\frac{X_1 \times 10^4}{297.67 & 8.54} \xrightarrow{\text{Coefficient}}_{\alpha \times 10^2} \xrightarrow{\text{Coefficient}}_{L \times 10^2} \xrightarrow{\text{L} \times 10^2}_{\frac{1 \times 10^2}{2.13_3}} \frac{2.13_3}{2.13_3}$ $\frac{297.97 & 8.64}{307.90 & 8.53} & 1.94_4 & 2.19_1}{308.15 & 8.43} & 1.92_2 & 2.16_9}$ $318.65 & 8.30 & 1.88_2 & 2.19_6}{328.00 & 8.17} & 1.84_4 & 2.20_7$ Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - \operatorname{RT} \ln X_1 = -1359.7 + 63.245 \text{ T}$ Std. Dev. $\Delta G^{\circ} = 14.8$ , Coef. Corr. = 0.9998<br>$\Delta H^{\circ}/J \mod^{-1} = -1359.7$ , $\Delta S^{\circ}/J \operatorname{K}^{-1} \mod^{-1} = -6$ $\frac{1}{\frac{1}{293.15}} \times \frac{8.68}{8.68} \times \frac{17,181}{17,497} = -6$ $\frac{1}{303.15} \times \frac{8.68}{8.45} \times \frac{17,181}{18,129} = -6$ $\frac{1}{313.15} \times \frac{8.38}{8.45} \times \frac{18,445}{18,129} = -6$ $\frac{1}{313.15} \times \frac{8.38}{8.18} \times \frac{18,445}{18,129} = -6$ $\frac{1}{328,15} \times \frac{18,129}{328,15} = \frac{18,18}{19,394} = -6$ $\frac{1}{4} \times \frac{10^{4}}{1293.15} \times \frac{19,078}{328,15} = \frac{19,078}{328,15} = -6$ $\frac{1}{4} \times \frac{10^{4}}{17,181} \times \frac{10^{4}}{19,394} = -6$ $\frac{1}{4} \times \frac{10^{4}}{17,181} \times \frac{10^{4}}{19,394} = -6$ $\frac{1}{4} \times \frac{10^{4}}{17,181} \times \frac{10^{4}}{19,394} = -6$ $\frac{1}{4} \times \frac{10^{4}}{1293.15} \times \frac{10^{4}}{1293.15} \times \frac{10^{4}}{1293.15} \times \frac{10^{4}}{1293.15} \times \frac{10^{4}}{1293.15} \times \frac{10^{4}}{1293.15} \times \frac{10^{4}}{133.15} \times \frac{10^{4}}{19,394} = -6$ $\frac{1}{4} \times \frac{10^{4}}{1293.15} \times \frac{10^{4}}{1293.1$  |                            |  |  |
| $\frac{297.97}{307.90} \begin{array}{c} 8.64 \\ 1.980 \\ 2.160 \\ 307.90 \\ 8.53 \\ 1.944 \\ 2.191 \\ 308.15 \\ 8.43 \\ 1.922 \\ 2.196 \\ 328.00 \\ 8.17 \\ 1.844 \\ 2.207 \\ \end{array}$ Smoothed Data: $\Delta G^{\circ}/J \mod^{-1} = - \operatorname{RT} \ln X_1 = -1359.7 + 63.245 \operatorname{T}$<br>Std. Dev. $\Delta G^{\circ} = 14.8$ , Coef. Corr. = 0.9998 $\Delta H^{\circ}/J \mod^{-1} = -1359.7$ , $\Delta S^{\circ}/J \operatorname{K}^{-1} \mod^{-1} = -6 \\ \hline \\ \hline \\ \hline \\ \hline \\ \begin{array}{c} T/K \\ 293.15 \\ 308.15 \\ 8.68 \\ 17,181 \\ 308.15 \\ 8.68 \\ 17,497 \\ 303.15 \\ 8.53 \\ 17,813 \\ 308.15 \\ 8.45 \\ 18,129 \\ 313.15 \\ 8.38 \\ 18,445 \\ 318.15 \\ 8.31 \\ 18,762 \\ 323.15 \\ 8.18 \\ 19,394 \\ \end{array}$<br>METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERN  | t                          |  |  |
| $\frac{307.90}{308.15} \frac{8.53}{8.43} \frac{1.944}{1.922} \frac{2.191}{2.169}$ $\frac{308.15}{328.00} \frac{8.53}{8.30} \frac{1.882}{1.882} \frac{2.196}{2.207}$ Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - \text{RT ln } X_1 = -1359.7 + 63.245 \text{ T}$ $\frac{\Delta G^{\circ}/J \text{ mol}^{-1} = -1359.7,  \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -6$ $\frac{1}{17/K} \frac{\text{Mol Fraction}}{X_1 \times 10^4} \frac{\Delta G^{\circ}/J \text{ mol}^{-1}}{1} = -6$ $\frac{1}{17,181} \frac{293.15}{303.15} \frac{8.68}{8.53} \frac{17,181}{17,181}$ $\frac{308.15}{308.15} \frac{8.45}{8.45} \frac{17,181}{18,129}$ $\frac{313.15}{313.15} \frac{8.38}{8.38} \frac{18,445}{18,129}$ $\frac{313.15}{328.15} \frac{8.25}{8.18} \frac{19,394}{19,394}$ $4000000000000000000000000000000000000$   |                            |  |  |
| $\frac{308.15}{318.65} = 8.43 \qquad 1.92_{2} \qquad 2.16_{9}^{2} \\ \frac{318.65}{328.00} = 8.17 \qquad 1.88_{2} \qquad 2.196 \\ \frac{328.00}{328.00} = 8.17 \qquad 1.84_{4} \qquad 2.207 \\ \text{Smoothed Data:} \qquad \Delta G^{\circ}/J \ \text{mol}^{-1} = -\text{RT ln } X_{1} = -1359.7 + 63.245 \ \text{T} \\ \text{Std. Dev. } \Delta G^{\circ} = 14.8, \qquad \text{Coef. Corr.} = 0.9998 \\ \Delta H^{\circ}/J \ \text{mol}^{-1} = -1359.7, \qquad \Delta S^{\circ}/J \ \text{K}^{-1} \ \text{mol}^{-1} = -6 \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ $  |                            |  |  |
| $\frac{328.00}{328.00} \frac{8.17}{1.844} \frac{2.207}{2.207}$ Smoothed Data: $\Delta G^{\circ}/J \text{ mol}^{-1} = - \text{ RT ln } X_1 = -1359.7 + 63.245 \text{ T}$ Std. Dev. $\Delta G^{\circ} = 14.8$ , Coef. Corr. = 0.9998<br>$\Delta H^{\circ}/J \text{ mol}^{-1} = -1359.7$ , $\Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -6$ $\frac{T/K}{X_1 \times 10^4} \frac{\Lambda G^{\circ}/J \text{ mol}^{-1}}{X_1 \times 10^4}$ $\frac{293.15}{8.68} \frac{8.68}{17,497}$ $303.15}{8.53} \frac{17,481}{17,497}$ $303.15}{8.38} \frac{18,445}{18,129}$ $313.15}{8.38} \frac{18,445}{18,129}$ $313.15}{8.31} \frac{18,762}{323.15} \frac{8.25}{8.18} \frac{19,394}{19,394}$ $AUXILIARY INFORMATION$ METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERN   |                            |  |  |
| Std. Dev. $\Delta G^{\circ} = 14.8$ , Coef. Corr. = 0.9998<br>$\Delta H^{\circ}/J \text{ mol}^{-1} = -1359.7$ , $\Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -6$<br>T/K Mol Fraction $\Delta G^{\circ}/J \text{ mol}^{-1}$<br>293.15 8.68 17,181<br>298.15 8.60 17,497<br>303.15 8.53 17,813<br>308.15 8.45 18,129<br>313.15 8.38 18,445<br>318.15 8.31 18,762<br>323.15 8.18 19,394<br>AUXILIARY INFORMATION<br>METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERN  |                            |  |  |
| Std. Dev. $\Delta G^{\circ} = 14.8$ , Coef. Corr. = 0.9998<br>$\Delta H^{\circ}/J \text{ mol}^{-1} = -1359.7$ , $\Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -6$<br>T/K Mol Fraction $\Delta G^{\circ}/J \text{ mol}^{-1}$<br>293.15 8.68 17,181<br>298.15 8.60 17,497<br>303.15 8.53 17,813<br>308.15 8.45 18,129<br>313.15 8.38 18,445<br>318.15 8.31 18,762<br>323.15 8.18 19,394<br>AUXILIARY INFORMATION<br>METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERN  |                            |  |  |
| $\Delta H^{\circ}/J \text{ mol}^{-1} = -1359.7,  \Delta S^{\circ}/J \text{ K}^{-1} \text{ mol}^{-1} = -6$ $T/K \qquad Mol \text{ Fraction} \qquad \Delta G^{\circ}/J \text{ mol}^{-1}$ $293.15 \qquad 8.68 \qquad 17,181$ $298.15 \qquad 8.60 \qquad 17,497$ $303.15 \qquad 8.53 \qquad 17,813$ $308.15 \qquad 8.45 \qquad 18,129$ $313.15 \qquad 8.38 \qquad 18,445$ $318.15 \qquad 8.31 \qquad 18,762$ $323.15 \qquad 8.18 \qquad 19,394$ $AUXILIARY INFORMATION$ METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERIAL  |                            |  |  |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  |                            |  |  |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | 3.245                      |  |  |
| 293.15 8.68 17,181<br>298.15 8.60 17,497<br>303.15 8.53 17,813<br>308.15 8.45 18,129<br>313.15 8.38 18,445<br>318.15 8.31 18,762<br>323.15 8.25 19,078<br>328.15 8.18 19,394<br>AUXILIARY INFORMATION<br>METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERI   |                            |  |  |
| 298.15       8.60       17,497         303.15       8.53       17,813         308.15       8.45       18,129         313.15       8.38       18,445         318.15       8.31       18,762         323.15       8.25       19,078         328.15       8.18       19,394         AUXILIARY INFORMATION   |                            |  |  |
| 308.15       8.45       18,129         313.15       8.38       18,445         318.15       8.31       18,762         323.15       8.25       19,078         328.15       8.18       19,394         AUXILIARY INFORMATION   |                            |  |  |
| 313.15       8.38       18,445         318.15       8.31       18,762         323.15       8.25       19,078         328.15       8.18       19,394         AUXILIARY INFORMATION  |                            |  |  |
| 323.15<br>328.15<br>AUXILIARY INFORMATION<br>METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERI   |                            |  |  |
| AUXILIARY INFORMATION<br>METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERI   |                            |  |  |
| METHOD: The apparatus is based on the SOURCE AND PURITY OF MATERI  |                            |  |  |
|  |                            |  |  |
| and the version used is a modification 99.995 Min. Vol   | o., Inc.                   |  |  |
| of the apparatus of Clever, Battino,<br>Saylor and Gross (2). 2. Olive oil. A. U   | .S.P., Fisher              |  |  |
| Scientific Compan<br>fatty acid.   | y., 0.58% free             |  |  |
| B. Nutritional E   | iochemicals                |  |  |
| APPARATUS/PROCEDURE: Degassing. Corp., 0.30% free<br>The solvent is sprayed into an evacu- The density was m   | oscurod and                |  |  |
| ated chamber of an all glass appara- fitted to the equ   | ation p/g cm <sup>-3</sup> |  |  |
| tus; it is stirred and heated until = 0.9152 = 0.0004  | bot/c. The aver            |  |  |
| pressure of the liquid. Solubility   |                            |  |  |
| Determination. The degassed liquid<br>passes in a thin film down a glass $\delta T/K = 0.$   | 03                         |  |  |
| spiral tube at a total pressure of $\delta P/mmHg =$   | 0.5                        |  |  |
| one atm of solute gas plus solvent $\delta X_1/X_1 =$ vapor. The gas absorbed is measured  | 0.01                       |  |  |
| in the attached buret system, and the REFERENCES:  |                            |  |  |
| solvent is collected in a tared<br>flask and weighed.<br>J. Chem. Soc. 1948  | illett, F.<br>, 2033.      |  |  |
| 2. Clever, H. L.; Bat<br>Saylor, J. H.; Gro<br>J, Phys. <u>Chem</u> . 195  | ss, P. M.                  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:             |
|---|------------------------------------|
| 1. Neon; Ne; 7440-01-9  | Ikels, K. G.                       |
|   | TRETS, N. G.                       |
| 2. Human Fat (pooled)   |                                    |
|   | Technical Report                   |
|   | SAM-TDR-64-28, May 1964.           |
| VARIABLES:<br>T/K: 310.75   | PREPARED BY:<br>P. L. Long         |
|   | II. DONY                           |
| Total P/kPa: 101.325 (1 atm)<br>EXPERIMENTAL VALUES:                      |                                    |
| EXTERIMENTAL VALUES:  |                                    |
| T/K Bunsen<br>Coeffici<br>α x 10  | ent Coefficient                    |
| 310.75 l.972 ±  | 0.0109 2.24                        |
|   |                                    |
| The Bunsen coefficient uncertainty is                                     | the standard deviation.            |
| The Ostwald coefficient was calculated                                    | d by the compiler.                 |
| The optimity controlling was calculated                                   |                                    |
|   |                                    |
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|   |                                    |
|   |                                    |
|   |                                    |
|   |                                    |
|   |                                    |
|   |                                    |
|   |                                    |
| AUXILIARY   | INFORMATION                        |
| METHOD:   | SOURCE AND PURITY OF MATERIALS:    |
| Van Slyke-gas chromatograph appa-   | 1. Neon. No source given. Research |
| ratus (1). Equilibration apparatus<br>was a standard Van Slyke instrument | grade.                             |
| to which a small water manometer was attached. The sample material was    |                                    |
| degassed in vacuo in the Van Slyke  |                                    |
| apparatus, gas was added, and the system agitated until equilibrium was   |                                    |
| reached. The saturated gas-liquid sample was passed from the Van Slyke    |                                    |
| apparatus to the gas chromatograph  |                                    |
| where the solubility was measured by<br>the peak size. Known volumes of a | ESTIMATED ERROR:                   |
| reference gas were used before and after each run. The chromatograph was  |                                    |
| calibrated with water.  |                                    |
|   | REFERENCES:                        |
|   | 1. Ikels, K. G.                    |
|   | SAM-TDR-64-1, February 1964.       |
|   |                                    |
|   |                                    |
|   |                                    |

HELIUM AND NEON SOLUBILITIES ABOVE 2 BAR

Ceneral Remarks for High Pressure Solubility Studies on Mixtures Containing Helium or Neon

Mixtures containing helium often exhibit the phenomenon referred to as gas-gas immiscibility (1). This has led to a number of studies in which the solubility data of helium in a less volatile component are presented in a graphical form or are, in general of very low precision.

The following remarks on mixtures (a) studied primarily for investigating gas-gas immiscibility or (b) studied by only one or two groups of workers but at several temperatures and pressure, are included to increase the usefulness and comprehensibleness of the compiled tables.

## Helium and Dichlorodifluoromethane

This system was investigated by Tsiklis, Maslennikova and Goryunova (2) primarily to establish that it exhibited gas-gas immiscibility of the first kind. The data are of fairly low accuracy and are classified as tentative.

#### Helium + Carbon Monoxide

This system has been investigated by Parrish and Stewart (3) and by Sinor and Kurata (4). Although slightly different temperature ranges were used the data interpolated to the same temperatures are in good agreement. The two sets are therefore classified as tentative.

# Helium + Ethane

This system has been investigated by Nikitina and coworkers (5). There is little on which to base a meaningful evaluation and hence these data are classified as tentative.

## Helium + Propane

This system has only been investigated by Schindler and coworkers (6). There is little evidence on which to base a meaningful evaluation and hence these data are classified as tentative.

## Helium + Fluorine

The only data published on these systems are those of Cannon and Crane (7) which are not of high precision. They are classified as tentative.

#### Helium + Krypton

The only data published on this system are those of Kidnay  $et \ al$ . (8) which are classified as tentative. Other measurement on similar systems by this group are thought to be of good accuracy.

# Helium-4 + Deuterium

# Helium-3 + Deuterium

Hiza's data (9) are the only measurements on the solubility for these two systems and hence both sets of data are classified as tentative. Hiza's

data on the corresponding helium + hydrogen system appear to be reliable.

## Helium + Nitrous Oxide

The only data published on this system are those of Parrish and Stewart (3) which are classified as tentative.

## Helium + Xenon

The data of De Swaan Arons and Diepen (10) are bubble point-dew point data at fixed composition and are not in usual form of solubility data. They were determined to establish the existence of gas-gas immiscibility in this system and are classified as tentative.

Helium + Methanol

Helium + n-Hexane

Helium + Benzene

Helium + Sulfur dioxide

These systems were studied by Tsiklis and Khodeeva (11) but no tabulated data were given. The primary purpose of the investigation was to establish whether these systems exhibited gas-gas immiscibility. All four systems were found to exhibit gas-gas immiscibility of the first type. For the present purpose the data are rejected because of their limited nature and low precision.

# Helium + Ammonia

The data of Hiese (12) for this system are limited in scope but classified as tentative. The data of Tsiklis (13) are rejected as they are only reported in graphical form and were determined to establish if this system exhibited gas-gas immiscibility. The data of Ipatieff and Teodorovich (14) are also rejected as they were determined by an inadequate technique. The data of Zakharova and coworkers (15) are also rejected because they are presented in a graphical form.

#### Neon + Methane

This system has only been studied by Streett and Hill (16). Their data are classified as tentative in view of the fact that other data from this group, where comparison with other workers' data is possible, appears to be reliable. This system exhibits gas-gas immiscibility and the baro-tropic or phase inversion phenomenon (17).

# References

- Schneider, G. M., in Chemical Thermodynamics Vol. 2 Specialist Periodical Report, Chapter 4, ed. McGlashan, M. L., Chemical Society, London, <u>1978</u>.
- Tsiklis, D. S., Maslennikova, V. Ya. and Goryunova, N. P., *Zhur. Fiz.* Chem., <u>1967</u>, 41, 1804.

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з.
      Parrish, W. R. and Stewart, W. G., J. Chem. Engng. Data, 1975, 20, 412.
 4.
      Sinor, J. E. and Kurata, F., J. Chem. Engng. Data, 1966, 11, 537.
 5.
      Nikitina, I. E., Skripka, V. G., Gubkina, G. F., Sirotin, A. G. and
         Ben'yaminovic, O. A., Gazov. Prom., 1970, 15, no. 6, 35.
 6.
      Schindler, D. L., Swift, G. W. and Kurata, F., Hydrocarbon Process.,
         1966, 45, no. 11, 205.
 7.
      Cannon, W. A. and Crane, W. E., Cryogenic Tech., 1968, 4, 178.
      Kidnay, A. J., Miller, R. C. and Hiza, M. J., Ind. Eng. Chem. Fundam.,
 8.
         1971, 10, 459.
 9.
      Hiza, M. J., Nat. Bur. Standards, Tech. Note 621, 1972.
10.
      De Swaan Arons, J. and Diepen, G. A. M., J. Chem. Phys., 1966, 44, 2322.
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      Tsiklis, D. S. and Khodeeva, S. M., Inzh.-Fiz. Zhur. Acad. Nauk.
         Belorus. S.S.R., 1958, no. 11, 62.
12.
      Heise, F., Ber. Bunsenges. Phys. Chem., 1972, 76, 938.
13.
      Tsiklis, D. S., Doklady Acad. Nauk. S.S.S.R., 1952, 86, 1159.
14.
      Ipatieff, V. V. and Teodorovich, V. P., Zhur. Obshchei Khim., 1932,
         2, 305.
15.
      Zakharova, A. V., Nikiforova, M. B. and Khazanova, N. E., Zhur. Fiz.
         Khim., 1969, 43, 750.
16.
      Streett, W. B. and Hill, J. L. E., Progr. Refrig. Sci. Technol.
         XIII Proc. Internat. Congr. Refria., 1971, 1, 309.
17.
      Rowlinson, J. R., Liquids and Liquid Mixtures 2nd Edition, p.218, 1969.
```

| COMPO | DNENTS:                  |           | EVALUATOR:                |  |
|-------|--------------------------|-----------|---------------------------|--|
| 1.    | Helium; He;              | 7440-59-7 | Colin Young,              |  |
|       |                          |           | School of Chemistry,      |  |
| 2.    | Water; H <sub>2</sub> O; | 7732-18-5 | University of Melbourne,  |  |
|       |                          |           | Parkville, Victoria 3052, |  |
|       |                          |           | AUSTRALIA.                |  |

CRITICAL EVALUATION:

The experimental data of Wiebe and Gaddy (1) and Pray et al. (2) are classified as tentative whereas those of Gardiner and Smith (3) are recommended. Since there is no overlap in the temperature range a detailed comparison of the data of Pray  $et \ al$ . (2) with those of the other two groups is not possible. However, the data of Pray et al. (2) are thought to be of considerably lower accuracy than those of Wiebe and Gaddy and Gardiner and Smith (3). The data of Wiebe and Gaddy (1) are probably less accurate than the more recent data of Gardiner and Smith (3). In the latter work a correction for the effect of the meniscus curvature was taken into account which, the authors claim, could account for a slight discrepancy between their values and the earlier values of Wiebe and Gaddy (1). There is little doubt that Gardiner and Smith (2) are correct in applying this meniscus correction. Unfortunately only some of the experimental data are presented in the work of Gardiner and Smith (3), however, smoothing equations were given and these are those recommended below.

The data of Enns *et al*. (4) are not in agreement with either the work of Wiebe and Gaddy (1) or that of Gardiner and Smith (3) and are rejected.

#### Smoothing Equations

323.15K  $x_{\text{He}} = 7.152 \times 10^{-6} P - 3.214 \times 10^{-9} P^2 + 3.3926 \times 10^{-12} P^3$ 373.15K  $x_{\text{He}} = 6.7624 \times 10^{-6} P - 2.5091 \times 10^{-9} P^2 + 2.4032 \times 10^{-12} P^3$ where P is pressure in units of bar (10<sup>5</sup> Pa)

## References

- 1. Wiebe, R. and Gaddy, V. L., J. Am. Chem. Soc., <u>1935</u>, 57, 847.
- Pray, H. A., Schweickert, C. E. and Minnick, B. H., Ind. Eng. Chem., <u>1952</u>, 44, 1146.
- 3. Gardiner, G. E. and Smith, N. O., J. Phys. Chem., 1972, 76, 1195.
- 4. Enns, T., Scholander, P. F. and Bradstreet, E. D., J. Phys. Chem., <u>1965</u>, 69, 389.

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| <pre>(1) Helium; He; 7440-59-7 (2) Water; H<sub>2</sub>O; 7732-18-5</pre>   | Wiebe, R. and Gaddy, V. L.,<br>J. Am. Chem. Soc., <u>1935</u> , 57, 847.   |
| VARIABLES:  | PREPARED BY:   |
| Temperature, pressure   | C. L. Young  |
| EXPERIMENTAL VALUES:  |  |
| 10 <sup>3</sup> Mole fraction<br>T/K P/bar of helium in water,<br>10 <sup>3</sup> x <sub>He</sub>   | $10^3$ Mole fraction<br>T/K P/bar of helium in water,<br>$10^3 x_{\rm He}$   |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | $\begin{array}{cccccccccccccccccccccccccccccccccccc$   |
| 101.32       0.606         202.65       1.205         405.30       2.311         607.95       3.334         810.60       4.280  | 101.32 0.6926<br>202.65 1.3608<br>405.30 2.6128<br>348.15 810.60 4.826<br>1013.25 5.861  |
|   |  |
|   | INFORMATION  |
| METHOD /APPARATUS/PROCEDURE:<br>One pass flow method with two vessel<br>adsorption train. Second vessel<br>used as source of sample for analysis<br>Pressure maintained with dead weight<br>gauges. Measurements taken both<br>for a high pressure and low pressure<br>approach to equilibrium. Details<br>in source and refs. 1 and 2. | <ol> <li>SOURCE AND PURITY OF MATERIALS;</li> <li>Purity 99.95 mole per cent;<br/>Bureau of Mines sample.</li> <li>No details given.</li> </ol>  |
|   | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.5\%;$<br>$\delta x_{He} < 0.2\%$ (estimated by compiler).<br>REFERENCES:  |
|   | <ol> <li>Wiebe, R., Gaddy, V. L. and<br/>Heins, C., J. Am. Chem. Soc.,<br/><u>1933</u>, 55, 947.</li> <li>Wiebe, R., Gaddy, V. L. and<br/>Heins, C., Ind. Eng. Chem., <u>1931</u>,<br/>23, 401.</li> </ol> |

| COMPONENTS  | :   |  | ORIGINAL MEASUREMENTS:   |
|---|---|--|--|
| (1) He  | Lium; He; 744   | 40-59-7  | Gardiner, G. E. and Smith, N. O.,  |
| ,   | ,, ,4   |  | J. Phys. Chem., <u>1972</u> , 76, 1195.  |
| (2) Wat   | er; H <sub>2</sub> O; 77  | 32-18-5  | ······································   |
| (2) Wal   | Ler; m <sub>2</sub> 0; //.  | 32-10-3  |  |
| ARIABLES  | ······································  |  | PREPARED BY:   |
| AVIUDUUD  | •   |  |  |
| Temperat  | ure, pressure   |  | C. L. Young  |
| EXPERIMENT  | TAL VALUES:   |  | 1 2.2  |
| т/к   | P/bar 10° Ma  | ole fraction of<br>in liquid, 10 <sup>3</sup>  | nellum<br><sup>x</sup> He  |
| 293.15  | 202.6   | 1.336  |  |
| 298.15  | 202.6   | 1.323  |  |
| 303.15  | 202.6   | 1.324  |  |
| 308.15  | 202.6   | 1.329  |  |
| 313.15  | 202.6   | 1.331  |  |
|   | 202.6   | 1.343  |  |
| 323.15  | 101.3   | 0.692  |  |
|   | 202.6   | 1.363  |  |
| 323.15  | 304.0   | 1.979  |  |
|   | 405.3   | 2.599  |  |
| 323.15<br>323.15  | 506.6<br>607.9  | 3.236<br>3.745   |  |
| 727.17  | 007.5   | 5.745  |  |
| не  | 7624×10 P7Da  | ar - 2.5091×10 -   | $(P/bar)^2 + 2.4032 \times 10^{-12} (P/bar)^3$ .   |
| пе  | 7624×10 7758  | ar - 2.5091×10 -   | (P/bar) <sup>2</sup> + 2.4032×10 <sup>-12</sup> (P/bar) <sup>3</sup> .   |
| he  | 7624×10 7758  |  | (P/bar) <sup>2</sup> + 2.4032×10 <sup>-12</sup> (P/bar) <sup>3</sup> .   |
|   | PPARATUS/PROCI  | AUXILIARY  |  |
| METHOD /A<br>Large st   | PPARATUS/PROCE  | AUXILIARY<br>EDURE:<br>(~4.51).  | SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity  |
| METHOD /A<br>Large st<br>Pressure   | PPARATUS/PROCI<br>eel autoclave<br>measured with  | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.  | SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity  |
| METHOD /A<br>Large st<br>Pressure<br>Temperat   | PPARATUS/PROCI<br>eel autoclave<br>measured with<br>ure measured w  | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-  | SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity  |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant   | PPARATUS/PROCI<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoup]  | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>Le. Cell  | SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.   |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged                                  | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c                                    | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas                                    | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.  |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.                        | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik                   | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained                  | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.  |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples             | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.  |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained                  | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.  |
| ÆTHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr  | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.  |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized.</pre>  |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. ESTIMATED ERROR:</pre>   |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized.</pre>  |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | <pre>INFORMATION SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. sample, purity 99.995 mole per cent. 2. Distilled and deionized. ESTIMATED ERROR:</pre>   |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.05\%;$<br>$\delta x_{He} = \pm 0.4\%.$   |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples             | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | Y INFORMATION         SOURCE AND PURITY OF MATERIALS:         1. Matheson Co. sample, purity         99.995 mole per cent.         2. Distilled and deionized.         ESTIMATED ERROR: $\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.058;$ $\delta x_{He} = \pm 0.48.$ REFERENCES:                   |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.05\%;$<br>$\delta x_{He} = \pm 0.4\%.$   |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | Y INFORMATION         SOURCE AND PURITY OF MATERIALS:         1. Matheson Co. sample, purity         99.995 mole per cent.         2. Distilled and deionized.         ESTIMATED ERROR: $\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.058;$ $\delta x_{He} = \pm 0.48.$ REFERENCES:                   |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | <pre>Y INFORMATION<br/>SOURCE AND PURITY OF MATERIALS:<br/>1. Matheson Co. sample, purity<br/>99.995 mole per cent.<br/>2. Distilled and deionized.<br/>ESTIMATED ERROR:</pre>   |
| METHOD /A<br>Large st<br>Pressure<br>Temperat<br>constant<br>charged<br>added.<br>samples<br>volumetr | PPARATUS/PROCH<br>eel autoclave<br>measured with<br>ure measured v<br>an thermocoupl<br>with liquid, c<br>After equilik<br>removed and ar | AUXILIARY<br>EDURE:<br>(~4.51).<br>n Bourdon gauge.<br>vith iron-<br>le. Cell<br>compressed gas<br>prium attained<br>nalysed using | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity<br>99.995 mole per cent.<br>2. Distilled and deionized.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5;  \delta P/bar = \pm 0.05$ ;<br>$\delta x_{He} = \pm 0.4$ %.<br>REFERENCES:<br>1. O'Sullivan, T. D. and Smith, |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| (1) Helium; He; 7440-59-7   | Pray, H. A. H., Schweichert, C. E.                            |
| (2) Water; H <sub>2</sub> O; 7732-18-5                                      | and Minnich, B. H., Ind. Eng. Chem.,<br>1952, 44, 1147.       |
| (2) Watter, M20, 7752-10-5  | <u>1952</u> , 11, 1147.                                       |
|   |   |
| VARIABLES:  | PREPARED BY:  |
| Temperature, pressure   | C. L. Young   |
|   |   |
| EXPERIMENTAL VALUES:  |   |
| 10 <sup>3</sup> Mole fraction of<br>T/K P/bar in water, 10 <sup>3</sup>     | helium<br><sup>x</sup> He                                     |
| 435.9 6.89 0.14<br>13.79 0.22   |   |
| 20.68 0.27<br>533.1 6.89 0.29   |   |
| 13.79 0.43  |   |
| 20.68 0.71<br>27.58 0.99  |   |
| 34.47 1.26<br>588.7 13.79 0.66  |   |
| 20.68 1.18<br>27.58 1.78  |   |
| 34.47 2.13  |   |
|   |   |
|   |   |
|   |   |
|   |   |
|   |   |
|   |   |
|   |   |
| AUXILIARY   | INFORMATION   |
| METHOD /APPARATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:                               |
| Rocking equilibrium cell of 3 l capa-<br>city. Pressure measured with dead  | No details given.   |
| weight gauge and temperature measured                                       | no details given.   |
| using chromel-alumel thermocouple.<br>Cell contents equilibrated and liquid |   |
| sample removed. The amount of dis-<br>solved gas estimated volumetrically.  | i i   |
| ······································                                      |   |
|   |   |
|   |   |
|   | ESTIMATED ERROR:  |
|   | $\delta T/K = \pm 1;  \delta P/bar = \pm 1;  \delta x_{He} =$ |
|   | ±1-5% (estimated by compiler).                                |
|   | REFERENCES :  |
|   |   |
|   |   |
|   |   |
|   |   |

| OMPONENTS:  | ORIGINAL MEASUREMENTS:  |
|---|---|
| 1) Holium, Not 7740 50 7  | Gardiner, G. E. and Smith, N. O.,   |
| 1) Helium; He; 7740-59-7  | I Thus Cham 1972 76 1195  |
| <ol> <li>Sodium chloride; NaCl; 7647-14-</li> </ol>   | -5 5. Frys. crem., <u>1972</u> , 70, 1195.  |
| 3) Water; H <sub>2</sub> O; 7732-18-5   |   |
|   |   |
| ARIABLES:   | PREPARED BY:  |
| emperature, pressure, composition   | C. L. Young   |
| XPERIMENTAL VALUES:   |   |
| Coeffici  | ents in Smoothing Equation  |
| T/K Solvent a × 10 <sup>6</sup>   | $-b \times 10^{-9}$ c $\times 10^{12}$  |
| 298.15 1.003m NaCl 5.694  | 1,273 0.239   |
| 4.067m NaCl 3.283   | 1.187 0.805   |
| 323.15 1.003m NaCl 5.627  | 1.875 1.967   |
| 4.067m NaCl 3.327<br>373.15 1.003m NaCl 5.262   | 1.346 0.757<br>1.351 1.299  |
| 4.067m NaCl 5.282<br>4.056  | 2.905 2.218   |
|   |   |
|   |   |
| AUXILIA   | RY INFORMATION  |
| ······································  | RY INFORMATION<br>SOURCE AND PURITY OF MATERIALS:   |
| ETHOD /APPARATUS/PROCEDURE:   | SOURCE AND PURITY OF MATERIALS:<br>e 1. Matheson Co. sample, purity 99.99   |
| ETHOD /APPARATUS/PROCEDURE:<br>Large steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-  | SOURCE AND PURITY OF MATERIALS:<br>a 1. Matheson Co. sample, purity 99.99<br>mole per cent.   |
| ETHOD /APPARATUS/PROCEDURE:<br>arge steel cell (4.5 l). Pressurd<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell  | SOURCE AND PURITY OF MATERIALS:<br>e 1. Matheson Co. sample, purity 99.99<br>mole per cent.<br>2. Baker analysed reagent.   |
| ETHOD /APPARATUS/PROCEDURE:<br>arge steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-  | SOURCE AND PURITY OF MATERIALS:<br>a 1. Matheson Co. sample, purity 99.99<br>mole per cent.   |
| ETHOD /APPARATUS/PROCEDURE:<br>arge steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>sharged with salt solution, com-<br>pressed gas added. After equi-<br>.ibrium attained, samples of liquid   | SOURCE AND PURITY OF MATERIALS:<br>e 1. Matheson Co. sample, purity 99.99<br>mole per cent.<br>2. Baker analysed reagent.   |
| ETHOD /APPARATUS/PROCEDURE:<br>warge steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-<br>pressed gas added. After equi-<br>librium attained, samples of liquid<br>removed and analysed using volu-                                      | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>a Matheson Co. sample, purity 99.99<br/>mole per cent.</li> <li>2. Baker analysed reagent.</li> <li>3. Distilled and de-ionised.</li> </ul>   |
| ETHOD /APPARATUS/PROCEDURE:<br>warge steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-<br>pressed gas added. After equi-<br>tibrium attained, samples of liquid<br>removed and analysed using volu-<br>metric techniques. Details in ref | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>a Matheson Co. sample, purity 99.99<br/>mole per cent.</li> <li>2. Baker analysed reagent.</li> <li>3. Distilled and de-ionised.</li> </ul>   |
| ETHOD /APPARATUS/PROCEDURE:<br>Large steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-<br>pressed gas added. After equi-<br>librium attained, samples of liquid<br>removed and analysed using volu-<br>metric techniques. Details in ref | SOURCE AND PURITY OF MATERIALS:<br>e 1. Matheson Co. sample, purity 99.99<br>mole per cent.<br>2. Baker analysed reagent.<br>3. Distilled and de-ionised.   |
| ETHOD /APPARATUS/PROCEDURE:<br>heasured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-<br>pressed gas added. After equi-<br>librium attained, samples of liquid<br>removed and analysed using volu-<br>metric techniques. Details in ref                                       | SOURCE AND PURITY OF MATERIALS:<br>1. Matheson Co. sample, purity 99.99<br>mole per cent.<br>2. Baker analysed reagent.<br>3. Distilled and de-ionised.<br>ESTIMATED ERROR:   |
| ETHOD /APPARATUS/PROCEDURE:<br>Large steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-<br>pressed gas added. After equi-<br>librium attained, samples of liquid<br>removed and analysed using volu-<br>metric techniques. Details in ref | <pre>SOURCE AND PURITY OF MATERIALS:<br/>a l. Matheson Co. sample, purity 99.99<br/>mole per cent.<br/>2. Baker analysed reagent.<br/>3. Distilled and de-ionised.<br/>ESTIMATED ERROR:<br/>δT/K = ±0.5; δP/bar = ±0.5%;</pre>  |
| ETHOD /APPARATUS/PROCEDURE:<br>Large steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-<br>pressed gas added. After equi-<br>librium attained, samples of liquid<br>removed and analysed using volu-<br>metric techniques. Details in ref | <pre>SOURCE AND PURITY OF MATERIALS:<br/>1. Matheson Co. sample, purity 99.99<br/>mole per cent.<br/>2. Baker analysed reagent.<br/>3. Distilled and de-ionised.<br/>ESTIMATED ERROR:<br/>δT/K = ±0.5; δP/bar = ±0.5%;<br/>δx<sub>He</sub> = ±0.3%.</pre>   |
| ETHOD/APPARATUS/PROCEDURE:<br>Large steel cell (4.5 %). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-   | SOURCE AND PURITY OF MATERIALS:<br>a Source and Purity OF MATERIALS:<br>a Matheson Co. sample, purity 99.99<br>mole per cent.<br>2. Baker analysed reagent.<br>3. Distilled and de-ionised.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5$ ; $\delta P/bar = \pm 0.5$ ;<br>$\delta x_{He} = \pm 0.3$ %.<br>REFERENCES: |
| ETHOD /APPARATUS/PROCEDURE:<br>Large steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-<br>pressed gas added. After equi-<br>librium attained, samples of liquid<br>removed and analysed using volu-<br>metric techniques. Details in ref | <pre>SOURCE AND PURITY OF MATERIALS:<br/>a Matheson Co. sample, purity 99.99<br/>mole per cent.<br/>b Baker analysed reagent.<br/>J Distilled and de-ionised.<br/>ESTIMATED ERROR:<br/>δT/K = ±0.5; δP/bar = ±0.5%;<br/>δx<sub>He</sub> = ±0.3%.<br/>REFERENCES:<br/>1. O'Sullivan, T. D. and Smith, N. 6</pre>       |
| ETHOD /APPARATUS/PROCEDURE:<br>Large steel cell (4.5 l). Pressure<br>measured with Bourdon gauge.<br>Temperature measured with iron-<br>constantan thermocouple. Cell<br>charged with salt solution, com-<br>pressed gas added. After equi-<br>librium attained, samples of liquid<br>removed and analysed using volu-<br>metric techniques. Details in ref | SOURCE AND PURITY OF MATERIALS:<br>a Source and Purity OF MATERIALS:<br>a Matheson Co. sample, purity 99.99<br>mole per cent.<br>2. Baker analysed reagent.<br>3. Distilled and de-ionised.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.5$ ; $\delta P/bar = \pm 0.5$ ;<br>$\delta x_{He} = \pm 0.3$ %.<br>REFERENCES: |

| COMPONENT  | cs:   |  |   | ORIGINAL   | MEASUREMENTS  | :                               |                 |
|--|---|--|---|--|---|---------------------------------|-----------------|
| (l) He   | l) Helium; He; 7440-59-7  |  |   | Stephan, E. L., Hatfield, N. S.,   |   |                                 |                 |
| (2) Uranyl Sulfate; UO <sub>2</sub> SO <sub>4</sub> ;1314-64-3                     |   |  | Peoples, R. S. and Pray, H. A. H.,  |  |   |                                 |                 |
|  |   |  | Battel  | le Memorial  | Institu   | te Report                       |                 |
| (3) Water; H <sub>2</sub> O; 7732-18-5   |   |  |   | Battelle Memorial Institute Report<br>BMI-1067, <u>1956</u> .                  |   |                                 |                 |
| VARIABLES  | S:  |  |   | PREPARED   | BY:   |                                 |                 |
| Temperature, pressure, composition   |   |  |   | C. L. Young  |   |                                 |                 |
|  |   |  |   |  |   |                                 |                 |
| т/к  | g Urani<br>per lit  | um P <sup>+</sup> /bar<br>er   | Solubility*   | т/к  | g Uranium<br>per liter  | P <sup>+</sup> /bar             | Solubilit       |
| 435.92   | 40  | 35.4<br>35.2   | 0.618   | 533.15   | 100   | 29.6<br>26.2                    | 0.91            |
|  | 100   | 34.5<br>32.1   | 0.610<br>0.44   |  | 243   | 23.4<br>35.2                    | 0.78<br>0.865   |
|  | 100   | 30.0   | 0.415   |  | 473   | 31.7                            | 0.77            |
|  | 242   | 27.2   | 0.375   | E74 00   | 4.0   | 29.0                            | 0.725           |
|  | 243   | 33.4<br>31.0   | 0.325<br>0.33   | 574.82   | 40  | 19.0<br>18.3                    | 1.12<br>1.11    |
|  |   | 29.3   | 0.31  |  |   | 13.8                            | 0.835           |
| 533.15   | 40  | 26.5<br>27.6   | 0.26<br>1.13  |  | 100   | 10.3<br>19.0                    | 0.62<br>0.975   |
|  |   | 24.8   | 0.98  |  | 200   | 18.3                            | 0.99            |
|  |   | 24.5   | 1.06  |  |   | 17.2<br>15.5                    | 0.90<br>0.81    |
|  |   |  | sure of heli<br>at S.T.P. p   |  | solution  |                                 |                 |
|  | -   |  |   |  | solution  |                                 |                 |
|  | -   |  |   | er g of  |   |                                 |                 |
|  | *   | ml of helium   | AUXILIARY   | er g of<br>INFORMATI   |   | MATERIALS :                     |                 |
| Static<br>liquid<br>Pressur<br>and tem<br>couple.<br>estimat<br>Details<br>estimat | *<br>equilib<br>equilib<br>e measu<br>peratur<br>Comp<br>ed by v<br>in sou<br>ed by s | ml of helium   | AUXILIARY<br>AUXILIARY<br>Gas and<br>hours.<br>ordon gauge<br>oith thermo-<br>iquid<br>thod.<br>al pressure<br>apor | er g of<br>INFORMATI   | :ON   |                                 |                 |
| Static<br>liquid<br>Pressur<br>and tem<br>couple.<br>estimat<br>Details<br>estimat | *<br>equilib<br>equilib<br>e measu<br>peratur<br>Comp<br>ed by v<br>in sou<br>ed by s | ml of helium<br>US/PROCEDURE<br>rium cell.<br>rated for 18<br>red with Bou<br>e measured w<br>osition of 1<br>olumetric me<br>rce. Parti<br>ubtracting w | AUXILIARY<br>AUXILIARY<br>Gas and<br>hours.<br>ordon gauge<br>oith thermo-<br>iquid<br>thod.<br>al pressure<br>apor | er g of<br>INFORMATI   | ION<br>ND PURITY OF<br>NO details   |                                 |                 |
| Static<br>liquid<br>Pressur<br>and tem<br>couple.<br>estimat<br>Details<br>estimat | *<br>equilib<br>equilib<br>e measu<br>peratur<br>Comp<br>ed by v<br>in sou<br>ed by s | ml of helium<br>US/PROCEDURE<br>rium cell.<br>rated for 18<br>red with Bou<br>e measured w<br>osition of 1<br>olumetric me<br>rce. Parti<br>ubtracting w | AUXILIARY<br>AUXILIARY<br>Gas and<br>hours.<br>ordon gauge<br>oith thermo-<br>iquid<br>thod.<br>al pressure<br>apor | er g of<br>INFORMATI<br>SOURCE A   | ION<br>ND PURITY OF   | given.                          |                 |
| Static<br>liquid<br>Pressur<br>and tem<br>couple.<br>estimat<br>Details<br>estimat | *<br>equilib<br>equilib<br>e measu<br>peratur<br>Comp<br>ed by v<br>in sou<br>ed by s | ml of helium<br>US/PROCEDURE<br>rium cell.<br>rated for 18<br>red with Bou<br>e measured w<br>osition of 1<br>olumetric me<br>rce. Parti<br>ubtracting w | AUXILIARY<br>AUXILIARY<br>Gas and<br>hours.<br>ordon gauge<br>oith thermo-<br>iquid<br>thod.<br>al pressure<br>apor | er g of<br>INFORMATI<br>SOURCE Α<br>ESTIMATE<br>δT/K =                         | ON<br>ND PURITY OF<br>No details<br>D ERROR:                                      | given.<br>bar = ±0<br>3% (estin | .3;             |
| Static<br>liquid<br>Pressur<br>and tem<br>couple.<br>estimat<br>Details<br>estimat | *<br>equilib<br>equilib<br>e measu<br>peratur<br>Comp<br>ed by v<br>in sou<br>ed by s | ml of helium<br>US/PROCEDURE<br>rium cell.<br>rated for 18<br>red with Bou<br>e measured w<br>osition of 1<br>olumetric me<br>rce. Parti<br>ubtracting w | AUXILIARY<br>AUXILIARY<br>Gas and<br>hours.<br>ordon gauge<br>oith thermo-<br>iquid<br>thod.<br>al pressure<br>apor | er g of<br>INFORMATI<br>SOURCE Α<br>ESTIMATE<br>δT/K =                         | ND PURITY OF<br>NO details<br>D ERROR:<br>$\pm 0.6; \delta P/$<br>pility) = $\pm$ | given.<br>bar = ±0<br>3% (estin | .3;<br>nated by |
| Static<br>liquid<br>Pressur<br>and tem<br>couple.<br>estimat<br>Details<br>estimat | *<br>equilib<br>equilib<br>e measu<br>peratur<br>Comp<br>ed by v<br>in sou<br>ed by s | ml of helium<br>US/PROCEDURE<br>rium cell.<br>rated for 18<br>red with Bou<br>e measured w<br>osition of 1<br>olumetric me<br>rce. Parti<br>ubtracting w | AUXILIARY<br>AUXILIARY<br>Gas and<br>hours.<br>ordon gauge<br>oith thermo-<br>iquid<br>thod.<br>al pressure<br>apor | er g of<br>INFORMATI<br>SOURCE A<br>SOURCE A<br>ESTIMATE<br>δT/K =<br>δ (solub | ND PURITY OF<br>NO details<br>D ERROR:<br>$\pm 0.6; \delta P/$<br>pility) = $\pm$ | given.<br>bar = ±0<br>3% (estin | .3;<br>nated by |

| COMPONENTS:                           | EVALUATOR:                           |
|---------------------------------------|--------------------------------------|
| l. Helium; He; 7440-59-7              | Colin Young,<br>School of Chemistry, |
| 2. Methane; CH <sub>4</sub> ; 74-82-8 | University of Melbourne,             |
|                                       | Parkville, Victoria 3052,            |
|                                       | AUSTRALIA.                           |

CRITICAL EVALUATION:

Measurements on this system have been reported in six publications. The measurements by Sinor *et al*. (1), Rhodes and coworkers (2), (3), Heck and Hiza (4) and Streett *et al*. (5) are in good agreement in the ranges of temperature and pressures where there is extensive overlap. The data of Streett *et al*. (5) are of lower accuracy than those of the other workers mentioned above but the range of pressure is more than an order of magnitude greater. All the above data are classified as tentative.

The data of Gonikberg and Fastowski appear to be somewhat high when compared with extrapolated and interpolated data obtained from the results of the five above studies and are therefore classified as doubtful.

#### References

- Sinor, J. E., Schindler, D. L. and Kurata, F., Am. Inst. Chem. Engnrs. J., 1966, 12, 353.
- Rhodes, H. L., De Vaney, W. E. and Tully, P. C., J. Chem. Engng. Data, <u>1971</u>, 16, 19.
- De Vaney, W. E., Rhodes, H. L. and Tully, P. C., J. Chem. Engng. Data, 1971, 16, 158.
- 4. Heck, C. K. and Hiza, M. J., Am. Inst. Chem. Engnrs. J., <u>1967</u>, 13, 593.
- 5. Streett, W. B., Erickson, A. L. and Hill, J. L. E., Physics Earth Planetary Interiors, <u>1972</u>, 6, 69.
- Gonikberg, M. G. and Fastowski, V. G., Acta Physicochimica U.R.S.S., <u>1940</u>, 13, 399.

| COMPONEN            | TS:  |                                     | ORIGINAL                               | MEASUREMEN     | NTS:                          |                              |  |
|---------------------|--|-------------------------------------|--|----------------|-------------------------------|------------------------------|--|
| (1) He              | elium; He; 7440-                                 | -59-7                               | Sinor, J. E., Schindler, D. L. and     |                |                               |                              |  |
| [ · ·               |  |                                     | Kurata, F., Am. Inst. Chem. Engnrs.J., |                |                               |                              |  |
| (2) Me              | thane; CH <sub>4</sub> ; 74-                     | -82-8                               | $\frac{1966}{1}, 1$                    | 2, 353.        |                               |                              |  |
|                     |  |                                     |  |                |                               |                              |  |
|                     |  |                                     |  |                |                               |                              |  |
| VARIABLE            | S:   |                                     | PREPARED                               | BY:            |                               |                              |  |
| Tempera             | ture, pressure                                   |                                     | с. г. ч                                |                |                               |                              |  |
| Tempera             | cure, pressure                                   |                                     | C. D. 1                                | oung           |                               |                              |  |
| EXPERIME            | NTAL VALUES:                                     | <u></u>                             | 1                                      |                |                               |                              |  |
| m /11               |  | ction of helium                     | m /17                                  |                | ole fraction                  |                              |  |
| T/K                 | <i>P/bar</i> in liquit<br><sup><i>x</i></sup> He | d, in vapor,<br><sup>Y</sup> He     | т/к                                    | P/Dar 1        | n liquid,<br><sup>x</sup> He  | in vapor,<br><sup>Y</sup> He |  |
| 93.15               | 17.2 0.000                                       |                                     | 153.15                                 | 55.2           | 0.0163                        | 0.744                        |  |
| 55.15               | 34.5 0.001                                       | 1 0.992                             | 199.19                                 | 68.95          | 0.0205                        | -                            |  |
|                     | 51.7 0.0016<br>68.95 0.0022                      |                                     |  | 86.18<br>103.4 | 0.0266<br>0.0320              | 0.825<br>0.850               |  |
|                     | 86.18 0.0026                                     | 5 –                                 |  | 120.7          | 0.0366                        | 0.867                        |  |
|                     | 103.4 0.003<br>120.7 0.003                       |                                     | 173.15                                 | 137.9<br>34.5  | 0.0404<br>0.0060              | 0.884<br>0.150               |  |
| 112 15              | 137.9 0.0039                                     | 9 0.998                             |  | 51.7           | 0.0189                        | 0.361                        |  |
| 113.15              | 17.2 0.0013<br>34.5 0.0028                       |                                     |  | 68.95<br>86.18 | 0.0322<br>0.0417              | 0.491<br>0.554               |  |
|                     | 51.7 0.0042<br>68.95 0.005                       |                                     |  | 103.4<br>120.7 | 0.0524<br>0.0618              | 0.632<br>0.674               |  |
|                     | 86.18 0.0067                                     | 7 0.980                             |  | 137.9          | 0.0712                        | 0.713                        |  |
|                     | 103.4 0.0078<br>120.7 0.0090                     |                                     | 188.15                                 | 51.7<br>68.95  | 0.0142<br>0.0428              | 0.058<br>0.169               |  |
|                     | 137.9 0.0099                                     | 0.985                               |  | 86.18          | 0.0678                        | 0.253                        |  |
| 133.15              | 17.2 0.0024<br>34.5 0.0056                       |                                     |  | 103.4<br>120.7 | 0.0906<br>0.1105              | 0.322<br>0.372               |  |
|                     | 51.7 0.0086                                      | 5 –                                 | 100 15                                 | 137.9          | 0.1300                        | 0.415                        |  |
|                     | 68.95 0.0116<br>86.18 0.0144                     |                                     | 189.15<br>189.65                       | 137.9<br>137.9 | 0.138<br>0.152                | 0.372<br>0.348               |  |
|                     | 103.4 0.0169<br>120.7 0.0193                     |                                     | 190.15<br>190.45                       | 137.9<br>137.9 | 0.166<br>0.178                | 0.320<br>0.300               |  |
|                     | 137.9 0.0214                                     | 0.952                               | 190.65                                 | 037.9          | 0.183                         | 0.287                        |  |
| 153.15              | 27.6 0.0058<br>41.4 0.0109                       |                                     | 190.95                                 | 137.9          | 0.265                         | 0.275                        |  |
|                     |  |                                     |  |                |                               |                              |  |
|                     |  | AUXILIARY                           |  |                |                               |                              |  |
| , i                 | APPARATUS/PROCEI                                 |                                     |  |                | OF MATERIALS:                 |                              |  |
| Static (<br>city) f | equilibrium cell<br>itted with magne             | L (0.1 & capa-<br>tic stirrer.      |  |                | ines sample r<br>parts per m: |                              |  |
| Tempera             | ture measured wi                                 | th platinum                         | _                                      | -              | troleum pure                  |                              |  |
|                     | nce thermometer.<br>d with Bourdon o             |                                     | Dur                                    |                | mole per cer                  |                              |  |
| charged             | into cell, equi                                  | librated;                           |  |                |                               |                              |  |
|                     | d by G.C. Deta                                   | es withdrawn and<br>ails in source. |  |                |                               |                              |  |
|                     |  |                                     | ¢                                      |                |                               |                              |  |
| 1                   |  |                                     |  |                |                               |                              |  |
|                     |  |                                     | ESTIMATE                               | D EBBOD.       |                               |                              |  |
|                     |  |                                     |  |                | $P/bar = \pm 0.1$             | ;                            |  |
|                     |  |                                     |  |                | whichever is                  | ne                           |  |
|                     |  |                                     | $\delta y_{\rm He} =$                  | ±1%.           |                               |                              |  |
|                     |  |                                     | REFERENC                               |                |                               |                              |  |
|                     |  |                                     |  |                |                               |                              |  |
|                     |  |                                     |  |                |                               |                              |  |
|                     |  |                                     |  |                |                               |                              |  |
|                     |  |                                     |  |                |                               |                              |  |
|                     |  |                                     |  |                |                               |                              |  |

| COMPONEN  | TS:  |   |  | ORIGINAL  | MEASUREM  | ENTS:  |  |  |
|---|--|---|--|---|---|--|--|--|
|   |  | He; 7440-59-7<br>CH <sub>4</sub> ; 74-82-8  |  | Rhodes, H. L., DeVaney, W. E. and<br>Tully, P. C., J. Chem. Engng. Data,<br>1971, 16, 19. |   |  |  |  |
| VARIABLE<br>Tempera   | s:<br>ture, p  | ressure   |  | PREPARED BY:<br>C. L. Young   |   |  |  |  |
| EXPERIME  | NTAL VALU  | ES:   |  | 1   |   |  |  |  |
| т/к   | P/bar  | Mole fraction<br>in liquid,<br><sup>x</sup> He  | of helium<br>in gas,<br><sup>y</sup> He  | т/к   | P/bar   | Mole fractio<br>in liquid,<br><sup>x</sup> He  |  |  |
| 94.00<br>124.00   | 69.57<br>69.84<br>103.4<br>103.5<br>139.5<br>139.1<br>69.29<br>69.02<br>103.3<br>137.7<br>137.6<br>206.4<br>207.0<br>261.7<br>261.5<br>69.09<br>68.88<br>103.4<br>138.3<br>137.9<br>206.8<br>206.6<br>261.7<br>261.9 | 0.0022  | 0.9962<br>0.9968<br>0.9978<br>0.9544<br>0.9675<br>0.9744<br>0.9816<br>0.9849<br>0.7618<br>0.8314<br>0.8685<br>0.9048<br>0.9048 | 164.00  | 68.88<br>86.39<br>86.25<br>103.4<br>103.5<br>137.6<br>137.9<br>172.8<br>172.7<br>207.1<br>207.0<br>261.7<br>262.1<br>68.88<br>68.74<br>86.05<br>85.98<br>103.5<br>103.1<br>137.7<br>137.6<br>172.3<br>172.1<br>206.8<br>260.2 | 0.0238<br>0.0310<br>0.0378<br>0.0498<br>0.0609<br>0.0702<br>0.0836<br>0.0291<br>0.0396<br>0.0493<br>0.0493<br>0.0669<br>0.0820<br>0.0957 | 0.6300<br>0.6924<br>0.7341<br>0.7900<br>0.8253<br>0.8499<br>0.8761<br>0.4580<br>0.5386<br>0.5986<br>0.5986<br>0.6768<br>0.7280<br>0.7280<br>0.7642<br>0.8035 |  |
|   |  |   | AUXILIARY  | INFORMATI   | ON  |  |  |  |
| Recircu<br>Berylli<br>recircu<br>Tempera<br>resistan<br>pressure<br>calibra | lating w<br>um-coppe<br>lated th<br>ture meance ther<br>nce ther<br>e transo<br>ted agai   | JS/PROCEDURE:<br>vapor flow appared windowed cells<br>in ough external<br>asured with pla<br>cmometer and me<br>ducer and Bourd<br>inst a dead we<br>cce and ref. 1 | ll. Vapor<br>l loop.<br>atinum<br>easured by<br>dón gauge<br>ight tester.  | 1. Ultr<br>99.9<br>2. Samp<br>gen<br>per  | apure sa<br>9 mole p<br>le conta  | OF MATERIALS:<br>umple purity<br>per cent.<br>ined oxygen<br>es purity 99  | and nitro-   |  |
|   |  |   |  | $\delta x_{\text{He}} \simeq 0$<br>REFERENC<br>1. Tul<br>Rhoo                             | $\pm 0.01;$ $\delta y_{He} = \pm$ $\Xi S:$ $Iy, P. C$ $des, H.$   | δP/bar = ±0<br>0.0005.<br>., DeVaney, W<br>L., Adv. Cryc<br><u>1</u> , 16, 88.   | N. E. and  |  |

| COMPONENTS: |      |                |      |                  |                        | ORIGINAL MEASUREMENTS: |                    |                                 |                            |  |
|-------------|------|----------------|------|------------------|------------------------|------------------------|--------------------|---------------------------------|----------------------------|--|
| (1)         | He   | lium;          | He;  | 7440-59-7        | ,                      | Rhodes,<br>Tully,      | , н. L.,<br>Р. С., | DeVaney, W. E<br>J. Chem. Engng | . and<br>. Data,           |  |
| (2)         | Me   | thane;         | СН4; | 74-82-8          | 3                      | <u>1971</u> , 1        | 16, 19.            |                                 |                            |  |
|             |      |                |      |                  |                        |                        |                    |                                 |                            |  |
|             |      |                |      | -                |                        |                        |                    |                                 |                            |  |
| EXPE        | RIME | ENTAL V        |      |                  | - 6 1 - 1 <del>i</del> |                        |                    | Mala franchian                  | of helde                   |  |
| т/к         |      | P/bar          | in 1 | iquid,           | of helium<br>in gas,   | т/к                    | P/bar              | Mole fraction in liquid,        | in gas,                    |  |
|             |      |                |      | <sup>ж</sup> Не  | <sup>у</sup> не        |                        |                    | <sup>x</sup> He                 | <sup>y</sup> <sub>He</sub> |  |
| 174.        |      | 259.8          |      | 0.1126           | _                      | 190.60                 | 172.1              | 0.1899                          | -                          |  |
| 184.        | 00   | 68.88          |      | -                | 0.2518                 |                        | 206.8              | -                               | 0.4503                     |  |
|             |      | 68.85<br>86.18 |      | 0.0353           | 0.3400                 |                        | 207.1<br>262.0     | 0.2129                          | 0.5351                     |  |
|             |      | 86.25          |      | 0.0525           | -                      |                        | 261.9              | 0.2395                          | -                          |  |
|             |      | 103.4          |      | _                | 0.4081                 | 190.90                 | 114.2              | 0.1562                          | 0.2043                     |  |
|             |      | 103.1          |      | 0.0681           | -                      |                        | 118.8              | -                               | 0.2210                     |  |
|             |      | 120.3          |      | -                | 0.4617                 |                        | 118.3              | 0.1585                          | -                          |  |
|             |      | 120.2          |      | 0.0820           | -                      |                        | 123.8              | -                               | 0.2358                     |  |
|             |      | 138.4          |      | 0.0957           | 0.5082                 |                        | 123.6<br>138.0     | 0.1620                          | -<br>0.2787                |  |
|             |      | 172.9          |      | -                | 0.5769                 |                        | 137.9              | 0.1743                          | -                          |  |
|             |      | 172.6          |      | 0.1187           | -                      |                        | 172.3              | -                               | 0.3645                     |  |
|             |      | 206.6          |      | -                | 0.6271                 |                        | 172.2              | 0.2012                          | -                          |  |
|             |      | 206.2          |      | 0.1376           | -                      |                        | 207.0              | -                               | 0.4361                     |  |
|             |      | 262.1          |      | -                | 0.6877                 |                        | 206.6              | 0.2224                          |                            |  |
| 189.0       |      | 262.0          |      | 0.1621           | 0.1399                 | 191.06                 | 261.9<br>137.8     | 0.2472                          | 0.5228<br>0.2530           |  |
| 102.0       | 00   | 68.95          |      | 0.0429           | 0.1399                 | 191.00                 | 137.8              | 0.1936                          | -                          |  |
|             |      | 85.98          |      | -                | 0.2138                 | 191.10                 | 207.1              | -                               | 0.4230                     |  |
|             |      | 85.84          |      | 0.0680           | -                      |                        | 206.8              | 0.2306                          | -                          |  |
|             |      | 103.4          |      | -                | 0.2769                 | 191.37                 | 172.5              | -                               | 0.3054                     |  |
|             |      | 103.6          |      | 0.0909           | -                      |                        | 172.4              | 0.2478                          | -                          |  |
|             |      | 120.8          |      | -                | 0.3306                 | 191.40                 | 176.1              | 0 2520                          | 0.3113                     |  |
|             |      | 120.4<br>137.9 |      | 0.1112<br>0.1284 | 0.4514                 |                        | 176.0<br>179.2     | 0.2526                          | 0.3263                     |  |
|             |      | 172.4          |      | -                | 0.4834                 |                        | 179.0              | 0.2445                          | -                          |  |
|             |      | 172.5          |      | 0.1585           | -                      |                        | 192.7              | -                               | 0.3650                     |  |
| 190.        | 30   | 68.95          |      | -                | 0.1019                 |                        | 193.0              | 0.2439                          | -                          |  |
|             |      | 68.81          |      | 0.0511           | -                      |                        | 206.9              | -                               | 0.3991                     |  |
|             |      | 86.18          |      |                  | 0.1673                 |                        | 206.2              | 0.2456                          | -                          |  |
|             |      | 103.4          |      | 0.0819           | 0.2236                 |                        | 230.4<br>262.1     | 0.2532<br>0.2632                | 0.4471<br>0.4987           |  |
|             |      | 103.5          |      | 0.1086           | -                      | 191.68                 | 207.0              | -                               | 0.3589                     |  |
|             |      | 120.6          |      | -                | 0.2753                 | 171.00                 | 206.7              | 0.2804                          | -                          |  |
|             |      | 120.5          |      | 0.1316           | _                      | 192.00                 | 236.4              | -                               | 0.3849                     |  |
|             |      | 138.0          |      | -                | 0.3211                 |                        | 236.1              | 0.3058                          | -                          |  |
|             |      | 137.7          |      | 0.1508           | -                      |                        | 238.0              | -                               | 0.3911                     |  |
|             |      | 172.6          |      | -                | 0.4000                 |                        | 237.9              | 0.3080                          | -                          |  |
|             |      | 172.3 206.8    |      | 0.1806           | 0.4651                 |                        | 248.3<br>248.1     | 0.2998                          | 0.4227                     |  |
|             |      | 206.6          |      | 0.2054           | -                      |                        | 262.0              | 0.2946                          | 0.4557                     |  |
|             |      | 262.1          |      | 0.2327           | 0.5464                 |                        | 262.1              | 0.2944                          | _                          |  |
| 190.0       | 60   | 68.88          |      | 0.0587           | 0.0873                 |                        | 261.8              | -                               | 0.4548                     |  |
|             |      | 103.4          |      | 0.1182           | 0.2043                 | 192.20                 | 262.1              |                                 | 0.4288                     |  |
|             |      | 137.9          |      | -                | 0.3029                 | 100.00                 | 262.0              | 0.3153                          | -                          |  |
|             |      | 137.8<br>172.6 |      | 0.1594           | -                      | 192.29                 | 262.0              | 0.3417                          | 0.4071                     |  |
|             |      | 12.0           |      | -                | 0.3850                 |                        |                    |                                 |                            |  |

| COMPONENT | rs:                     |                                  |                              | ORIGINAL MEASUREMENTS:               |                              |                               |                              |  |  |
|-----------|-------------------------|----------------------------------|------------------------------|--------------------------------------|------------------------------|-------------------------------|------------------------------|--|--|
| (1) He    | lium;                   | He; 7440-59-7                    |                              | Streett, W. B., Erickson, A. L., and |                              |                               |                              |  |  |
| (2) Me    | thana                   | CH <sub>4</sub> ; 74-82-8        |                              | Hill, J                              | . L. E.                      | , Physics Earth               | h                            |  |  |
| (2) Me    | chane;                  | CH4; /4-82-8                     |                              | Planeta:                             | ry Inte                      | riors, 1972, 6                | , 69.                        |  |  |
| VARIABLE  | <u>S:</u>               |                                  |                              | PREPARED                             | RV •                         |                               | <del>,,</del>                |  |  |
| Tempera   | ture. r                 | pressure                         |                              | C. L. Y                              |                              |                               |                              |  |  |
| rempera   | curc, b                 |                                  |                              |                                      | o ung                        |                               |                              |  |  |
| EXPERIME  | NTAL VALI               | UES:<br>Mole fraction            | of helium                    |                                      |                              | Mole fraction                 | of helium                    |  |  |
| т/к       | P/bar                   | in liquid,<br><sup>x</sup> He    | in vapor,<br><sup>y</sup> He |                                      | P/bar                        | in liquid,<br><sup>x</sup> He | in vapor,<br><sup>y</sup> He |  |  |
| 94.92     | 62                      | 0.0023                           | 0.9931                       | 130.16                               | 482                          | 0.0398                        | 0.9858                       |  |  |
|           | 152<br>172              | 0.0038<br>0.0050                 | 0.9966<br>0.9973             |                                      | 643<br>850                   | 0.0451<br>0.0488              | 0.9882<br>0.9903             |  |  |
|           | 204 <sup>a</sup>        | 0.006                            | 0.998                        |                                      | 973                          | 0.0506                        | 0.9924                       |  |  |
| 100.05    | 164                     | 0.0056                           | 0.9946                       |                                      | 1102                         | 0.0510                        | 0.9935                       |  |  |
|           | 207                     | 0.0069                           | 0.9954                       |                                      | 1232                         | 0.0508                        | 0.9935                       |  |  |
|           | 241<br>276              | 0.0077<br>0.0085                 | 0.9954<br>0.9954             |                                      | 1378<br>1516                 | 0.0519<br>0.0521              | 0.9940<br>0.9940             |  |  |
|           | 352                     | 0.0098                           | 0.9957                       |                                      | 1791                         | 0.0517                        | 0.9956                       |  |  |
|           | 413                     | 0.0111                           | 0.9963                       |                                      | 2188 <sup>a</sup>            | 0.052                         | 0.996                        |  |  |
| 105 00    | 458 <sup>a</sup>        | 0.012                            | 0.997                        | 139.85                               | 482                          | 0.0559                        | 0.9763                       |  |  |
| 105.09    | 283<br>345              | 0.0111<br>0.0125                 | 0.9946<br>0.9970             |                                      | 628<br>819                   | 0.0618<br>0.0670              | 0.9800<br>0.9844             |  |  |
|           | 413                     | 0.0140                           | 0.9973                       |                                      | 965                          | 0.0691                        | 0.9865                       |  |  |
|           | 482                     | 0.0144                           | 0.9977                       |                                      | 1102                         | 0.0707                        | 0.9876                       |  |  |
|           | 551                     | 0.0155                           | 0.9979                       |                                      | 1378                         | 0.0709                        | 0.9906                       |  |  |
|           | 620<br>669 <sup>a</sup> | 0.0163<br>0.017                  | 0.9983<br>0.998              |                                      | 1929<br>2205                 | 0.0693<br>0.0689              | 0.9938<br>0.9987             |  |  |
| 110.07    | 276                     | 0.0136                           | 0.9948                       |                                      | 2480                         | 0.0660                        | 0.9980                       |  |  |
|           | 413                     | 0.0170                           | 0,9955                       |                                      | 2619                         | 0.0642                        | 0.9959                       |  |  |
|           | 489                     | 0.0186                           | 0.9970                       |                                      | 2810 <sup>a</sup>            | 0.062                         | 0.998                        |  |  |
|           | 620<br>765              | 0.0209<br>0.0219                 | 0.9977<br>0.9981             | 149.78                               | 227<br>413                   | 0.0500<br>0.0693              | 0.9286<br>0.9525             |  |  |
|           | 827                     | 0.0228                           | 0.9981                       |                                      | 689                          | 0.0867                        | 0.9674                       |  |  |
|           | 954 <sup>a</sup>        | 0.024                            | 0.998                        |                                      | 965                          | 0.0939                        | 0.9783                       |  |  |
| 130.16    | 353                     | 0.0334                           | 0.9820                       | TNFODMART                            | <u>1378</u>                  | 0.0955                        | 0.9844                       |  |  |
| METHOD /  | APPARAT                 | US/PROCEDURE:                    | AUXILIARY                    |                                      |                              | OF MATERIALS:                 |                              |  |  |
|           |                         |                                  |                              | 1                                    |                              |                               |                              |  |  |
|           |                         | vapor flow appa<br>pump. Tempera |                              | No details given.                    |                              |                               |                              |  |  |
| measure   | d with                  | platinum resist                  | tance                        |                                      |                              |                               |                              |  |  |
|           |                         | Pressure measu                   |                              |                                      |                              |                               |                              |  |  |
|           |                         | tance gauge.                     |                              |                                      |                              |                               |                              |  |  |
| conduct   | ivity.                  | gas analysed by<br>Details in re | ef. 1.                       |                                      |                              |                               |                              |  |  |
| Conduct   |                         | SCOULD IN IC                     |                              | l                                    |                              |                               |                              |  |  |
|           |                         |                                  |                              |                                      |                              |                               |                              |  |  |
|           |                         |                                  |                              | 1                                    |                              |                               |                              |  |  |
|           |                         |                                  |                              |                                      |                              |                               |                              |  |  |
|           |                         |                                  |                              | ESTIMATEI                            | D ERROR:                     |                               |                              |  |  |
|           |                         |                                  |                              | δT/K = =                             | ±0.02;                       | $\delta P/bar = \pm 5;$       |                              |  |  |
|           |                         |                                  |                              | δx <sub>He</sub> , δι                | $y_{\rm He} = \pm 3$         | l mole per cent               | t.                           |  |  |
|           |                         |                                  |                              | PEEDENC                              | FC.                          |                               |                              |  |  |
|           |                         |                                  |                              | REFERENCI                            |                              |                               |                              |  |  |
|           |                         |                                  |                              | 1. Stree                             | ett, W.                      | B. and Ericks                 | on, A. L.,                   |  |  |
|           |                         |                                  |                              | Physi                                | ics Eart                     | th Planetary In               | iteriors,                    |  |  |
|           |                         |                                  |                              | 1972                                 | <i>, 5</i> , 35 <sup>°</sup> | 7.                            |                              |  |  |
|           |                         |                                  |                              |                                      | ÷                            |                               |                              |  |  |
|           |                         |                                  |                              | <b>I</b>                             |                              |                               |                              |  |  |
|           |                         |                                  |                              | L                                    |                              |                               |                              |  |  |

| $\begin{array}{cccc} & & & & & & & & \\ \hline x_{\rm He} & & & & & \\ 149.78 & 1723 & & 0.0935 & & 0.9855 \\ 2067 & & 0.0897 & & 0.9903 \\ 3102 & & 0.0831 & & 0.9931 \\ \end{array}$                   | Hill,<br>Planet         | J. L. E<br>ary Into<br>P/bar<br>353 | ., Erickson, A<br>., Physics Ear<br>eriors, <u>1972</u> ,<br>Mole fraction<br>in liquid,<br><sup>x</sup> He | <pre>h f, 69. f, 69. f, of helium in vapor,</pre> |
|--|-------------------------|-------------------------------------|---|---|
| <pre>(2) Methane; CH<sub>4</sub>; 74-82-8 EXPERIMENTAL VALUES:</pre>   | Planet<br>Im<br>or, T/K | ary Into<br>P/bar<br>353            | eriors, <u>1972</u> ,<br>Mole fraction<br>in liquid,  | 6, 69.<br>n of helium<br>in vapor,                |
| EXPERIMENTAL VALUES:<br>Mole fraction of heliu<br>T/K P/bar in liquid, in vapo<br><sup><i>x</i></sup> He <sup><i>y</i></sup> He<br>149.78 1723 0.0935 0.9855<br>2067 0.0897 0.9903<br>3102 0.0831 0.9931 | im<br>or, T/K           | <i>P/</i> bar<br>353                | Mole fraction<br>in liquid,   | n of helium<br>in vapor,                          |
| Mole fraction of heliu<br>T/K P/bar in liquid, in vapo<br><sup><i>w</i></sup> He <sup><i>y</i></sup> He<br>149.78 1723 0.0935 0.9855<br>2067 0.0897 0.9903<br>3102 0.0831 0.9931                         | or, T/K                 | 353                                 | in liquid,  | in vapor,   |
| Mole fraction of heliu<br>T/K P/bar in liquid, in vapo<br><sup><i>w</i></sup> He <sup><i>y</i></sup> He<br>149.78 1723 0.0935 0.9855<br>2067 0.0897 0.9903<br>3102 0.0831 0.9931                         | or, T/K                 | 353                                 | in liquid,  | in vapor,   |
| Mole fraction of heliu<br>T/K P/bar in liquid, in vapo<br><sup><i>w</i></sup> He <sup><i>y</i></sup> He<br>149.78 1723 0.0935 0.9855<br>2067 0.0897 0.9903<br>3102 0.0831 0.9931                         | or, T/K                 | 353                                 | in liquid,  | in vapor,   |
| T/K P/bar in liquid, in vapo<br><sup>x</sup> He <sup>y</sup> He<br>149.78 1723 0.0935 0.9855<br>2067 0.0897 0.9903<br>3102 0.0831 0.9931   | or, T/K                 | 353                                 | in liquid,  | in vapor,   |
| 149.78 1723 0.0935 0.9855<br>2067 0.0897 0.9903<br>3102 0.0831 0.9931  | 187.81                  |                                     | ине   | u   |
| 2067 0.0897 0.9903<br>3102 0.0831 0.9931   | 187.81                  |                                     |   | <sup>y</sup> He                                   |
| 3102 0.0831 0.9931   |                         |                                     | 0.2276  | 0.6906  |
| 3105 0.0821 0.3321   |                         | 482<br>689                          | 0.2519<br>0.2675  | 0.7736<br>0.8413                                  |
| 3488 <sup>a</sup> 0.080 0.994  |                         | 965                                 | 0.2677  | 0.8861  |
| 159.84 276 0.0763 0.8610   |                         | 1240                                | 0.2612  | 0.9161  |
| 413 0.0953 0.9279  |                         | 1654                                | 0.2481  | 0.9412  |
| 551 0.1076 -<br>697 0.1149 0.9518  | 187.87                  | 165<br>198                          | 0.1407<br>0.1640  | 0.4932<br>0.5360                                  |
| 697 0.1149 0.9518<br>827 0.1200 0.9589   |                         | 267                                 | 0.2077  | 0.5989  |
| 1034 0.1245 0.9670   | 189.97                  | 689                                 | 0.2851  | 0.8216  |
| 1240 0.1258 0.9698   |                         | 1034                                | 0.2803  | 0.8877  |
| 1516 0.1247 0.9756   |                         | 1385<br>1654                        | 0.2687<br>0.2588  | 0.9207<br>0.9348                                  |
| 1791 0.1225 0.9796<br>2067 0.1192 0.9855   |                         | 1929                                | 0.2491  | 0.9478  |
| 2371 0.1143 -  |                         | 2094                                | 0.2464  | 0.9548  |
| 2480 0.1145 0.9899   |                         | 2411                                | 0.2365  | 0.9677  |
| 2757 0.1111 0.9903<br>3102 0.1066 0.9924   |                         | 3102<br>3791                        | 0.2123<br>0.1967  | 0.9810<br>0.9903                                  |
| 3446 0.1026 -  |                         | 4135                                | 0.1887  | 0.9941  |
| 3791 0.0979 0.9928   | 190.98                  | 138                                 | 0.2177  | 0.2862  |
| 3881 0.1018 0.9817   |                         | 145                                 | 0.1705  | 0.3195  |
| 4066 0.0961 0.9931<br>4080 0.0998 0.9899   |                         | 159<br>168                          | 0.1915<br>0.1950  | 0.3579<br>0.3560                                  |
| 4080 0.0998 0.9899<br>4163 0.0985 0.9913   |                         | 241                                 | 0.2365  | 0.4927  |
| 4212 0.098 0.9927  |                         | 276                                 | 0.2505  | 0.5411  |
| 4281 0.0972 0.9936   |                         | 324                                 | 0.2653  | 0.5965  |
| 4308 <sup>a</sup> 0.098 0.994<br>180.08 35 0.0051 0.1123   |                         | 719<br>965                          | 0.2966<br>0.2932  | 0.8176<br>0.8698                                  |
| 180.08         35         0.0051         0.1123           46         0.0071         0.1589   |                         |                                     | 0.2836  | 0.9038  |
| 60 0.0176 -  | 192.58                  | 1240<br>248 <sup>b</sup>            | 0.375   | 0.375   |
| 69 0.0350 0.3715   |                         | 276                                 | 0.3267  | 0.4563  |
| 103 0.0691 0.4961<br>138 0.0819 0.5863   |                         | 310<br>340                          | 0.3175  | 0.5463<br>0.5645                                  |
| 138 0.0819 0.5863<br>179 0.1038 0.6588   |                         | 413                                 | 0.3147  | 0.6356  |
| 234 0.1329 0.7293  |                         | 482                                 | 0.3198  | 0.6855  |
| 293 0.1499 0.7691  |                         | 555                                 | 0.3204  | 0.7300  |
| 482 0.1849 0.6476  |                         | 616                                 | 0.3198  | 0.7549  |
| 628 0.2011 0.8797<br>827 0.2119 0.9067   |                         | 689<br>827                          | 0.3186<br>0.3167  | 0.7720<br>0.8121                                  |
| 1034 0.2132 0.9263   |                         | 1026<br>400 <sup>b</sup>            | 0.3062  | 0.8670  |
| 1344 0.2107 0.9442   | 194.52                  |                                     | 0.450   | 0.450   |
| 1723 0.2028 0.9586<br>2067 0.1942 0.9674   |                         | 434<br>455                          | 0.3910<br>0.3807  | 0.5490<br>0.5850                                  |
| 2067 0.1942 0.9674<br>2412 0.1862 0.9705   |                         | 486                                 | 0.3765  | 0.6229  |
| 2757 0.1778 0.9790   |                         | 565                                 | 0.3592  | 0.6954  |
| 3102 0.1701 0.9817   |                         | 709                                 | 0.3451  | 0.7707  |
| 3460 0.1633 0.980<br>2633 0.1605 0.9859  |                         | 896<br>1034                         | 0.3280<br>0.3222  | 0.8296<br>0.8591                                  |
| 3633 0.1605 0.9859<br>4135 0.1516 0.9889   | 198.33                  | 1034<br>648 <sup>b</sup>            | 0.535   | 0.535   |
| 4156 0.1516 0.9859   |                         | 689                                 | 0.4610  | 0.6380  |
| 4488 0.1459 0.9876   |                         | 728                                 | 0.4439  | 0.6792  |
| 4839 0.140 0.9884  |                         | 758                                 | 0.4270  | 0.7089<br>0.7282                                  |
| 5335 0.1335 0.9894<br>5777 0.1286 0.9905   |                         | 792<br>847                          | 0.4165<br>0.4034  | 0.7587  |
| 5845 0.1285 0.9917   |                         | 1034                                | 0.3662  | 0.8231  |
| 5893 0.1279 0.9923   |                         | 1461                                | 0.3345  | 0.8921  |
| 5976 0.1265 0.9930<br>0.1260 0.9933  |                         | 1723                                | 0.3157  | 0.9158  |
| 6059 0.1260 0.9933<br>6134_ 0.1257 0.9933  |                         | 2067<br>2412                        | 0.2956<br>0.2792  | 0.9358<br>0.9491                                  |
| 6134 $0.1257$ $0.99336167^{a} 0.125 0.993$   |                         | 2757                                | 0.2632  | 0.9596  |
| •••  |                         |                                     |   |   |

| COMPON  | IENTS:                                 |                           |                  | ORIGINAL MEASUREMENTS:               |                           |                                 |                  |  |
|---------|--|---------------------------|------------------|--------------------------------------|---------------------------|---------------------------------|------------------|--|
| (1) H   | Ielium;                                | He; 7440-59-7             |                  | Streett, W. B., Erickson, A. L., and |                           |                                 |                  |  |
| (2) M   | ethane:                                | CH <sub>4</sub> ; 74-82-8 |                  |                                      |                           | ., Physics Ear<br>eriors, 1972, |                  |  |
| (2) 1   | le chanc,                              | Cm47 /4 02 0              |                  | 1 banet                              | ui y 1110                 | <u></u>                         | .,               |  |
| EVDEDTM | ENTAL V                                |                           |                  |                                      |                           |                                 |                  |  |
|         |  | Mole fraction             |                  |                                      | - 4                       | Mole fraction                   |                  |  |
| т/к     | P/bar                                  | in liquid,                | in vapor,        | T/K                                  | <i>P/</i> bar             | in liquid,                      | in vapor         |  |
|         |  | <sup><i>x</i></sup> He    | <sup>y</sup> He  |                                      |                           | <sup>x</sup> He                 | <sup>у</sup> Не  |  |
| 198.33  | 3102                                   | 0.2501                    | 0.9647           | 215.07                               | 1689 <sup>b</sup>         | 0.662                           | 0.662            |  |
|         | 3446<br>3791                           | 0.2413<br>0.2314          | 0.9708<br>0.9767 |                                      | 1723<br>1757              | 0.5743<br>0.5457                | 0.7460<br>0.7723 |  |
|         | 3791                                   | 0.2224                    | 0.9757           |                                      | 1791                      | 0.5334                          | 0.7879           |  |
|         | 3846                                   | 0.2243                    | 0.9671           |                                      | 1929                      | 0.4857                          | 0.8317           |  |
|         | 4135                                   | 0.2280                    | 0.9796           |                                      | 2067                      | 0.4571                          | 0.8557           |  |
|         | 4281                                   | 0.2110                    | 0.9776           |                                      | 2412                      | 0.4079                          | 0.8937           |  |
|         | 4694                                   | 0.2012                    | 0.980            |                                      | 2757                      | 0.3737                          | 0.9161           |  |
|         | 5115                                   | 0.1886                    | 0.9826           |                                      | 3102                      | 0.3534                          | 0.9316           |  |
|         | 5659                                   | 0.1775                    | 0.9843           |                                      | 3446                      | 0.3320                          | 0.9422           |  |
|         | 6134                                   | 0.1682                    | 0.9867           |                                      | 3791                      | 0.3127                          | 0.9501           |  |
|         | 6624<br>7162                           | 0.1622<br>0.1568          | 0.9884<br>0.990  | 221.10                               | 4135<br>2081 <sup>b</sup> | 0.2942<br>0.677                 | 0.9565<br>0.677  |  |
|         | 7596                                   | 0.1518                    | 0.9903           | 221.10                               | 2116                      | 0.6136                          | 0.7431           |  |
|         | 70/9                                   | 0.1446                    | 0.9903           |                                      | 2136                      | 0.5980                          | 0.7618           |  |
|         | 7996 <sup>a</sup><br>1006 <sup>b</sup> | 0.144                     | 0.990            |                                      | 2170                      | 0.5717                          | 0.7825           |  |
| 203.75  |  | 0.589                     | 0.589            |                                      | 2205                      | 0.5493                          | 0.8015           |  |
|         | 1019                                   | 0.5316                    | -                |                                      | 2274                      | 0.5259                          | 0.8207           |  |
|         | 1048                                   | 0.4950                    | 0.6770           |                                      | 2412                      | 0.4806                          | 0.8532           |  |
|         | 1102<br>1171                           | 0.4687<br>0.4479          | 0.7256<br>0.7508 |                                      | 2757<br>3102              | 0.4308<br>0.3977                | 0.8911<br>0.9158 |  |
|         | 1240                                   | 0.4296                    | 0.7896           |                                      | 3446                      | 0.3681                          | 0.9315           |  |
|         | 1447                                   | 0.3942                    | 0.8352           |                                      | 3791                      | 0.3454                          | 0.9412           |  |
|         | 1723                                   | 0.3639                    | 0.8813           |                                      | 4135<br>2427 <sup>b</sup> | 0.3258                          | 0.9493-          |  |
|         | 2067                                   | 0.3343                    | 0.9165           | 225.84                               |                           | 0.687                           | 0.687            |  |
|         | 2412                                   | 0.3116                    | 0.9339           |                                      | 2439                      | 0.6366                          | 0.7373           |  |
|         | 2757                                   | 0.2991                    | 0.9471           |                                      | 2480                      | 0.5844                          | 0.7879           |  |
|         | 3102<br>3446                           | 0.2778<br>0.2625          | 0.9555<br>0.9623 |                                      | 2571<br>2647              | 0.5465<br>0.5210                | 0.8175<br>0.8358 |  |
|         | 3446<br>3791                           | 0.2510                    | 0.9623           |                                      | 2757                      | 0.4983                          | 0.8558           |  |
|         | 4135 <sub>b</sub>                      | 0.2415                    | -                |                                      | 3102                      | 0.4985                          | 0.8934           |  |
| 210.62  | 1420 <sup>b</sup>                      | 0.638                     | 0.638            |                                      | 3446                      | 0.4069                          | 0.9124           |  |
|         | 1447                                   | 0.5426                    | 0.7198           |                                      | 3791                      | 0.3779                          | 0.9289           |  |
|         | 1516                                   | 0.5151                    | 0.7643           |                                      | 4135<br>2840 <sup>b</sup> | 0.3541                          | 0.9335           |  |
|         | 1654                                   | 0.4691                    | 0.8193           | 231.83                               |                           | 0.698                           | 0.698            |  |
|         | 1791                                   | 0.4400                    | 0.8494           |                                      | 2843                      | -                               | 0.7161           |  |
|         | 1929<br>2205                           | 0.4182<br>0.3856          | 0.8698<br>0.8996 |                                      | 2860<br>2895              | 0.6325<br>0.5998                | 0.7667<br>0.7957 |  |
|         | 2412                                   | 0.3635                    | -                |                                      | 2964                      | 0.5730                          | 0.8201           |  |
|         | 2757                                   | 0.3385                    | -                |                                      | 3102                      | 0.5336                          | 0.8457           |  |
|         | 3102                                   | 0.3234                    | 0.9412           |                                      | 3446                      | 0.4666                          | 0.8873           |  |
|         | 3446                                   | 0.3020                    | 0.9515           |                                      | 3708                      | 0.4463                          | 0.9013           |  |
|         | 3743                                   | 0.2846                    | 0.9592           |                                      | 3791                      | 0.4322                          | 0.9119           |  |
|         | 3791                                   | 0.2847                    | 0.9589           |                                      | 4004<br>4135              | 0.4171                          | 0.9163           |  |
|         | 3998<br>4135                           | 0.2740<br>0.2719          | 0.9604<br>0.9647 |                                      | 4488                      | 0.4013<br>0.3802                | 0.9249<br>0.9375 |  |
|         | 4287                                   | 0.2640                    | 0.9647           |                                      | 4956                      | 0.3564                          | 0.9498           |  |
|         | 4700                                   | 0.2502                    | 0.9707           |                                      | 5514                      | 0.3319                          | 0.9593           |  |
|         | 5115                                   | 0.2373                    | 0.9740           |                                      | 5521                      | 0.3332                          | 0.9579           |  |
|         | 5576                                   | 0.2255                    | 0.9758           |                                      | 6011                      | 0.3135                          | 0.9655           |  |
|         | 6072                                   | 0.2134                    | 0.9804           |                                      | 6224                      | 0.3091                          | 0.9665           |  |
|         | 6562                                   | 0.2022                    | 0.9838           |                                      | 6693                      | 0.2950                          | 0.9702           |  |
|         | 7031                                   | 0.1930                    | 0.9858           |                                      | 7182                      | 0.2816                          | 0.9737           |  |
|         | 7582<br>8140                           | 0.1831<br>0.1741          | 0.9871<br>0.9885 |                                      | 7754<br>8010              | 0.2674<br>0.2538                | 0.9766<br>0.9784 |  |
|         | 8375                                   | 0.1728                    | 0.9887           |                                      | 8554                      | 0.2330                          | 0.9809           |  |
|         | 8547                                   | 0.1677                    | 0.9892           |                                      | 9078                      | 0.2330                          | 0.9835           |  |
|         | 8967                                   | 0.1687                    | 0.9897           |                                      | 9636                      | 0.2247                          | 0.9849           |  |
|         | 9208<br>9422 <sup>a</sup>              | 0.1591                    | 0.9899           |                                      | 9761                      | 0.2214                          | 0.9853           |  |
|         | 9422                                   | 0.158                     | 0.990            |                                      | 10133                     | 0.2159                          | 0.9858           |  |

| COMPO  | NENTS:                                   |                          |                        | ORIGINAL MEASUREMENTS: |                            |  |                            |  |  |
|--------|--|--------------------------|------------------------|------------------------|----------------------------|--|----------------------------|--|--|
| (1)    | Helium;                                  | He; 7440-59-             | 7                      | Hill,                  | J. L. E.                   | , Erickson, A.<br>, Physics Eart       | h                          |  |  |
| (2)    | Methane;                                 | СН <sub>4</sub> ; 74-82- | 8                      | Planet                 | ary Inte                   | eriors, <u>1972</u> , 6                | , 69.                      |  |  |
|        |  |                          |                        |                        |                            |  |                            |  |  |
| EXPER  | MENTAL V                                 | /ALUES:                  |                        |                        |                            | <u></u>                                |                            |  |  |
| т/к    | <i>P/</i> bar                            | Mole fractior in liquid, | of helium<br>in vapor, |                        | <i>P/</i> bar              | Mole fraction in liquid,               | of helium<br>in vapor,     |  |  |
| -,     | ,  | <sup>x</sup> He          | <sup>y</sup> He        | -,                     | •                          | <sup>x</sup> He                        | <sup>y</sup> <sub>He</sub> |  |  |
| 239.95 |  | 0.706                    | 0.706                  | 256.49                 |                            | 0.5936                                 | 0.8501                     |  |  |
|        | 3515<br>3557                             | 0.6294<br>0.5971         | 0.8021<br>0.8201       |                        | 5170                       | 0.5686                                 | 0.8643                     |  |  |
|        | 3653                                     | 0.5621                   | 0.8431                 |                        | 5445                       | 0.5281                                 | 0.8896                     |  |  |
|        | 3791                                     | 0.5298                   | 0.8635                 |                        | 5859<br>6335               | 0.4851                                 | 0.9111<br>0.9279           |  |  |
|        | 4135                                     | 0.4768                   | 0.8963                 |                        | 6802                       | 0.4482<br>0.4156                       | 0.9339                     |  |  |
| 243.20 |  | 0.710                    | 0.710                  |                        | 6893                       | 0.4135                                 | 0.9339                     |  |  |
|        | 3722                                     | -                        | 0.7490                 |                        | 7444                       | 0.3833                                 | 0.9494                     |  |  |
|        | 3756                                     | 0.6226                   | 0.7951                 |                        | 7988                       | 0.3605                                 | 0.9566                     |  |  |
|        | 3791                                     | 0.6052                   | 0.8130                 |                        | 8554                       | 0.3404                                 | 0.9625                     |  |  |
|        | 3832                                     | 0.5893                   | 0.8258                 |                        | 9105                       | 0.3229                                 | 0.9678                     |  |  |
|        | 3859                                     | 0.5770                   | 0.8352                 |                        | 9657                       | 0.3074                                 | 0.9708                     |  |  |
|        | 3914                                     | 0.5646                   | 0.8446                 |                        | 10049,                     | 0.2958                                 | 0.9737                     |  |  |
|        | 3997                                     | 0.5451                   | 0.8576                 | 273.0                  | 10049<br>6342 <sup>b</sup> | 0.746                                  | 0.746                      |  |  |
|        | 4135 <sub>h</sub>                        | 0.5179                   | 0.8762                 |                        | 6417                       | 0.6525                                 | 0.8342                     |  |  |
| 244.24 | 1 3791 <sup>b</sup>                      | 0.712                    | 0.712                  |                        | 6486                       | 0.6272                                 | 0.8461                     |  |  |
|        | 3805                                     | 0.6588                   | 0.7735                 |                        | 6549                       | 0.6131                                 | 0.8552                     |  |  |
|        | 3859                                     | 0.6079                   | 0.8136                 |                        | 6700                       | 0.5899                                 | 0.8718                     |  |  |
|        | 3997                                     | 0.5651                   | 0.8426                 |                        | 6906                       | 0.5593                                 | 0.8862                     |  |  |
|        | 4135                                     | 0.5340                   | 0.8639                 |                        | 7245                       | 0.5220                                 | 0.9056                     |  |  |
|        | 4488                                     | 0.4955                   | 0.8921                 |                        | 7727                       | 0.4836                                 | 0.9221                     |  |  |
| 244.24 |  | 0.4475                   | 0.9157                 |                        | 8265                       | 0.4508                                 | 0.9346                     |  |  |
|        | 5514                                     | 0.4083                   | 0.9324                 |                        | 8706                       | 0.4299                                 | 0.9428                     |  |  |
|        | 5996                                     | 0.3801                   | 0.9420                 |                        | 8829                       | 0.4210                                 | 0.9454                     |  |  |
|        | 6555                                     | 0.3534                   | 0.9546                 | 200 0                  | 9306<br>8175 <sup>b</sup>  | 0.4041                                 | 0.9484                     |  |  |
|        | 7169<br>7720                             | 0.3295                   | 0.9622                 | 290.0                  |                            | 0.753                                  | 0.753                      |  |  |
|        | 8292                                     | 0.3111<br>0.2943         | 0.9678<br>0.9713       |                        | 8292<br>8354               | 0.6337                                 | 0.8633                     |  |  |
|        | 8829                                     | 0.2943                   | 0.9749                 |                        | 8354<br>8423               | 0.6245<br>0.7072                       | 0.8679<br>0.8740           |  |  |
|        | 9519                                     | 0.2666                   | 0.9771                 |                        | 8478                       | 0.600                                  | 0.8769                     |  |  |
|        | 9912                                     | 0,2572                   | 0.9794                 |                        | 8575                       | 0.5874                                 | 0.8852                     |  |  |
|        | 10064                                    | 0.2479                   | -                      |                        | 8753                       | 0.5670                                 | 0.8933                     |  |  |
| 256.49 | 4811 <sup>b</sup>                        | 0.732                    | 0.732                  |                        | 9126                       | 0.5344                                 | 0.9083                     |  |  |
|        | 4913                                     | 0.6353                   | 0.8208                 |                        | 9554                       | 0.5028                                 | 0.9221                     |  |  |
|        | 4970                                     | 0.6094                   | 0.8365                 |                        | 10133                      | 0.4703                                 | 0.9332                     |  |  |
|        | a Thre                                   | e phase pressu           | re ± 10 ba             | r.                     |                            | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, |                            |  |  |
|        | <sup>b</sup> Critical pressure ± 20 bar. |                          |                        |                        |                            |  |                            |  |  |
|        | CIII                                     | icai pressure            | - 20 Dar.              |                        |                            |  |                            |  |  |
|        |  |                          |                        |                        |                            |  |                            |  |  |
|        |  |                          |                        |                        |                            |  | ſ                          |  |  |
|        |  |                          |                        |                        |                            |  |                            |  |  |
|        |  |                          |                        |                        |                            |  |                            |  |  |

.

| COMPONENT  | S:  |  |   | ORIGINAL 1  | MEASUREM  | ENTS:   |   |
|--|---|--|---|---|---|---|---|
|  | •   | He; 7440-01-9<br>CH <sub>4</sub> ; 74-82-8   |   | DeVaney<br>Tully,<br>1971, 1                            | P. C.,  | , Rhodes, H. I<br>J. Chem. Engng  | . and<br>g. Data,                         |
| VARIABLES  | 5:  | · · · · · · · · · · · · · · · · · · ·  |   | PREPARED  | BY:   |   |   |
| Tempera  | ture, p   | pressure   |   | С. L. Y   | oung  |   |   |
| EXPERIMEN  | TAL VALU  |  |   | L   |   |   |   |
| T/K  | <i>P/</i> bar   | Mole fraction<br>in liquid,<br><sup>x</sup> He   | of helium<br>in vapor,<br><sup>y</sup> He   | т/К   | <i>P/</i> bar   | Mole fraction<br>in liquid,<br><sup>x</sup> He  | of helium<br>in vapor,<br><sup>y</sup> He |
| 124.00   | 13.9213.9920.8127.5727.6434.4041.0841.3654.8755.0169.0213.7917.3020.8927.3627.7834.2034.5441.2341.5855.57168.8820.8924.27 | 0.0015<br>0.0024<br>0.0031<br>0.0035<br>0.0044<br>0.0060<br>0.0079<br>0.0001<br>0.0014<br>0.0028<br>0.0050<br>0.0072<br>0.0098<br>0.0148<br>0.0192<br>0.0006<br>0.0026 | $\begin{array}{c} & & & - \\ 0 & .7996 \\ 0 & .8643 \\ 0 & .9155 \\ 0 & .9282 \\ 0 & .9452 \\ 0 & .9452 \\ 0 & .0644 \\ 0 & .2197 \\ 0 & .3321 \\ 0 & .4742 \\ 0 & .5640 \\ 0 & .6285 \\ 0 & .7121 \\ 0 & .0683 \\ \end{array}$ | 164.00<br>174.00<br>184.00                              | 24.34<br>27.65<br>27.72<br>34.54<br>41.09<br>41.37<br>48.19<br>48.26<br>55.71<br>68.88<br>31.16<br>31.23<br>34.54<br>41.16<br>41.30<br>48.26<br>55.71<br>68.88<br>31.16<br>41.23<br>55.57<br>62.12<br>62.19<br>68.74<br>41.23<br>41.37<br>48.26 | -<br>0.0046<br>0.0078<br>0.0108<br>-<br>0.0139<br>0.0181<br>0.0238<br>0.0027<br>0.0057<br>0.0105<br>-<br>0.0150<br>0.0200<br>0.0246<br>0.0291<br>0.0038<br>0.0122 | 0.1643<br>0.2380<br>                      |
|  |   |  | AUXILIARY   | INFORMATIO  | ON  |   |   |
| Recircu<br>Berylli<br>recircu<br>Tempera<br>resista<br>measure | lating<br>um copp<br>lated t<br>ture me<br>nce the<br>d by pr   | TUS/PROCEDURE:<br>vapor flow apport<br>through externates<br>asured with play<br>ermometer and pressure transdu<br>. Details red                                       | ll. Vapor<br>al loop.<br>Latinum<br>pressure<br>ucer and  | 1. Bure<br>puri<br>cent<br>2. Ultr.<br>mole<br>and      | au of M<br>ty bett<br>•<br>apure <u>o</u><br>per ce<br>nitroge  | Y OF MATERIALS;<br>Mines high puri<br>er than 99.999<br>grade at least<br>ent (traces of<br>en).  | 99.99                                     |
|  |   |  |   | $\frac{\delta x_{He}}{\text{REFERENCE}}$ 1. Tully Rhode | ±0.01;<br>δy <sub>He</sub> =<br>ES:<br>y, P. C  | δP/bar = ±0.0<br>±0.005%.<br>2., DeVaney, W.<br>L., Adv. Cryog  | E. and                                    |

|         | elium; H       | le; 7440-59-7 |                 | ORIGINAL MEASUREMENTS:<br>DeVaney, W. E., Rhodes, H. L. and<br>Tully, P. C., J. Chem. Engng. Data, |
|---------|----------------|---------------|-----------------|--|
| (2) Me  | thane; (       | CH4; 74-82-8  |                 | <u>1971</u> , <i>16</i> , 158.   |
| EXPERIM | ENTAL V        | ALUES:        |                 |  |
|         |                | Mole fraction |                 |  |
| T/K     | <i>P/</i> bar  | in liquid,    | in vapor,       |  |
|         |                | $^{x}$ He     | <sup>у</sup> не |  |
| 184.00  | 48.33          |               | 0.1039          | -  |
|         | 55.02          | 0.0196        | -               |  |
|         | 55.57          | -             | 0.1626          |  |
|         | 62.19          | 0.0280        | -               |  |
|         | 62.26          | -             | -               |  |
|         | 68.95          |               | 0.2092          |  |
| 186.00  | 48.26          | 0.0110        | 0.0699          |  |
|         | 48.13          | 0.0088        | -               |  |
|         | 48.26          | _             | 0.0398          |  |
| 189.00  | 49.71          | 0.0100        | -               |  |
|         | 49.78          | -             | 0.0363          |  |
|         | 55.16<br>55.23 | 0.0196        | -               |  |
|         | 62.19          | 0.0316        | 0.0679          |  |
|         | 62.33          | 0.0310        | 0.1064          |  |
|         | 68.95          | 0.0429        | 0.1064          |  |
| 190.30  | 55.09          | 0.0215        | -               |  |
|         | 55.16          |               | 0.0435          |  |
|         | 62.12          | 0.0368        | -               |  |
|         | 62.26          | -             | 0.0736          |  |
|         | 68.81          | 0.0511        |                 |  |
| 190.60  | 55.23          | -             | 0.0331          |  |
|         | 55.30          | 0.0256        | -               |  |
|         | 62.05          | 0.0429        | -               |  |
|         | 62.12          | -             | 0.0596          |  |
|         | 68.88          | 0.0587        | -               |  |

| COMPONEN  | rs:  | ·····  |  | ORIGINAL   | MEASUREMEN  | TS:  |   |
|---|--|--|--|--|---|--|---|
| (1) He  | lium; He;  | ; 7440-59-7                                  |  | Heck, C. K. and Hiza, M. J.,   |   |  |   |
|   |  | 14; 74-82-8                                  |  | Am. Inst. Chem. Engnrs. J., <u>1967</u> ,  |   |  |   |
| (2) 110   | chuncy of  | · 4 / / <del>1</del> · 02 · 0                |  | <i>13</i> , 593  | •   |  |   |
| VARIABLE  | S:   | <u> </u>                                     | · · · · ·  | PREPARED   | BY:   |  |   |
| Tempera   | ture, pres   | sure   |  | С. L. Y  | oung  |  |   |
| EXPERIME  | NTAL VALUES  | le fraction                                  | of holium  | 1  | Mc  | le fraction  | of holium                               |
| т/к   | P/bar in   |  | in vapor,<br><sup>y</sup> He                         | т/к  |   | <sup>x</sup> He  | in vapor,<br><sup>y</sup> He            |
| 94.97<br>±0.02<br>124.85<br>±0.03   | $\begin{array}{c} 4.81\\ 10.18\\ 20.27\\ 40.28\\ 60.80\\ 69.91\\ 85.72\\ 91.50\\ 119.0\\ 144.5\\ 164.0\\ 182.8\\ 194.5\\ 11.35\\ 20.47\\ 40.73\\ 64.44\\ 86.63\\ 113.7\\ 144.4\\ 174.0\\ 204.0\\ 23.10\\ 39.72\\ 63.23\end{array}$ | 0.00012<br>0.00034<br>0.00069<br>0.00136<br> | 0.9580<br>0.9810<br>0.9900<br>0.99405<br>0.99566<br> | 139.83<br>±0.03<br>169.81<br>±0.05   | 82.88<br>113.5<br>144.3<br>174.3<br>201.6<br>32.93<br>56.03<br>58.77<br>67.79<br>83.09<br>108.6<br>116.1<br>143.8<br>170.8<br>198.5<br>20.42<br>35.67<br>41.54<br>71.23<br>90.99<br>102.8<br>103.4<br>133.1<br>164.8<br>193.0 | 0.0163<br>0.0214<br>0.0262<br>0.0304<br>0.0341<br>0.0640<br>0.0206<br>0.0217<br>0.0261<br>0.0352<br>0.0469<br>0.0499<br>0.0612<br>0.0716<br>0.0806<br>0.00151<br>0.00262<br>0.00304<br>0.00488<br>0.00679<br>0.00833<br>0.00978<br>0.0111  | 0.9055<br>0.9258<br>                    |
|   |  |  |  | INFORMATI  |   |  | <u></u>                                 |
| METHOD /  | APPARATUS  | PROCEDURE :                                  |  |  |   | F MATERIALS;   |   |
| METHOD /APPARATUS/PROCEDURE:<br>Vapor recirculated through cell.<br>Liquid and vapor samples analysed by<br>gas chromatography. Pressure measu-<br>red by Bourdon gauge and temperature<br>measured with platinum resistance<br>thermometer. Details in source and<br>ref. 1. |  |  |  | <ol> <li>Bureau of Mines grade A sample<br/>0.015 mole per cent neon.</li> <li>Two samples used, purities better<br/>than 99.8 mole per cent and 99.95<br/>mole per cent (no difference de-<br/>tected in results using different<br/>samples).</li> </ol> |   |  |   |
|   |  |  |  | 100 bar<br>$\delta x_{\text{He}} \simeq$<br>$\pm 0.0000$<br>REFERENC<br>1. Herr  | $\pm 0.05; \delta$<br>$) = \pm 0.03$<br>$\delta (1-y)_{He}$<br>2 (whiche<br>ES:<br>ing, R. N  | $P/bar = \pm 0.$ (above 100) $= \pm 3\% \text{ of val}$ ver is greating the second seco | bar);<br>lue or<br>test).<br>ck, P. L., |

| COMPONE | NTS:           |  |                 | ORIGINAL MEASUREMENTS:  |  |  |  |
|---------|----------------|--|-----------------|---|--|--|--|
|         |                | He; 7440-59-7<br>CH <sub>4</sub> ; 74-82-8 |                 | Heck, C. K. and Hiza, M. J.,<br>Am. Inst. Chem. Engnrs. J., <u>1967</u> ,<br>13, 593. |  |  |  |
|         |                |  |                 |   |  |  |  |
| EXPERIM | ENTAL V        | ALUES:                                     |                 |   |  |  |  |
|         |                | Mole fraction                              | of helium       |   |  |  |  |
| T/K     | <i>P/</i> bar  |  | in gas,         |   |  |  |  |
| ·       | ·              | $x_{\rm He}$                               | <sup>y</sup> He |   |  |  |  |
| 109.90  |                |  | <u></u>         | ~   |  |  |  |
| ±0.02   | 201.7          | -  | 0.99279         |   |  |  |  |
| 154.80  | 17.63          | -  | 0.212           |   |  |  |  |
| ±0.04   | 37.69          | 0.0103                                     | -               |   |  |  |  |
|         | 43.67          | 0.0130                                     | 0.632           |   |  |  |  |
|         | 63.13          | 0.0189                                     | -               |   |  |  |  |
|         | 79.64          | -  | 0.785           |   |  |  |  |
|         | 80.55          | 0.0235                                     | -               |   |  |  |  |
|         | 109.9          | 0.0319                                     | -               |   |  |  |  |
|         | 110.3          | -  | 0.838           |   |  |  |  |
|         | 144.9          |  | 0.871           |   |  |  |  |
|         | 173.9          | 0.0480                                     | 0.892           |   |  |  |  |
| 104 02  | 203.9          | 0.0537                                     | 0.900           |   |  |  |  |
|         | 45.09<br>67.48 | 0.0352                                     | 0.0693<br>0.212 |   |  |  |  |
| ±0.05   | 67.48<br>88.66 | 0.0352                                     | 0.331           |   |  |  |  |
|         | 89.17          | 0.0558                                     | 0.33I<br>-      |   |  |  |  |
|         | 113.4          | 0.0773                                     | 0.436           |   |  |  |  |
|         | 154.4          | 0.111                                      | 0.519           |   |  |  |  |
|         | 180.4          | 0.126                                      | 0.562           |   |  |  |  |
|         | 205.3          | 0.137                                      | 0.592           |   |  |  |  |
|         |                |  |                 |   |  |  |  |
|         |                |  |                 |   |  |  |  |
|         |                |  |                 |   |  |  |  |
|         |                |  |                 |   |  |  |  |
|         |                |  |                 |   |  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Methane; CH<sub>4</sub>;74-82-8</li> </ol>  | Gonikberg, M. G. and Fastowski, V. G<br>Acta Physicochimica URSS, <u>1940</u> , 13,<br>399.   |
| VARIABLES:  | PREPARED BY:  |
| Temperature, pressure   | C. L. Young   |
| EXPERIMENTAL VALUES:  | I   |
| T/K P/bar Mole frac   | tion of helium in liquid, $x_{\mathrm{He}}$   |
| 90.3<br>29.4<br>76.5<br>96.1<br>113.8<br>136.3<br>158.9<br>106.0<br>25.5<br>59.8<br>98.1<br>146.1<br>156.9  | 0.0013<br>0.0027<br>0.0032<br>0.0037<br>0.0046<br>0.0052<br>0.0019<br>0.0039<br>0.0063<br>0.0090<br>0.0097  |
|   | INFORMATION   |
|   |   |
| METHOD/APPARATUS/PROCEDURE:<br>Recirculating vapor flow apparatus.<br>Method described in ref. 1. Sample<br>analysed by adsorption on charcoal<br>then removal of helium. | SOURCE AND PURITY OF MATERIALS:<br>1. Purity 99.8 mole per cent.<br>2. Purity 99.6 mole per cent.   |
|   | <pre>ESTIMATED ERROR:<br/>δT/K = ±0.1; δP/bar = ±1;<br/>δx<sub>He</sub> = ±0.0003 (compiler).<br/>REFERENCES:<br/>1. Sokolov, V. A. "Methods for<br/>investigation of natural gases."<br/>1932 (Russian).</pre> |
|   |   |

| COMPON | ENTS:           |                                  |                          | ORIGINAL        | MEASUREM           | ENTS:                                  |                             |
|--------|-----------------|----------------------------------|--------------------------|-----------------|--------------------|--|-----------------------------|
| (1)    | Helium;         | He; 7440-59                      | -7                       | Nikitir         | ha, I. E           | ., Skripka, V                          | .G.,                        |
| (2)    | Ethane          | $C_{2}H_{6}; 74-84$              | -0                       | Gubkina         | , G. F.            | , Sirotin, A.                          | G. and                      |
| (2)    | Denanc,         | 02167 74 04                      | Ũ                        | Ben'yam         | inovic,            | O. A., Gazov.                          | Prom.,                      |
|        |                 |                                  |                          | <u>1970</u> , 1 | 5, No.             | 6, 35.                                 |                             |
|        |                 |                                  |                          |                 |                    |  |                             |
| VARIAB |                 |                                  |                          | PREPARED        |                    |  |                             |
| Tempe  | erature,        | pressure                         |                          | C. L. Y         | oung               |  |                             |
| EXPERI | MENTAL VA       |                                  |                          |                 |                    |  |                             |
| т/к    | P/bai           | Mole fraction<br>in liquid,      | n of helium<br>in vapor, | т/к             | <i>P/</i> bar      | Mole fraction in liquid,               | of helium in vapor,         |
|        | •               | x <sub>He</sub>                  | <sup>y</sup> He          | -,              | -,                 | <sup>x</sup> He                        | и чарог,<br><sup>у</sup> не |
| 273.   | 15 29.4         | 0.00297                          | 0.145                    | 233.15          | 19.6               | 0.00315                                | 0.569                       |
|        | 39.2            |                                  | 0.328                    |                 | 39.2               | 0.00681                                | 0.784                       |
|        | 58.8<br>78.5    |                                  | 0.477<br>0.566           |                 | 58.8<br>78.5       | 0.00947                                | 0.857                       |
|        | 98.1            |                                  | 0.635                    |                 | 78.5<br>98.1       | 0.01158<br>0.01340                     | 0.896<br>0.915              |
|        | 117.7           |                                  | 0.696                    |                 | 117.7              | 0.01510                                | 0.926                       |
| 263.   | 15 19.6         | 0.00060                          | 0.037                    | 223.15          | 9.8                | 0.00108                                | 0.389                       |
|        | 39.2            |                                  | 0.475                    |                 | 19.6               | 0.00315                                | 0.681                       |
|        | 58.8            |                                  | 0.618                    |                 | 39.2               | 0.00626                                | 0.849                       |
|        | 78.5<br>98.1    | • ·                              | 0.696<br>0.750           |                 | 58.8               | 0.00852                                | 0.906                       |
|        | 117.7           |                                  | 0.794                    |                 | 78.5<br>98.1       | 0.01027<br>0.01180                     | 0.928<br>0.941              |
| 253.   |                 |                                  | 0.188                    |                 | 117.7              | 0.01329                                | 0.948                       |
|        | 39.2            |                                  | 0.581                    | 213.15          | 4.9                | 0.00028                                | 0.200                       |
|        | 58.8            |                                  | 0.714                    |                 | 9.8                | 0.00133                                | 0.570                       |
|        | 78.5            |                                  | 0.779                    |                 | 19.6               | 0.00300                                | 0.790                       |
|        | 98.1            |                                  | 0.821                    |                 | 39.2               | 0.00548                                | 0.894                       |
| 040    | 117.7           |                                  | 0.850                    |                 | 58.8               | 0.00740                                | 0.932                       |
| 243.1  | L5 19.6<br>39.2 |                                  | 0.360                    |                 | 78.5               | 0.00897                                | 0.949                       |
|        | 58.8            |                                  | 0.674<br>0.781           |                 | 98.1<br>117.7      | 0.01035<br>0.01170                     | 0.960<br>0.966              |
|        | 78.5            |                                  | 0.842                    | 193.15          | 4.9                | 0.00043                                | 0.570                       |
|        | 98.1            | 0.01493                          | 0.875                    | 190.10          | 9.8                | 0.00105                                | 0.835                       |
|        | 117.7           | 0.01679                          | 0.894                    |                 | 19.6               | 0.00219                                | 0.916                       |
| 233.1  | L5 9,8          | 0.00060                          | 0.182                    |                 | 39.2               | 0.00408                                | 0.957                       |
|        |                 |                                  | AUXILIARY                | INFORMATIO      | ИС                 |  |                             |
| METHOI | )/APPARA        | TUS/PROCEDURE:                   |                          | SOURCE AN       | D PURITY           | OF MATERIALS:                          |                             |
|        |                 | g vapor flow a                   | pparatus                 | 1. Puri         | ty 99.9            | mole per cent                          | :.                          |
|        |                 |                                  | perature                 | 2. Puri         | tv 99.5            | mole per cent                          |                             |
| measu  | ired wit        | h platinum res                   | istance                  |                 | 0, ,,,,,           | more per cent                          | - •                         |
|        |                 | Liquid and                       |                          |                 |                    |  |                             |
|        |                 | gas chromatogr<br>nductivity det |                          |                 |                    |  |                             |
|        |                 | ource and ref.                   |                          |                 |                    |  |                             |
| Detui  |                 | ource and rer.                   | -d- 0                    |                 |                    |  |                             |
|        |                 |                                  |                          |                 |                    |  |                             |
|        |                 |                                  |                          | 1               |                    |  |                             |
|        |                 |                                  |                          | 1               |                    |  |                             |
|        |                 |                                  |                          | L               |                    |  |                             |
|        |                 |                                  |                          | ESTIMATEI       | ERROR:             |  |                             |
|        |                 |                                  |                          | δт/К =          | ±0.2;              | $\delta P/bar = \pm 1$ %;              | $\delta x_{rr} =$           |
|        |                 |                                  |                          | ±0.5%;          | δ(1-y <sub>H</sub> | $e^{} = \pm 2.0\%$                     | пе                          |
|        |                 |                                  |                          | REFERENCE       | 25:                | <u></u>                                |                             |
|        |                 |                                  |                          | 1               |                    |  |                             |
|        |                 |                                  |                          | 1. Skri         | pka, V.            | G., Barsuk, S                          | . D.,                       |
|        |                 |                                  |                          | Niki            | tina, I            | . E. and Ben'y                         | aminovic,                   |
|        |                 |                                  |                          |                 |                    | v. Prom., 1964                         |                             |
|        |                 |                                  |                          |                 |                    | ······································ | ,,                          |
|        |                 |                                  |                          | No.             | 4, 41.             |  |                             |
|        |                 |                                  |                          | 1               |                    |  |                             |

| COMPONE  | NTS:          |                               |                              | ORIGINAL MEASUREMENTS:  |  |  |  |
|--|---------------|-------------------------------|------------------------------|---|--|--|--|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Ethane; C<sub>2</sub>H<sub>6</sub>; 74-84-0</li> </ol> |               |                               |                              | Nikitina, I. E., Skripka, V. G.,<br>Gubkina, G. F., Sirotin, A. G. and<br>Ben'yaminovic, O. A., <i>Gazov. Prom.</i> ,<br><u>1970</u> , <i>15</i> , No. 6, 35. |  |  |  |
|  |               |                               |                              |   |  |  |  |
| EXPERIM  | 1ENTAL V      | ALUES:<br>Mole fraction       | of bolium                    |   |  |  |  |
| т/к  | P/bar         | in liquid,<br><sup>x</sup> He | in vapor,<br><sup>y</sup> He |   |  |  |  |
| 193.15   | 58.8<br>78.5  | 0.00560<br>0.00683            | 0.972<br>0.978               |   |  |  |  |
|  | 98.1          | 0.00797                       | 0.983                        |   |  |  |  |
| 173.15   | 117.7<br>4.9  | 0.00911<br>0.00037            | 0.987<br>0.903               |   |  |  |  |
|  | 9.8<br>19.6   | 0.00072<br>0.00146            | 0.950<br>0.971               |   |  |  |  |
|  | 39.2          | 0.00273                       | 0.986                        |   |  |  |  |
|  | 58.8<br>78.5  | 0.00382<br>0.00479            | 0.992<br>0.994               |   |  |  |  |
|  | 98.1<br>117.7 | 0.00562<br>0.00642            | 0.995<br>0.996               |   |  |  |  |
| 153.15   | 4.9           | 0.00022                       | 0.975                        |   |  |  |  |
|  | 9.8<br>19.6   | 0.00045<br>0.00090            | 0.986<br>0.993               |   |  |  |  |
|  | 39.2          | 0.00182                       | 0.997                        |   |  |  |  |
|  | 58.8<br>78.5  | 0.00258<br>0.00323            | 0.998<br>0.998               |   |  |  |  |
|  | 98.1<br>117.7 | 0.00385<br>0.00440            | 0.998<br>0.999               |   |  |  |  |
| 133.15   | 4.9           | 0.00010                       | 0.996                        |   |  |  |  |
|  | 9.8<br>19.6   | 0.00021<br>0.00042            | 0.998<br>0.998               |   |  |  |  |
|  | 39.2<br>58.8  | 0.00084<br>0.00128            | -                            |   |  |  |  |
|  | 78.5          | 0.00170                       | -                            |   |  |  |  |
|  | 98.1<br>117.7 | 0.00213<br>0.00257            |                              |   |  |  |  |
| 113.15   | 4.9           | 0.00004                       | -                            |   |  |  |  |
|  | 9.8<br>19.6   | 0.00008<br>0.00017            | -                            |   |  |  |  |
|  | 39.2<br>58.8  | 0.00034<br>0.00050            | -                            |   |  |  |  |
|  | 78.5          | 0.00068                       | -                            |   |  |  |  |
|  | 98.1<br>117.7 | 0.00085<br>0.00102            | -                            |   |  |  |  |
|  |               |                               |                              | -   |  |  |  |
|  |               |                               |                              |   |  |  |  |
|  |               |                               |                              |   |  |  |  |
|  |               |                               |                              |   |  |  |  |
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|  |               |                               |                              |   |  |  |  |
|  |               |                               |                              |   |  |  |  |

.

| COMPONEN           | TS:            |                                       |                            | ORIGINAL   | MEASUREMEN        | TS •  |                            |
|--------------------|----------------|---------------------------------------|----------------------------|--|-------------------|---|----------------------------|
|                    |                | e; 7440-59                            | -7                         | ORIGINAL MEASUREMENTS:<br>Schindler, D. L., Swift, G. W. and<br>Kurata, F., <i>Hydrocarbon Process.</i> ,<br>1966, 45, no.11, 205. |                   |   |                            |
| (2) Pr             |                | C <sub>3</sub> H <sub>8</sub> ; 74-98 | <i>c</i>                   |  |                   |   |                            |
| (2) FI             | opane,         | c 3118, 74-98.                        | -6                         | 1, 1   | <i>o</i> , no.11, | 205.  |                            |
| VARIABLE           | S:             |                                       |                            | PREPARED   | BY:               |   |                            |
| Tempera            | ture, pro      | essure                                |                            | С. L. Y  | oung              |   |                            |
| EXPERIME           | NTAL VALUE     |                                       | n of helium                | •  |                   | ole fraction  | of helium                  |
| т/к                |                | n liquid,<br><sup>x</sup> He          | in gas,<br><sup>y</sup> He | т/к  |                   | <sup>x</sup> He   | in gas,<br><sup>y</sup> He |
| 348.15             | 41.37<br>68.95 | 0.0132                                | 0.221<br>0.432             | 273.15   | 96.53<br>124.1    | 0.0266  | 0.9444<br>0.9540           |
|                    | 96.53          | 0.0625                                | 0.550                      |  | 151.7             | 0.0392  | 0.9600                     |
|                    | 124.1<br>151.7 | 0.0826<br>0.101                       | 0.633<br>0.694             |  | 179.3<br>206.8    | 0.0449<br>0.0506  | 0.9646<br>0.9688           |
|                    | 179.3          | 0.118                                 | 0.694                      | 248.15   | 206.8             | 0.0025  | 0.9688                     |
|                    | 206.8          | 0.134                                 | 0.763                      |  | 41.37             | 0.0080  | 0.9414                     |
| 323.15             | 41.37<br>68.95 | 0.0150<br>0.0311                      | 0.495<br>0.671             |  | 68.95<br>96.53    | 0.0133<br>0.0183  | 0.9642<br>0.9739           |
|                    | 96.53          | 0.0462                                | 0.756                      |  | 124.1             | 0.0230  | 0.9791                     |
|                    | 124.1<br>151.7 | 0.0601                                | 0.806<br>0.839             |  | 151.7<br>179.3    | 0.0274<br>0.0315  | 0.9822<br>0.9839           |
|                    | 179.3          | 0.0730<br>0.0847                      | 0.839                      |  | 206.8             | 0.0315  | 0.9839                     |
|                    | 206.8          | 0.0953                                | 0.874                      | 223.15   | 13.79             | 0.0018  | 0.9387                     |
| 298.15             | 13.79<br>41.37 | 0.0020<br>0.0139                      | 0.253<br>0.721             |  | 41.37<br>68.95    | 0.0055<br>0.0089  | 0.9815<br>0.9884           |
|                    | 68.95          | 0.0246                                | 0.831                      |  | 96.53             | 0.0122  | 0.9905                     |
|                    | 96.53          | 0.0343                                | 0.879                      |  | 124.1             | 0.0153  | 0.9913                     |
|                    | 124.1<br>151.7 | 0.0435<br>0.0523                      | 0.9047<br>0.9204           |  | 151.7<br>179.3    | 0.0182<br>0.0210  | 0.9920<br>0.9929           |
|                    | 179.3          | 0.0611                                | 0.9304                     |  | 206.8             | 0.0238  | 0.9942                     |
| 273.15             | 206.8<br>13.79 | 0.0702<br>0.0030                      | 0.9365<br>0.624            | 198.15   | 13.79<br>41.37    | 0.0011<br>0.0033  | 0.9820<br>0.9920           |
| 270.10             | 41.37          | 0.0117<br>0.0195                      | 0.877<br>0.9255            |  | 68.95<br>96.53    | 0.0054<br>0.0074  | 0.9961<br>0.9971           |
| <u></u>            |                |                                       | AUXILIARY                  | INFORMATI  | ON                |   |                            |
| METHOD /           | APPARATUS      | S/PROCEDURE                           |                            |  |                   | F MATERIALS:  |                            |
|                    |                |                                       | th magnetic                | 1. Mini  | mum nurit         | y 99.9988 mc  | le per                     |
| stirrer            | . Tempe        | erature meas                          | sured with                 | cent   | -                 | . <u>,</u>  |                            |
|                    |                | ance thermored with Bour              |                            | 2. Inst  | rument gr         | ade sample.   |                            |
|                    |                |                                       | nelium added               | ]  |                   |   |                            |
| Samples            | of both        | phases anal                           | lysed by gas               |  |                   |   |                            |
| chromat<br>in ref. |                | Details o                             | of apparatus               |  |                   |   |                            |
| th ret.            | ±•             |                                       |                            |  |                   |   |                            |
|                    |                |                                       |                            |  |                   |   |                            |
|                    |                |                                       |                            |  |                   |   |                            |
|                    |                |                                       |                            | ESTIMATE:  |                   | $P/bar = \pm 0.1$   | 5.                         |
|                    |                |                                       |                            | 1  |                   | $\begin{cases} r/bar = \pm 0.1 \\ \$;  \delta y_{He} = \pm \end{cases}$ |                            |
|                    |                |                                       |                            | Не   |                   | Не  | ··· =                      |
|                    |                |                                       |                            | REFERENC   | ES:               | · · · · · · · · · · · · · · · · · · ·                                   |                            |
|                    |                |                                       |                            | Kura   |                   | Schindler,<br>m. Inst. Che<br>357.                                      |                            |
|                    |                |                                       |                            |  |                   |   |                            |
|                    |                |                                       |                            |  |                   |   |                            |

| COMPONEI         | NTS:  |   | I  | ORIGINAL MEASUREMENTS:  |
|------------------|---|---|--|---|
|                  |   | e; 7440-59-7<br>C₃H₀; 74-98-6   |  | Schindler, D. L., Swift, G. W. and<br>Kurata, F., <i>Hydrocarbon Process.</i> ,<br><u>1966</u> , 45, no. 11, 205. |
| EXPERIM          | ENTAL V   | ALUES:  |  |   |
| T/K              | P/bar   | Mole fraction<br>in liquid,<br><sup>x</sup> He                          | of helium<br>in gas,<br><sup>y</sup> He                      |   |
| 198.15<br>173.15 | 124.1<br>151.7<br>179.3<br>206.8<br>13.79                   | 0.0092<br>0.0110<br>0.0127<br>0.0143<br>0.00064                         | 0.9978<br>0.9982<br>0.9984<br>0.9984                         |   |
| 1/3.15           | 41.37<br>68.95<br>96.53<br>124.1<br>151.7                   | 0.0019<br>0.0031<br>0.0042<br>0.0052<br>0.0062                          | 0.9972<br>0.9986<br>0.99932<br>0.99937<br>0.99940<br>0.99947 |   |
| 123.15           | 179.3<br>206.8<br>13.79<br>41.37<br>68.95<br>96.95<br>124.1 | 0.0072<br>0.0081<br>0.00012<br>0.00033<br>0.00052<br>0.00070<br>0.00087 | 0.99960<br>0.99980<br>-<br>-<br>-<br>-                       |   |
|                  | 151.7<br>179.3<br>206.8                                     | 0.0010<br>0.0012<br>0.0014  | -  |   |
|                  |   |   |  | _   |
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|                  |   |   |  |   |

| COMPO | ONENTS:                        |                                   |                         | ORIGI  | NAL MEASUREN        | ENTC .                             | ······                     |
|-------|--------------------------------|-----------------------------------|-------------------------|--|---------------------|------------------------------------|----------------------------|
|       |                                | He; 7440-59-7                     |                         |  |                     |                                    | V. Ya.                     |
|       |                                | ·                                 |                         | Tsiklis, D. S., Maslennikova, V. Ya.<br>and Goryunova, N. P., Zhur. Fiz. |                     |                                    |                            |
| 2.    | 2. Methane, dichlorodifluoro-; |                                   |                         | 1  | n., <u>1967</u> , 4 |                                    | -                          |
|       | CCl                            | 2F2; 75-71-8                      |                         |  | ·                   |                                    |                            |
| ľ     |                                |                                   |                         |  |                     |                                    |                            |
| VARI  | ABLES:                         |                                   |                         | PREPA  | ARED BY:            |                                    |                            |
| Tem   | perature,                      | pressure                          |                         | с. 1   | . Young             |                                    |                            |
|       |                                |                                   |                         |  |                     |                                    |                            |
| EXPE  | RIMENTAL VA                    |                                   |                         |  |                     |                                    |                            |
| T/K   | <i>P/</i> bar                  | Mole fraction<br>in lower         | n of helium<br>in upper | т/к  | <i>P/</i> bar       | Mole fraction in lower             | of helium<br>in upper      |
| -,    | -,                             | phase,                            | phase,                  | -,   | -,                  | phase,                             | phase,                     |
|       |                                | <sup>x</sup> He                   | ${}^{y}{}_{	ext{He}}$   |  |                     | $x_{ m He}$                        | ${}^{y}$ He                |
| 298   | 57                             |                                   | 0.85                    | 388  | 79                  | 0.075                              | 0.24                       |
|       | 126<br>134                     | 0.05                              | -<br>0.934              |  | 81<br>93            | -                                  | 0.243<br>0.275             |
|       | 137<br>228                     | -                                 | 0.934                   |  | 96                  | 0.106                              | -                          |
| 323   | 60                             | 0.09                              | 0.73                    |  | 101<br>122          | 0.150                              | 0.30                       |
|       | 126<br>138                     | 0.06                              | -<br>0.865              |  | 126<br>135          | -                                  | 0.408<br>0.435             |
|       | 233                            | 0.11                              | -                       |  | 140                 | 0.166                              | -                          |
| 348   | 238<br>64                      | -                                 | 0.92<br>0.619           |  | 144<br>155          | 0.135<br>0.192                     | -                          |
|       | 132<br>134                     | 0.12                              | _<br>0.776              |  | 158<br>167          | 0.283                              | 0.49                       |
|       | 241                            | 0.16                              | -                       |  | 173                 | -                                  | 0.517                      |
|       | 244<br>247                     | -                                 | 0.857<br>0.860          |  | 181<br>188          | 0.22                               | -<br>0.55                  |
| 373   | 74                             | -                                 | 0.413                   |  | 213                 | 0.258                              | -                          |
|       | 143<br>148                     | 0.13                              | 0.64                    |  | 221<br>241          | _<br>0.258                         | 0.59                       |
|       | 199<br>245                     | 0.212                             | 0.70                    | 391  | 251<br>110          | 0.308                              | 0.667                      |
|       | 251                            | -                                 | _                       | 791  | 111                 |                                    | 0.312                      |
| 388   | 61<br>71                       | -                                 | 0.155<br>0.191          |  | 118<br>120          | -<br>0.16                          | 0.17                       |
|       |                                |                                   |                         | THEOR  |                     | <u></u>                            |                            |
|       |                                |                                   | AUXILIARY               |  |                     |                                    |                            |
| METH  | OD/APPARAI                     | US/PROCEDURE:                     |                         | SOURC  | E AND PURITY        | OF MATERIALS:                      |                            |
|       |                                | lave apparatus.<br>rence in which |                         |  | Purity bet<br>cent. | ter than 99.7 m                    | nole per                   |
| is d  | escribed.                      | It is not cl                      | ear which               |  |                     | _                                  |                            |
|       | he severa<br>used.             | l apparatus des                   | cribed                  | 2.   | Technical           | grade.                             |                            |
|       |                                |                                   |                         |  |                     |                                    |                            |
|       |                                |                                   |                         |  |                     |                                    |                            |
|       |                                |                                   |                         | 1  |                     |                                    |                            |
|       |                                |                                   |                         |  |                     |                                    |                            |
| ļ     |                                |                                   | i                       |  | ATED ERROR:         |                                    |                            |
|       |                                |                                   |                         |  |                     | $\delta P/bar = \pm 1.0;$          | δ <i>x</i> <sub>He</sub> ′ |
|       |                                |                                   |                         | <sup>δy</sup> He   | $= \pm 0.01$ (      | estimated by co                    | mpiler).                   |
|       |                                |                                   |                         | BEFEI  | RENCES :            |                                    |                            |
|       |                                |                                   |                         |  |                     | . S., Technique                    | e of                       |
|       |                                |                                   |                         |  |                     | . S., lechnique<br>nical Experimen |                            |
|       |                                |                                   |                         |  | -                   | ltrahigh Pressu                    |                            |
|       |                                |                                   |                         |  |                     | ya, Moscow, 1 <u>9</u> 6           |                            |
|       |                                |                                   |                         |  |                     |                                    |                            |

| COMPONENTS:<br>(1) Helium; He; 7440-59-7<br>(2) Methane; dichlorodifluoro-;<br>CCL <sub>2</sub> F <sub>2</sub> ; 75-71-8 |  |  | Tsikl<br>and G                           | .is, D. S<br>Soryunova | UREMENTS:<br>., Maslennikova<br>, N. P., <i>Zhur.</i><br>41, 1804. |  |                                 |
|--|--|--|--|------------------------|--|--|---------------------------------|
| EXPE:<br>T/K   | RIMENTAL V<br>P/bar                                  | <pre>/ALUES:<br/>Mole fraction<br/>in lower<br/>phase,</pre> | in upper                                 |                        | P/bar  | Mole fraction<br>in lower<br>phase,<br><sup>x</sup> He |                                 |
| 391  | 122<br>135<br>150<br>160<br>197<br>203<br>220<br>223 | -<br>-<br>0.23<br>0.26<br>0.29<br>-<br>0.307                 | 0.36<br>0.37<br>-<br>-<br>0.515<br>0.563 | 391<br>395             | 235<br>240<br>279<br>286<br>316<br>321<br>333                      | 0.323<br>0.645<br>0.562<br>0.464                       | 0.57<br>0.615<br>0.566<br>0.684 |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |
|---|---|
| 1. Helium; He; 7440-59-7  | Heise, F., Ber. Bunsenges. Phys.  |
| 2. Ammonia; NH <sub>3</sub> ; 7664-41-7   | Chem., <u>1972</u> , 76, 936.   |
|   |   |
|   |   |
| VARIABLES:  | PREPARED BY:  |
| Temperature, pressure   | C. L. Young   |
| Temperature, pressure   |   |
| EXPERIMENTAL VALUES:  | • • • • • • • • • • • • • • • • • • •   |
| Mole fraction of helium<br>T/K P/bar in liquid, in vapor,   |   |
| <sup>x</sup> <sub>He</sub> <sup>y</sup> <sub>He</sub>   |   |
|   |   |
| 298.15 102.5 0.00304 -<br>104.25 - 0.8900   |   |
| 194.35 0.00528 0.9358<br>313.15 210.05 0.00701 0.9031   |   |
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| AUXILIARY   | INFORMATION   |
| METHOD /APPARATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:   |
| Static rocking equilibrium cell;  | <ol> <li>Messer-Griessheim sample, purity<br/>better than 99.95 mole per cent.</li> </ol> |
| liquid and gas samples removed after<br>equilibrium established. Samples<br>analysed by freezing out ammonia in | 2. Gerling and Holtz sample, purity   |
| liquid nitrogen trap. Details in source and ref. 1.   | better than 99.8 mole per cent<br>as determined by gas chromato-                          |
| source and ref. 1.  | graphy and mass spectrometry.   |
|   |   |
|   |   |
|   |   |
|   | ESTIMATED ERROR:  |
|   | $\delta T/K = \pm 0.1;  \delta P/bar = \pm 0.3 \text{ below } 100$                        |
|   | bar; $\pm 0.6$ above 100 bar; $\delta x_{\text{He}} = \pm 2$ %                            |
|   | (estimated by compiler).<br>REFERENCES:   |
|   | 1. Heise, F., Dissertation,   |
|   |   |
|   | Göttingen, <u>1971</u> .  |
|   | Göttingen, <u>1971</u> .  |

| COMPONENTS :             | EVALUATOR:  |
|--------------------------|---|
| 1. Helium; He; 7440-59-7 | Colin Young,<br>School of Chemistry,<br>University of Melbourne,<br>Parkville, Victoria 3052,<br>AUSTRALIA. |

CRITICAL EVALUATION:

There are seven sets of high pressure measurements on this system. The three sets of data by Streett and coworkers (1,2,3) are mutually consistent but cover different pressure ranges. The two sets of data by Skripka and coworkers (4,5) are in fair agreement but the later data by Skripka and Lobonova (5) are thought to be more reliable. There is good agreement between the data of Mullins and Ziegler (6), Sinor and Kurata (7) and Streett (1). Hence the data of Mullins and Ziegler (6), Sinor and Kurata (7), Streett (1), Streett and Erickson (2), Streett and Hill (3) are all classified as tentative. The solubility data of Skripka and Lobonova (5) are marginally higher than that of Streett (1) and are classified as doubtful as are the earlier data of Skripka and Dykhno (4).

## References

- 1. Streett, W. B., Trans. Faraday Soc., 1969, 65, 696.
- Streett, W. B. and Erickson, A., Physics Earth Planetary Interiors, 1972, 5, 357.
- 3. Streett, W. B. and Hill, J. L. E., Trans. Faraday Soc., <u>1971</u>, 67, 622.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr., 1964, no. 8, 63.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, no.13, 90.
- Mullins, J. C. and Ziegler, W. T., Int. Adv. Cryog. Engng., <u>1964</u>, 10, 171.
- 7. Sinor, J. E. and Kurata, F., J. Chem. Engng. Data, 1966, 11, 537

| -  | He; 7440-59-7   |  | 1  |  |   |  |  |  |
|--|---|--|--|--|---|--|--|--|
| (l) Helium; He; 7440-59-7<br>(2) Argon; Ar; 7440-37-1  |   |  |  | Streett, W. B. and Erickson, A. L.,<br>Physics Earth Planetary Interiors,<br><u>1972</u> , 5, 357.   |   |  |  |  |
|  |   |  | PREPARED   | RV.  |   |  |  |  |
|  |   |  |  |  |   |  |  |  |
| ture, p  | essure  |  | С. Б. х  | oung   |   |  |  |  |
| NTAL VALU  |   | of helium  |  |  | Mole fraction   | of helium  |  |  |
| P/bar  |   | in vapor,<br><sup>y</sup> He   | T/K  | <i>P/</i> bar  |   | in vapor,<br><sup>y</sup> He   |  |  |
| 3860<br>4274<br>4518<br>4683 <sup>a</sup><br>3515  | 0.2941<br>0.2825<br>0.2744<br>0.270<br>0.4240   | 0.9353<br>0.9435<br>0.9472<br>0.949<br>0.8721  | 180.00   | 5796<br>5935<br>5996<br>6072<br>6293   | 0.6217<br>0.6002<br>0.5877<br>0.5731<br>0.5419  | 0.7835<br>0.7991<br>0.8104<br>0.8207<br>0.8419   |  |  |
| 4001<br>4481<br>4963<br>5386   | 0.3904<br>0.3640<br>0.3429<br>0.3272<br>0.3191<br>0.317   | 0.8972<br>0.9135<br>0.9256<br>0.9342<br>0.9384<br>0.939  | 190.00   | 6555<br>7031<br>7516<br>7968<br>8010   | 0.5143<br>0.4772<br>0.4483<br>0.4265<br>0.424<br>0.715  | 0.8603<br>0.8818<br>0.8983<br>0.9079<br>0.910<br>0.715   |  |  |
| 4067 <sup>D</sup><br>4102<br>4142<br>4205<br>4280<br>4419<br>4625<br>4963<br>5452  | 0.682<br>0.6114<br>0.5893<br>0.5672<br>0.5541<br>0.5301<br>0.5020<br>0.4695<br>0.4324   | 0.682<br>-<br>0.7737<br>0.7958<br>0.8086<br>0.8262<br>0.8470<br>0.8689<br>0.8927   |  | 7937<br>8003<br>8079<br>8143<br>8357<br>8678<br>9002<br>9264<br>9312 <sup>a</sup>  | 0.6346<br>0.6193<br>0.6042<br>0.5949<br>0.5697<br>0.4265<br>0.5167<br>0.5033<br>0.500   | 0.7989<br>0.8086<br>0.8210<br>0.8280<br>0.8433<br>0.8605<br>0.8762<br>0.8821<br>0.883  |  |  |
| 5935<br>6197<br>6638<br>6817a<br>5804 <sup>b</sup>   | 0.4051<br>0.3947<br>0.3760<br>0.368<br>0.702  | 0.9079<br>0.9171<br>0.9261<br>0.930<br>0.702   | 193.00   | 8514 <sup>D</sup><br>8657<br>8685<br>8726<br>8768  | 0.719<br>0.6259<br>0.6124<br><br>0.5927   | 0.719<br>0.8073<br>0.8182<br>0.8264<br>0.8310  |  |  |
|  |   | AUXILIARY  | INFORMATIO   | ON   |   |  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>Recirculating vapor flow apparatus<br>with magnetic pump. Temperature<br>measured with platinum resistance<br>thermometer. Pressure measured with<br>manganin resistance gauge. Samples<br>of liquid and gas analysed by thermal<br>conductivity. Details in source. |   |  |  |  |   |  |  |  |
|  |   |  | $\delta T/K = \pm$<br>= ±1 mol<br>compiler   | ±0.01;<br>e perce<br>:).   | -   |  |  |  |
|  | NTAL VALU<br>P/bar<br>3860<br>4274<br>4518<br>4683<br>3515<br>4001<br>4481<br>4963<br>5386<br>5645<br>56665<br>4067<br>4102<br>4142<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>4205<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804<br>5804 | P/bar in liquid, $x_{He}$ 3860       0.2941         4274       0.2825         4518       0.2744         4683a       0.270         3515       0.4240         4001       0.3904         4481       0.3640         4963       0.3429         5386       0.3272         5645       0.3191         5666a       0.317         4067b       0.682         4102       0.6114         412       0.5893         4205       0.5672         4280       0.5541         4419       0.5301         4625       0.5020         4963       0.4695         5452       0.4324         5935       0.4051         6197       0.3947         6638       0.3760         6817a       0.368         5804b       0.702 | NTAL VALUES:         Mole fraction of helium         P/bar in liquid,       in vapor, $x_{He}$ $y_{He}$ 3860       0.2941       0.9353         4274       0.2825       0.9435         4518       0.2704       0.949         3515       0.4240       0.8721         4001       0.3904       0.8972         4481       0.3640       0.9135         4963       0.3429       0.9256         5386       0.3272       0.9342         5645       0.3191       0.9384         5666a       0.317       0.939         4067 <sup>b</sup> 0.682       0.682         4102       0.6114       -         4142       0.5893       0.7737         4205       0.5672       0.7958         4280       0.5541       0.8086         4419       0.5301       0.8262         4625       0.5020       0.8470         4963       0.4695       0.8689         5452       0.4324       0.8927         5935       0.4051       0.9079         6197       0.368       0.930         5804 <td>Mole fraction of helium<br/>P/bar in liquid, in vapor, T/K<br/>"He         T/K           "He         "He           3860         0.2941         0.9353         180.00           4274         0.2825         0.9435         180.00           4274         0.2825         0.9435         180.00           4274         0.2825         0.9435         180.00           4518         0.2744         0.9472           4683         0.270         0.949           3515         0.4240         0.8721           4001         0.3904         0.9256           5386         0.3272         0.9342           5645a         0.3191         0.9384           5666a         0.317         0.939           4067         0.682         0.682           4102         0.6114         -           -         4142         0.5893         0.7737           4280         0.5541         0.8086           4419         0.5301         0.8262           4625         0.5020         0.8470           4963         0.4695         0.8689           5452         0.4324         0.8927           5935         0.4051         0.9</td> <td>Mode fraction of helium<br/>P/bar in liquid, in vapor, <math>T/K</math> <math>P/bar</math> <math>me</math> /td> <td>NTAL VALUES:<br/>Mole fraction of helium<br/>P/bar in liquid, in vapor, T/K       Mole fraction<br/>P/bar in liquid, in vapor, T/K       Mole fraction<br/>P/bar in liquid, in vapor, T/K         3860       0.2941       0.9353       180.00       5796       0.6217         4274       0.2825       0.9435       5935       0.6002         4683<sup>a</sup>       0.270       0.949       6072       0.5711         4683<sup>a</sup>       0.270       0.949       6052       0.5419         4001       0.3904       0.8972       6555       0.5433         4881       0.3640       0.9135       7031       0.4772         963       0.3429       0.9256       7516       0.4483         5386       0.3272       0.9344       8010<sup>a</sup>       0.424         5665       0.319       0.939       190.00       7830<sup>b</sup>       0.715         4102       0.6114       -       8003       0.6193         4120       0.5561       0.8086       8357       0.5549         4280       0.5541       0.8086       8357       0.5979         4281       0.4695       0.8689       9224       0.5033         5452       0.4324       0.8927       932<sup>b</sup>       0.500         <td< td=""></td<></td> | Mole fraction of helium<br>P/bar in liquid, in vapor, T/K<br>"He         T/K           "He         "He           3860         0.2941         0.9353         180.00           4274         0.2825         0.9435         180.00           4274         0.2825         0.9435         180.00           4274         0.2825         0.9435         180.00           4518         0.2744         0.9472           4683         0.270         0.949           3515         0.4240         0.8721           4001         0.3904         0.9256           5386         0.3272         0.9342           5645a         0.3191         0.9384           5666a         0.317         0.939           4067         0.682         0.682           4102         0.6114         -           -         4142         0.5893         0.7737           4280         0.5541         0.8086           4419         0.5301         0.8262           4625         0.5020         0.8470           4963         0.4695         0.8689           5452         0.4324         0.8927           5935         0.4051         0.9 | Mode fraction of helium<br>P/bar in liquid, in vapor, $T/K$ $P/bar$ $me$ | NTAL VALUES:<br>Mole fraction of helium<br>P/bar in liquid, in vapor, T/K       Mole fraction<br>P/bar in liquid, in vapor, T/K       Mole fraction<br>P/bar in liquid, in vapor, T/K         3860       0.2941       0.9353       180.00       5796       0.6217         4274       0.2825       0.9435       5935       0.6002         4683 <sup>a</sup> 0.270       0.949       6072       0.5711         4683 <sup>a</sup> 0.270       0.949       6052       0.5419         4001       0.3904       0.8972       6555       0.5433         4881       0.3640       0.9135       7031       0.4772         963       0.3429       0.9256       7516       0.4483         5386       0.3272       0.9344       8010 <sup>a</sup> 0.424         5665       0.319       0.939       190.00       7830 <sup>b</sup> 0.715         4102       0.6114       -       8003       0.6193         4120       0.5561       0.8086       8357       0.5549         4280       0.5541       0.8086       8357       0.5979         4281       0.4695       0.8689       9224       0.5033         5452       0.4324       0.8927       932 <sup>b</sup> 0.500 <td< td=""></td<> |  |  |

| COMPONE            | ENTS:  |                            |                          | ORIGINAL MEASUREMENTS:   |  |  |  |
|--------------------|--|----------------------------|--------------------------|--|--|--|--|
| 1) He              | lium; He   | ; 7440-59-7                |                          | Streett, W. B. and Erickson, A. L.<br>Physics Earth Planetary Interiors, |  |  |  |
| 2) Arg             | gon; Ar  | ; 7440-37-1                |                          | <u>1972</u> , 5, 357.  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
| EXPERIN            | MENTAL V   | ALUES:                     |                          |  |  |  |  |
| т/к                | <i>P/</i> bar                                    | Mole fractio<br>in liquid, | n of helium<br>in vapor, |  |  |  |  |
| 27                 | - / 542  | <sup>x</sup> He            | <sup>у</sup> не          |  |  |  |  |
| 193.00             | 8967   | 0.5712                     | 0.8461                   |  |  |  |  |
|                    | 9250<br>9567                                     | 0.5432<br>0.5208           | 0.8627<br>0.8750         |  |  |  |  |
|                    | 9670 <sup>a</sup><br>8974 <sup>b</sup>           | 0.520                      | 0.878                    |  |  |  |  |
| 195.00             |  | 0.722                      | 0.722                    |  |  |  |  |
|                    | 9151<br>9181                                     | 0.6026<br>0.6010           | 0.8250<br>0.8252         |  |  |  |  |
|                    | 9216   | 0.5975                     | 0.8252                   |  |  |  |  |
|                    | 9260   | 0.5951                     | 0.8344                   |  |  |  |  |
|                    | 9346   | 0.5800                     | 0.8442                   |  |  |  |  |
|                    | 9505   | 0.5622                     | 0.8548                   |  |  |  |  |
|                    | 9884<br>9940a                                    | 0.5347<br>0.550            | 0.8706<br>0.872          |  |  |  |  |
| 197.00             | 9360 <sup>b</sup>                                | 0.723                      | 0.723                    |  |  |  |  |
|                    | 9519   | 0.6204                     | 0.8160                   |  |  |  |  |
|                    | 9554   | 0.6160                     | 0.8210                   |  |  |  |  |
|                    | 9591<br>9636                                     | 0.6098<br>0.6034           | 0.8255                   |  |  |  |  |
|                    | 9784   | 0.5860                     | 0.8289<br>0.8416         |  |  |  |  |
|                    | 9981   | 0.5667                     | 0.8522                   |  |  |  |  |
|                    | 10153<br>10204 <sup>a</sup><br>9761 <sup>b</sup> | 0.5533                     | 0.8605                   |  |  |  |  |
| 199.00             | 10204~<br>0761b                                  | 0.560                      | 0.862                    |  |  |  |  |
| 199.00             | 9843   | 0.724<br>0.6497            | 0.724<br>0.7989          |  |  |  |  |
|                    | 9870   | 0.6432                     | 0.8020                   |  |  |  |  |
|                    | 9894   | 0.6368                     | 0.8077                   |  |  |  |  |
|                    | 9933   | 0.6289                     | 0.8120                   |  |  |  |  |
|                    | 10022<br>10043                                   | 0.6119<br>0.6056           | 0.8203<br>0.8244         |  |  |  |  |
|                    | 10160  | 0.5941                     | 0.8335                   |  |  |  |  |
|                    | 10408  | 0.5681                     | 0.8512                   |  |  |  |  |
|                    | 10481 <sup>a</sup>                               | 0.560                      | 0.860                    |  |  |  |  |
| <sup>a</sup> Three | phase p  | ressure ± 10               | bar                      | -  |  |  |  |
|                    |  | sure ± 20 bar              |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |
|                    |  |                            |                          |  |  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:  |  |  |  |  |
|---|---|--|--|--|--|
| (1) Helium; He; 7440-59-7<br>(2) Argon; Ar; 7440-37-1   | Mullins, J. C. and Ziegler, W. T.,<br>Internat. Adv. Cryogenic Engng., <u>1964</u> ,<br>10, 171.  |  |  |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |  |  |
| Temperature, pressure   | C. L. Young   |  |  |  |  |
| EXPERIMENTAL VALUES:<br>Mole fraction of helium   | Mole fraction of<br>helium  |  |  |  |  |
| T/K P/bar in liquid, in vapor<br><sup>x</sup> He <sup>y</sup> He  |   |  |  |  |  |
| 91.99 $81.26$ - $0.97053$ $91.99$ $61.10$ - $0.96384$ $92.00$ $40.67$ - $0.9496$ $91.95$ $20.18$ - $0.9084$ $91.96$ $121.39$ - $0.97465$ $97.50$ $121.66$ - $0.97465$ $97.50$ $121.66$ - $0.96417$ $97.50$ $101.40$ - $0.95970$ $97.51$ $81.06$ - $0.9530$ $97.51$ $61.05$ - $0.9412$ $97.51$ $40.57$ - $0.9179$ $97.52$ $20.29$ - $0.8522$ $97.50$ $61.00$ - $0.9416$ $86.02$ $81.20$ - $0.98351$ $86.02$ $61.10$ - $0.97989$ $86.03$ $40.04$ - $0.97195$ $86.02$ $121.66$ - $0.98726$ $86.01$ $121.82$ - $0.98724$ $86.00$ $101.71$ - $0.9873$ $86.02$ $121.59$ - $0.98727$ $108.01$ $121.59$ - $0.9229$ $108.01$ $101.40$ - $0.9123$ $108.04$ $81.06$ - $0.8966$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |  |  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>Single pass flow apparatus. Two   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:<br>1 and 2: Purities better than   |  |  |  |  |
| compartment equilibrium cell. Tem-<br>perature measured with platinum<br>resistance thermometer; pressure<br>measured with Bourdon gauge. Pure<br>helium bubbled through liquid argon.<br>Samples analysed by gas chromato-<br>graphy. Details in source.   | 99.995 mole per cent.   |  |  |  |  |
|   | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.03;  \delta P/bar = \pm 0.5\%;$<br>$\delta x_{He} \leq \pm 2\%;  \delta (1-y_{He}) \leq \pm 3\%.$ |  |  |  |  |
|   | REFERENCES:   |  |  |  |  |
|   |   |  |  |  |  |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| (1) Helium; He; 7440-59-7   | Sinor, J. E. and Kurata, F., J. Chem.  |
| (2) Argon; Ar; 7440-37-1  | Eng. Data, <u>1966</u> , <i>11</i> , 537.  |
| (2)   |  |
|   |  |
| VARIABLES:  | PREPARED BY:   |
|   |  |
| Temperature, pressure   | C. L. Young  |
| EXPERIMENTAL VALUES:<br>T/K P/bar Mole fraction of  | helium in liquid, <i>x</i> <sub>He</sub>   |
| 93.15 17.2<br>34.5  | 0.0015<br>0.0035   |
| 51.7  | 0.0052   |
| 68,95<br>86,18  | 0.0071<br>0.0087   |
| 103.4   | 0.0102   |
| 120.7   | 0.0114   |
| 137.9<br>113.15 17.2  | 0.0129<br>0.0025   |
| 34.5  | 0.0075   |
| 51.7<br>68.95   | 0.0119<br>0.0164   |
| 86.18   | 0.0210   |
| 103.4   | 0.0249   |
| 120.7<br>137.9  | 0.0287<br>0.0325   |
| 133.15 34.5   | 0.0068   |
| 51.7<br>68.95   | 0.0171<br>0.0276   |
| 86.18   | 0.0370   |
| 103.4<br>120.7  | 0.0461   |
| 137.9   | 0.0549 · · · · · · · · · · · · · · · · · · ·   |
| 148.15 51.7   | 0.0121   |
| 68.95<br>86.18  | 0.0393<br>0.0650   |
| 103.4   | 0.0895   |
| 120.7<br>137.9  | 0.1138<br>0.1380   |
| AUXILIARY   | INFORMATION  |
| METHOD /APPARATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:  |
| Static equilibrium cell (0.1 & capa-<br>city) fitted with magnetic stirrer.<br>Temperature measured with platinum<br>resistance thermometer. Pressure<br>measured with Bourdon gauge. Contents<br>charged into cell, equilibrated liquid<br>samples withdrawn and analysed by G.C.<br>Details in source and ref. 1. |  |
|   | ESTIMATED ERROR:   |
|   | $\delta T/K = \pm 0.02;  \delta P/bar = \pm 0.1;$<br>$\delta x_{He} = \pm 1\% \text{ or } \pm 0.0003 \text{ (whichever is greater)}$ |
|   | REFERENCES :   |
|   | <ol> <li>Sinor, J. E., Schindler, D. L. and<br/>Kurata, F., Am. Inst. Chem. Engnrs<br/>J., <u>1966</u>, 12, 353.</li> </ol>          |
| i la la la la la la la la la la la la la  |  |
|   |  |

| COMPONENT | IS:            |                               |                              | ORIGINAL                  | MEASUREN       | MENTS:                         |                              |
|-----------|----------------|-------------------------------|------------------------------|---------------------------|----------------|--------------------------------|------------------------------|
| (l) H     | elium;         | He; 7440-59                   | -7                           |                           |                | B., Trans.                     | Faraday                      |
| (2) A     | rgon;          | Ar; 7440-37                   | -1                           | Soc.,                     | <u>1969</u> ,  | 65, 696.                       |                              |
|           | 2              |                               |                              | 1                         |                |                                |                              |
|           |                |                               |                              |                           |                |                                |                              |
| VARIABLES | S:             |                               | <u></u>                      | PREPARED                  | BY:            |                                |                              |
| Temper    | ature,         | pressure                      |                              | с. г.                     | Young          |                                |                              |
|           |                |                               |                              |                           |                | ·····                          |                              |
| EXPERIMEN |                | Mole fractio                  | on of helium                 |                           |                |                                | ion of helium                |
| т/к       | <i>P/</i> bar  | in liquid,<br><sup>x</sup> He | in vapor,<br><sup>Y</sup> He | T/K                       | <i>P/</i> bar  | in liquid,<br><sup>x</sup> He  | in vapor,<br><sup>Y</sup> He |
| 91.34     | 14.2           |                               | 0.8812                       | 144.4                     | 554.6          | 0.2984                         | 0.7192                       |
|           | 41.3           | 0.0042                        | 0.9461                       |                           | 620.3          | -                              | 0.6861                       |
|           | 68.6           | 0.0065                        | 0.9666                       |                           | 628.9          |                                | -                            |
|           | 133.0          | 0.0118                        | 0.9765                       | 145 07                    | 687.2          |                                | -                            |
|           | 204.7<br>273.6 | 0.0158<br>0.0196              | 0.9844<br>0.9861             | 145.97                    | 243.0<br>308.1 |                                | 0.5323<br>0.5667             |
|           | 2/3.6          |                               | 0.9861                       |                           | 308.1          |                                | 0.5667                       |
|           | 366.0          |                               | 0.9924                       |                           | 450.8          |                                | 0.6261                       |
| 130.08    | 32.5           | 0.0067                        | 0.2716                       |                           | 548.0          |                                | 0.6600                       |
|           | 57.1           |                               | 0,5200                       |                           | 685.9          |                                | 0.7032                       |
|           | 97.2           | 0.0380                        | -                            | 146.90                    |                |                                | 0.4897                       |
|           | 141.3          | 0.0548                        | 0.7480                       |                           | 288.8          | 0.2783                         | 0.5086                       |
|           | 199.5          | 0.0794                        | 0.7967                       |                           | 317.0          |                                | 0.5187                       |
|           | 279.2          | 0.1032                        | 0.8329                       |                           | 323.2          |                                | 0.5240                       |
|           | 346.0          | 0.1200                        | 0.8521                       |                           | 374.9          |                                | 0.5363                       |
|           | 418.4          | 0.1348                        | 0.8670                       |                           | 412.9          |                                | 0.5543                       |
|           | 484.9<br>554.1 | 0.1454<br>0.1526              | 0.8779<br>0.8864             |                           | 448.1<br>486.7 | 0.3754<br>0.3822               | 0.5551<br>0.5862             |
|           | 619.3          | 0.1603                        | 0.9013                       |                           | 536.9          |                                | 0.6039                       |
|           | 685.5          | 0.1664                        | 0.9061                       |                           | 616.9          |                                | 0.6380                       |
| 144.4     | 68.7           | 0.0328                        | 0.3058                       |                           | 689.3          |                                | 0.6655                       |
|           | 134.1          | 0.0967                        | 0.4631                       | 147.73                    |                |                                | 0.2581                       |
|           | 204.4          | 0.1570                        | 0.5551                       |                           | 143.4          |                                | 0.3466                       |
|           | 273.5          | 0.1999                        | 0.6178                       |                           | 172.4          |                                | 0.3853                       |
|           | 346.0          | 0.2381                        | 0.6559                       |                           | 239.2          |                                | 0.4158                       |
|           | 422.5          | 0.2669                        | 0.6820                       |                           | 262.9          | 0.3678                         | 0.3873                       |
|           | 486.7          | 0.2862                        | 0.7020                       | TNEODWARTO                |                |                                | ······                       |
| 1000 /3   |                |                               | AUXILIARY                    | r                         |                |                                |                              |
|           |                | JS/PROCEDURE:                 |                              |                           |                | OF MATERIALS                   | ;                            |
|           |                | vapor flow a                  |                              | No deta:                  | ils giv        | ven.                           |                              |
|           |                | aratus given<br>asured with   |                              |                           |                |                                |                              |
|           |                |                               | Pressure                     |                           |                |                                |                              |
|           |                | Bourdon gaug                  |                              |                           |                |                                |                              |
|           |                | phases analy                  |                              |                           |                |                                |                              |
| thermal   | conduc         | tivity.                       |                              |                           |                |                                |                              |
|           |                | -                             |                              |                           |                |                                |                              |
|           |                |                               |                              |                           |                |                                |                              |
|           |                |                               |                              |                           |                |                                |                              |
|           |                |                               |                              |                           |                |                                |                              |
|           |                |                               |                              |                           |                |                                |                              |
|           |                |                               |                              | ESTIMATED                 | ERROR:         |                                |                              |
|           |                |                               |                              | $\delta T/K = \pm$        | :0.03;         | $\delta P/bar = \pm$           | 0.1;                         |
|           |                |                               |                              | $\delta x_{\rm Ho} = \pm$ | 0.0002         | ; $\delta y_{\text{He}} = \pm$ | 0.001                        |
|           |                |                               |                              |                           |                | compiler).                     |                              |
|           |                |                               |                              |                           |                | Compiler/                      | ·····                        |
|           |                |                               |                              | REFERENCE                 |                |                                | aniaa 1055                   |
|           |                |                               | 1                            | 1. Stre<br>5, 2           |                | . в., стуод                    | enics, <u>1965</u> ,         |
|           |                |                               |                              |                           |                |                                |                              |
|           |                |                               |                              |                           |                |                                |                              |
|           |                |                               |                              |                           |                |                                |                              |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |
|--|---|
| (l) Helium; He; 7440-59-7  | Skripka, V. G. and Dykhno, N. M.,<br>Trudy Vses. NauchIssled. Inst.   |
| (2) Argon; Ar; 7440-37-1   | Kriog. Mashinstr., <u>1964</u> , 8, 163.  |
| VARIABLES:   | PREPARED BY:  |
| Temperature, pressure  | C. L. Young   |
| EXPERIMENTAL VALUES:   |   |
|  | Mole fraction of helium   |
| T/K P/bar P <sup>+</sup> /bar  | in liquid, $x_{\rm He}$ in vapor, $y_{\rm He}$  |
| 90.5 6.03 4.66   | 0.0452 0.7392   |
| 11.08 9.72<br>16.14 14.77  | 0.092 0.8637<br>0.138 0.9043  |
| 21.21 19.84<br>26.26 24.90   | 0.138<br>0.190<br>0.230<br>0.9043<br>0.9043<br>0.9242<br>0.9382   |
| P <sup>+</sup> partial pressure of helium  |   |
|  |   |
|  |   |
| AUXIL  | IARY INFORMATION  |
| AUXIL:<br>METHOD /APPARATUS/PROCEDURE :  | IARY INFORMATION<br>SOURCE AND PURITY OF MATERIALS;   |
|  | SOURCE AND PURITY OF MATERIALS:<br>1. High purity containing no more<br>than 0.008% hydrogen, 0.02%<br>nitrogen, 0.005% oxygen and 0.07%<br>hydrocarbons.<br>2. No details given.   |
| METHOD /APPARATUS/PROCEDURE:<br>Vapor flow apparatus with magnetic<br>recirculating pump. Temperature<br>measured with platinum resistance<br>thermometer, pressure measured wit<br>Bourdon gauge. Samples of gas an<br>liquid analysed by gas phase inter | SOURCE AND PURITY OF MATERIALS:<br>1. High purity containing no more<br>than 0.008% hydrogen, 0.02%<br>nitrogen, 0.005% oxygen and 0.07%<br>hydrocarbons.<br>2. No details given.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02$ to 0.03; $\delta P$ less than<br>0.2 bar; $\delta x_{HO} \approx \delta y_{HO} = \pm 0.00001$ to   |
| METHOD /APPARATUS/PROCEDURE:<br>Vapor flow apparatus with magnetic<br>recirculating pump. Temperature<br>measured with platinum resistance<br>thermometer, pressure measured wit<br>Bourdon gauge. Samples of gas an<br>liquid analysed by gas phase inter | <pre>SOURCE AND PURITY OF MATERIALS:<br/>1. High purity containing no more<br/>than 0.008% hydrogen, 0.02%<br/>nitrogen, 0.005% oxygen and 0.07%<br/>hydrocarbons.<br/>2. No details given.<br/>ESTIMATED ERROR:<br/>ôT/K = ±0.02 to 0.03; ôP less than</pre>   |
| METHOD /APPARATUS/PROCEDURE:<br>Vapor flow apparatus with magnetic<br>recirculating pump. Temperature<br>measured with platinum resistance<br>thermometer, pressure measured wit<br>Bourdon gauge. Samples of gas an<br>liquid analysed by gas phase inter | SOURCE AND PURITY OF MATERIALS:<br>1. High purity containing no more<br>than 0.008% hydrogen, 0.02%<br>nitrogen, 0.005% oxygen and 0.07%<br>hydrocarbons.<br>2. No details given.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02 \text{ to } 0.03; \delta P \text{ less than}$<br>0.2 bar; $\delta x_{\text{He}} \simeq \delta y_{\text{He}} = \pm 0.00001 \text{ to}$<br>0.00002. |

| COMPONENT   | rs:  |  |   | ORIGINAL   | MEASUREM  | ENTS:  |   |
|---|--|--|---|--|---|--|---|
| (1) Helium; He; 7440-59-7<br>(2) Argon; Ar; 7440-37-1 |  |  |   | Skripka, V. G. and Lobonova, N. N.,<br>Trudy Vses. NauchIssled. Inst.<br>Kriog. Mashinostr., <u>1971</u> , 13, 90. |   |  |   |
| VARIABLE  | S:   | ······································   |   | PREPARED   | BY:   |  |   |
| Tempera   | Temperature, pressure  |  |   |  | oung  |  |   |
| EXPERIME  | NTAL VALUES  |  |   | L  |   |  |   |
| т/К   |  | ole fraction<br>liquid,<br><sup>x</sup> He   | of hellum<br>in vapor,<br><sup>y</sup> He   | т/к  |   | Mole fraction<br>in liquid,<br><sup><i>x</i></sup> He  | of helium<br>in vapor,<br><sup>y</sup> He   |
| 90.67   | 9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>98.1<br>107.9<br>117.7<br>127.5<br>137.3<br>147.1<br>156.9<br>166.7<br>176.5<br>186.3<br>196.1<br>205.9<br>215.7<br>9.8<br>19.6<br>29.4 | 0.0010<br>0.0021<br>0.0032<br>0.0043<br>0.0055<br>0.0066<br>0.0075<br>0.0088<br>0.0098<br>0.0109<br>0.0129<br>0.0129<br>0.0129<br>0.0138<br>0.0146<br>0.0154<br>0.0161<br>0.0161<br>0.0168<br>0.0175<br>0.0183<br>0.0190<br>0.0197<br>0.0204<br>0.0040<br>0.0061 | -<br>0.9230<br>0.9380<br>0.9485<br>0.9565<br>0.9620<br>0.9650<br>0.9675<br>0.9695<br>0.9715<br>0.9740<br>0.9755<br>0.9770<br>0.9775<br>0.9770<br>0.9775<br>0.9770<br>0.9775<br>0.9780<br>0.9805<br>0.9815<br>0.9830<br>0.9845<br>-<br>-<br>0.7815 | 102.95   | 39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>98.1<br>107.9<br>117.9<br>127.5<br>137.3<br>147.1<br>156.9<br>166.7<br>176.5<br>186.3<br>196.1<br>205.9<br>215.7<br>9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8 | 0.0080<br>0.0099<br>0.0118<br>0.0137<br>0.0155<br>0.0174<br>0.0209<br>0.0226<br>0.0242<br>0.0258<br>0.0273<br>0.0287<br>0.0302<br>0.0315<br>0.0328<br>0.0342<br>0.0342<br>0.0354<br>0.0354<br>0.0005<br>0.0046<br>0.0085<br>0.0120<br>0.0153<br>0.0183 | 0.8300<br>0.8590<br>0.8790<br>0.9030<br>0.9110<br>0.9180<br>0.9245<br>0.9300<br>0.9350<br>0.9385<br>0.9420<br>0.9450<br>0.9450<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9550<br>0.9570<br>0.9585<br>- |
|   | <u></u>  | <u> </u>   | AUXILIARY   | INFORMATI  | ON  |  |   |
| METHOD /  | APPARATUS  | /PROCEDURE:  |   | SOURCE A   | ND PURITY   | OF MATERIALS:  |   |
| with li<br>gas.<br>interfe<br>with pl<br>and pre      | quid and<br>Samples o<br>rometry.<br>atinum re   | sistance the<br>h Bourdon ga   | rized with<br>alysed by<br>ce measured<br>ermometer   | per<br>2. High   | cent.   | sample purit   |   |
|   |  |  |   | ESTIMATE<br>$\delta T/K = \pm 0$<br>$\delta y_{He} = \pm 0$<br>REFERENC  | ±0.01;<br>0.0002.   | $\delta P/\text{bar} = \pm 0.4$  | 4; δx <sub>He</sub> ,   |
|   |  |  |   |  |   |  |   |

ORIGINAL MEASUREMENTS: COMPONENTS: Helium; He; 7440-59-7 Skripka, V. G. and Lobonova, N. N., (1) Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, 13, 90. (2) Argon; Ar; 7440-37-1 EXPERIMENTAL VALUES: Mole fraction of helium T/K P/bar in liquid, in vapor,  $x_{\rm He}$  $y_{\text{He}}$ 115.09 68.6 0.0216 0.7480 78.5 0.0247 0.7730 88.3 0.0278 0.7930 98.1 0.0310 0.8080 107.9 117.7 0.0341 0.8215 0.0370 0.8320 127.5 0.0400 0.8420 137.3 0.0428 0.8505 147.1 0.0456 0.8580 156.9 0.0483 0.8650 166.7 0.0503 0.8700 176.5 0.0533 0.8760 186.3 0.0557 0.8800 196.1 0.8840 0.0579 205.9 0.0600 0.8880 215.7 0.0621 0.8920

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| COMPONENTS:  | <u>.                                    </u>   |  |  | ORIGINAL  | MEASUREME   | NTS:   |   |  |
|--|--|--|--|---|---|--|---|--|
| (1) Helium   | n; He;   | 7440-59-7  |  | Streett, W. B. and Hill, J. L. E.,                |   |  |   |  |
| (2) Argon;   | Ar;  | 7440-37-1  |  |   |   | Soc., <u>1971</u> , 6  |   |  |
| VARIABLES:   |  |  |  | PREPARED  | BY:   |  |   |  |
| Temperature, pressure  |  |  |  | с. г. т   | oung  |  |   |  |
| EXPERIMENTAL   |  |  |  |   |   |  |   |  |
| т/к <i>Р/</i> ь  |  | le fraction<br>liquid,<br><sup>x</sup> He  | of helium<br>in vapor,<br><sup>y</sup> He  |   | P/bar   | Mole fraction<br>in liquid,<br><sup>x</sup> He   | of helium<br>in vapor,<br><sup>Y</sup> He   |  |
| 98.02 220<br>275<br>420<br>482<br>627<br>696<br>717<br>108.17 489<br>620<br>757<br>8965<br>1034<br>1103<br>1179<br>1206<br>1224<br>1241<br>1261<br>1277<br>120.01 344<br>613<br>744<br>896<br>1034 | .6<br>.5<br>.2<br>.1<br>.4<br>.4<br>.1<br>.9<br>.7<br>.6<br>.5<br>.4<br>.4<br>.8<br>.0<br>.2<br>.5<br>.7<br>.0<br>.7<br>.7<br>.7 | 0.0229<br>0.0261<br>0.0347<br>0.0376<br>0.0430<br>0.0448<br>0.0452<br>0.0602<br>0.0669<br>0.0721<br>0.0762<br>0.0776<br>0.0784<br>0.0802<br>0.0813<br>0.0819<br>0.0823<br>0.0834<br>0.0841<br>0.0841<br>0.0841<br>0.0841<br>0.0841<br>0.0796<br>0.1078<br>0.1078<br>0.1078<br>0.1253 | 0.9740<br>0.9747<br>0.9802<br>0.9816<br>0.9817<br>0.9823<br>0.9834<br>0.9622<br>0.9670<br>0.9713<br>0.9754<br>0.9754<br>0.9774<br>0.9774<br>0.9774<br>0.9774<br>0.9774<br>0.9774<br>0.9774<br>0.9775<br>0.9117<br>0.9372<br>0.9426<br>0.9486<br>0.9528 | 120.01  | 1172.3<br>1310.1<br>1447.9<br>1585.7<br>1723.5<br>1861.3<br>1930.2<br>1999.1<br>2075.1<br>2111.6<br>358.7<br>482.3<br>620.1<br>757.9<br>896.7<br>1034.5<br>1241.2<br>1361.8<br>1585.7<br>1861.3<br>2068.0<br>2413.6<br>2620.3<br>2765.2<br>2827.0 | 0.1284<br>0.1286<br>0.1286<br>0.1315<br>0.1316<br>0.1316<br>0.1316<br>0.1316<br>0.1313<br>0.1310<br>0.1313<br>0.1310<br>0.1395<br>0.1557<br>0.1671<br>0.1754<br>0.1795<br>0.1836<br>0.1848<br>0.1856<br>0.1836<br>0.1848<br>0.1856<br>0.1836<br>0.1812<br>0.1769<br>0.1746<br>0.1732<br>0.1722 | 0.9557<br>0.9588<br>0.9629<br>0.9650<br>0.9678<br>0.9698<br>0.9705<br>0.9705<br>0.9705<br>0.9707<br>0.8555<br>0.8761<br>0.8912<br>0.9078<br>-<br>0.9360<br>0.9413<br>0.9492<br>0.9595<br>0.9595<br>0.9616<br>0.9692 |  |
|  |  |  | AUXILIARY  | INFORMATIC  | )N  |  |   |  |
| METHOD /APPA   | RATUS/I  | PROCEDURE :  |  | SOURCE AN   | D PURITY  | OF MATERIALS:  |   |  |
| with magnet<br>ture. Tem<br>platinum re<br>Pressure me   | ic pump<br>peratur<br>sistanc<br>asured  | or flow appa<br>at ambient<br>ce measured<br>te thermomet<br>with Bourdo<br>and ref. 1.  | tempera-<br>with<br>er.<br>n gauge.  | NO 0  | details   | given.   |   |  |
|  |  |  |  | $\delta x_{He} = \delta$<br>REFERENCE<br>1. Stree | $y_{\text{He}} = 0$<br>$y_{\text{He}} = 0$<br>$z_{\text{S:}}$<br>$z_{\text{He}}$  | δP/bar = ±0.5;<br>.001.<br>B., Cryogenics  |   |  |
|  |  |  |  | 5,27  | •   |  |   |  |

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| COMPONENTS: |                  |                  |                  | ORIGINAL MEASUREMENTS:            |                     |                            |                    |
|-------------|------------------|------------------|------------------|-----------------------------------|---------------------|----------------------------|--------------------|
| (1) H       | elium; He        | e; 7440-59-7     |                  | Street                            | t, W. B.<br>Faradau | and Hill, J<br>Soc., 1971, | L. E.,<br>67. 622. |
| (2) A:      | rgon; Ai         | ; 7440-37-1      |                  | 114.001                           | r ur uuug           |                            |                    |
|             |                  |                  |                  |                                   |                     |                            |                    |
|             |                  |                  |                  |                                   |                     |                            |                    |
| EVDEDTM     | ENTAL VA         |                  |                  | ي حيد من المالية في المسافرين الم | <u></u>             |                            |                    |
| LYPERIN     |                  | Mole fraction    | of helium        |                                   |                     | Mole fractio               | n of helium        |
| T/K         | <i>P/</i> bar    | in liquid,       | in vapor         | T/K                               | <i>P/</i> bar       | in liquid,                 | in vapor,          |
|             |                  | <sup>x</sup> He  | <sup>y</sup> He  |                                   |                     | <sup>x</sup> He            | <sup>y</sup> He    |
| 129.74      |                  | 0.1720           | 0.9662           | 147.80                            |                     | 0.3050                     | 0.4721             |
| 139.39      | 344.5<br>482.3   | 0.1765<br>0.2127 | 0.7502<br>0.7894 |                                   | 351.6<br>545.1      | 0.3641                     | -<br>0.5452        |
|             | 620.1            | 0.2347           | 0.8157           |                                   | 585.7               | 0.4317                     | -                  |
|             | 757.9            | 0.2479           | 0.8353           |                                   | 610.0               | -                          | 0.5753             |
|             | 896.7            | 0.2563           | 0.8520           |                                   | 627.2               | 0.4272                     | 0.5985             |
|             | 1034.5           | 0.2605           | 0.8659           |                                   | 641.3               | 0.4278                     | 0.6052             |
|             | 1172.3<br>1312.1 | 0.2629<br>0.2629 | 0.8775<br>0.8875 |                                   | 689.0<br>827.8      | 0.4232<br>0.4090           | 0.6315<br>0.6928   |
|             | 1447.9           | 0.2611           | 0.8961           |                                   | 965.6               | 0.4054                     | 0.7338             |
|             | 1723.5           | 0.2581           | 0.9091           | 148.03                            | 96.3                | 0.0854                     | 0.2787             |
|             | 1999.1           | 0.2529           | 0.9195           |                                   | 140.8               | 0.144                      | 0.3556             |
|             | 2275.8           | 0.2456           | 0.9280           |                                   | 179.3               | 0.1896                     | 0.3901             |
|             | 2551.4           | 0.2405           | 0.9333<br>0.9392 |                                   | 228.0               | 0.2400                     | 0.4183             |
|             | 2827.0<br>2895.9 | 0.2329           | 0.9406           |                                   | 262.4<br>658.6      | 0.3110<br>0.4559           | 0.3892<br>0.5981   |
|             | 2964.8           | 0.2307           | 0.9419           |                                   | 723.5               | 0.4320                     | -                  |
|             | 3033.7           | 0.2306           | 0.9486           |                                   | 836.9               | 0.4241                     | 0.6806             |
|             | 3102.6           | 0.2285           | 0.9499           |                                   | 895.7               | 0.4122                     | 0.7093             |
|             | 3171.5<br>3240.4 | 0.2277           | 0.9509           |                                   | 1043.6              | 0.4087                     | 0.7492             |
|             | 3326.5           | 0.2261<br>0.2251 | 0.9513<br>0.9534 |                                   | 1172.3<br>1379.0    | 0.3984<br>0.3829           | 0.7822<br>0.8145   |
|             | 3454.2           | 0.2238           | 0.9545           |                                   | 1654.6              | 0.3662                     | 0.8466             |
|             | 3581.8           | 0.2226           | 0.9556           |                                   | 1930.2              | 0.3506                     | 0.8713             |
|             | 3619.3           | 0.2224           | 0.9556           |                                   | 2068.0              | 0.3401                     | 0.8818             |
| 145.00      | 2750.8           | 0.2805           | -                |                                   | 2413.6              | 0.3261                     | 0.8989             |
|             | 3109.7           | 0.2685<br>0.2598 | -                |                                   | 2736.8              | 0.3118                     | 0.9099             |
|             | 3447.1<br>3792.6 | 0.2398           | 0.9379           |                                   | 3102.6<br>3461.3    | 0.2983<br>0.2869           | 0.9253<br>0.9326   |
|             | 4219.2           | 0.2480           | 0.9383           | 148.30                            | 757.9               | 0.4982                     | -                  |
| 146.90      | 220.9            | 0.2188           | 0.4957           |                                   | 793.4               | 0.4795                     | 0.5796             |
|             | 275.6            | 0.2584           | 0.5182           |                                   | 827.8               | 0.4527                     | 0.6535             |
|             | 344.5            | 0.3008           | -                |                                   | 965.6               | 0.4308                     | 0.7137             |
|             | 434.7<br>496.5   | 0.3425<br>0.3576 | 0.5876<br>0.6127 |                                   | 1103.4<br>1241.2    | 0.4157<br>0.4054           | 0.7476<br>0.7751   |
|             | 551.2            | 0.3717           | 0.6328           |                                   | 1654.6              | 0.3755                     | 0.8347             |
|             | 689.0            | 0.3817           | 0.6810           | 149.00                            | 892.7               | 0.4855                     | 0.6362             |
|             | 827.8            | 0.3842           | 0.7282           |                                   | 958.5               | _                          | 0.6821             |
|             | 965.6            | 0.3822           | 0.7571           |                                   | 1061.9              | 0.4385                     | 0.7222             |
|             | 1103.4<br>1241.2 | 0.3750<br>0.3696 | 0.7778<br>0.7976 |                                   | 1172.3<br>1379.0    | 0.4256<br>0.4045           | 0.7502<br>0.7932   |
|             | 1379.0           | 0.3614           | 0.8203           |                                   | 1654.6              | 0.3826                     | 0.8325             |
|             | 1654.6           | 0.3479           | 0.8520           |                                   | 1930.2              | 0.3626                     | 0.8604             |
|             | 2068.0           | 0.3310           | 0.8818           |                                   | 2482.5              | 0.3319                     | 0.8907             |
|             | 2413.6           | 0.3174           | -                |                                   | 2827.0              | 0.3189                     | 0.9098             |
|             | 2808.7<br>3102.6 | 0.3040<br>0.2942 | 0.9117<br>0.9208 |                                   | 3426.8<br>3792.6    | 0.2937<br>0.2851           | 0.9273<br>0.9372   |
| 147.30      | 344.5            | 0.3105           | 0.5349           | 150.02                            | 3/92.6              | 0.5239                     | 0.9372             |
|             | 413.4            | 0.3546           | 0.5536           | 130.02                            | 1103.4              | 0.4861                     | 0.6708             |
|             | 482.3            | 0.3839           | 0.5808           |                                   | 1254.4              | 0.4448                     | 0.7389             |
|             | 689.0            | 0.4089           | 0.6607           |                                   | 1379.0              | 0.4287                     | 0.7698             |
|             | 827.8            | 0.4045           | 0.7064           |                                   | 1516.8              | 0.4104                     | 0.7921             |
| 147.80      | 213.8<br>265.6   | 0.2269<br>0.2653 | 0.4476<br>0.4604 |                                   | 1723.5              | 0.3955                     | 0.8284             |
|             | 203.0            | 0.2000           | 0.4004           |                                   | 2075.1              | 0.3691                     | 0.8561             |
|             |                  |                  |                  |                                   |                     |                            |                    |

(cont.)

| COMPONENTS: |           |           | ORIGINAL MEASUREMENTS:  |  |  |  |
|-------------|-----------|-----------|---|--|--|--|
| (l) He      | lium; He; | 7440-59-7 | Streett; W. B. and Hill, J. L. E.,<br>Trans. Faraday Soc., 1971, 67, 622. |  |  |  |
| (2) Ar      | gon; Ar;  | 7440-37-1 | 11ano. Faraday 555., <u>1971</u> , 57, 522.                               |  |  |  |

EXPERIMENTAL VALUES:

| т/к    | P/bar | Mole fraction<br>in liquid<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>y</sup> He |        | P/bar | Mole fraction<br>in liquid,<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>Y</sup> He |
|--------|-------|---|---|--------|-------|--|---|
|        |       |   |   |        |       |  |   |
| 150.02 | 2424  | 0.3491  | 0.8862                                    | 155.94 | 3786  | 0.3485   | 0.9065                                    |
|        | 2765  | 0.3322  | 0.9039                                    |        | 4137  | 0.3399   | 0.9214                                    |
|        | 3006  | 0.3204  | 0.9117                                    | 158.09 | 2220  | 0.5749   | 0.6943                                    |
|        | 3447  | 0.3062  | 0.9247                                    |        | 2251  | -  | 0.7187                                    |
| Į      | 3793  | -   | 0.9346                                    |        | 2276  | 0.5293   | 0.7471                                    |
|        | 4137  | 0.2895  | 0.9425                                    |        | 2441  | 0.4964   | 0.7789                                    |
| 150.99 | 1179  | 0.5612  |   |        | 2482  | 0.4855   | -   |
|        | 1241  | 0.5057  | 0.6718                                    |        | 2800  | 0.4432   | 0.8260                                    |
|        | 1310  | 0.4788  | -   |        | 2992  | 0.4199   | 0.8454                                    |
| ł      | 1379  | 0.4656  | 0.7122                                    | 159.90 | 2503  | 0.5978   | 0.6967                                    |
|        | 1586  | -   | 0.7800                                    |        | 2520  | 0.5776   | 0.7117                                    |
|        | 1724  | 0.4169  | 0.8125                                    |        | 2551  | 0.5578   | 0.7297                                    |
| 155.94 | 1940  | 0.5616  | 0.7078                                    |        | 2599  | 0.5389   | 0.7539                                    |
| )      | 1952  | 0.5554  | 0.7187                                    |        | 2662  | 0.5210   | -   |
|        | 1982  | 0.5427  | 0.7323                                    |        | 2751  | 0.5036   | -   |
|        | 2006  | 0.5345  | 0.7430                                    |        | 2827  | 0.4886   | -   |
|        | 2031  | -   | 0.7539                                    |        | 2920  | 0.4755   | 0.8272                                    |
|        | 2206  | 0.4821  | 0.7943                                    |        | 3013  | -  | 0.8354                                    |
|        | 2414  | 0.4476  | 0.8239                                    |        | 3103  | 0.4578   | 0.8431                                    |
|        | 2758  | 0.4122  | 0.8573                                    |        | 3447  | 0.4211   | 0.8713                                    |
|        | 3103  | 0.3853  | 0.8794                                    |        | 3793  | 0.4004   | 0.8862                                    |
|        | 3447  | 0.3638  | 0.8938                                    |        | 4137  | 0.3761   | 0.9014                                    |
|        |       |   |   |        |       |  |   |

| COMPONEN                   | TS:                         |  |   | ORIGINAL MEASUREMENTS:   |                |  |   |  |
|----------------------------|-----------------------------|--|---|--|----------------|--|---|--|
|                            | Helium;                     | He; 7440-59-7<br>onoxide; CO; 6                  | 20-08-0                                   |  |                | and Stewart,<br>. Data, <u>1975</u> ,            |   |  |
| (2) C                      | arbon n                     | onoxide, co, o                                   | 30-08-0                                   |  |                |  |   |  |
| VARIABLE                   | ES :                        |  |   | PREPARED BY:   |                |  |   |  |
| Temperature, pressure      |                             |  |   | С. L. Yc   | oung           |  |   |  |
| EXPERIME                   | INTAL VALU                  | JES:   |   | L  |                | <u></u>  | ·   |  |
| т/К                        | P/bar                       | Mole fraction<br>in liquid,<br><sup>x</sup> He   | of helium<br>in vapor,<br><sup>y</sup> He |  | P/bar          | Mole fraction<br>in liquid,<br><sup>x</sup> He   | n of helium<br>in vapor,<br><sup>y</sup> He |  |
| 79.50                      | 41.2                        | 0.0047   | -   | 120.00   | 105.1<br>138.0 | 0.0767   |   |  |
|                            | 69.1                        | 0.0048<br>0.0077                                 | -   | 80.00  | 11.9           | 0.1003   | 0.9204                                      |  |
|                            | 69.4<br>102.7               | 0.0079<br>0.0115                                 | -   |  | 13.7<br>28.8   | -  | 0.9303<br>0.9636                            |  |
|                            | 103.4                       | 0.0116   | -   |  | 42.3           | -  | 0.9636                                      |  |
|                            | 134.9                       | 0.0143   | -   |  | 56.3           | -  | 0.9787                                      |  |
| 84.71                      | 136.1<br>69.0               | 0.0146<br>0.0105                                 | _   |  | 69.8<br>136.4  | -  | 0.9821<br>0.9885                            |  |
| -                          | 69.4                        | 0.0107   | -   | 84.71  | 6.9            | -  | 0.8709                                      |  |
|                            | 102.9<br>103.9              | 0.0152<br>0.0152                                 | -   |  | 7.0<br>15.2    | -  | 0.8713<br>0.8946                            |  |
|                            | 135.3                       | 0.0185   | -   |  | 28.8           | -  | 0.9395                                      |  |
| 90.00                      | 136.2<br>35.6               | 0.0186<br>0.0072                                 | -   |  | 42.8           | -  | 0.9563                                      |  |
| 90.00                      | 69.4                        | 0.0141   | -   |  | 56.4<br>70.9   | -  | 0.9649<br>0.9703                            |  |
|                            | 103.6                       | 0.0203   | -   |  | 104.0          | -  | 0.9777                                      |  |
|                            | 135.6<br>136.9              | 0.0253<br>0.0254                                 | -   | 90.00  | 14.6<br>26.7   | -  | 0.8127<br>0.8918                            |  |
| 100.00                     | 37.1                        | 0.0116   | -   |  | 40.1           | -  | 0.9239                                      |  |
|                            | 70.1<br>104.3               | 0.0227<br>0.0333                                 | -   |  | 55.6           | -  | 0.9413                                      |  |
|                            | 136.9                       | 0.0419   | -   |  | 71.2<br>104.0  | -  | 0.9515<br>0.9638                            |  |
| 120.00                     | 36.5<br>69.9                | 0.0174<br>0.0478                                 | -   | 100.00   | 137.6<br>13.4  | -  | 0.9689<br>0.5471                            |  |
|                            |                             |  | AUXILIARY                                 | INFORMATIC   | N              |  |   |  |
| METHOD /                   | APPARAT                     | US/PROCEDURE :                                   |   | SOURCE AN  | D PURITY       | OF MATERIALS:                                    |   |  |
| Vapor                      | recircu                     | lation system s                                  | imilar to                                 | 1. No  | details        | s given.   |   |  |
| that i<br>with B<br>measur | n ref.<br>ourdon<br>ed with | l. Pressure m<br>gauge. Temper<br>platinum resis | easured<br>ature<br>tance                 | 2. Ult   | rapure         | purity better<br>per cent.                       | than  |  |
| vapor                      |                             | Samples of li<br>d by gas chroma<br>urce.        |   |  |                |  |   |  |
|                            |                             |  |   |  |                |  |   |  |
|                            |                             |  |   |  |                |  |   |  |
|                            |                             |  |   | $\begin{array}{l} \text{ESTIMATED} \\ {}^{\delta} \mathbf{T}/\mathbf{K} &= \pm \\ {}^{\delta} x_{\mathbf{He}} &\cong \delta \end{array}$ | A A12.         | $\delta P/\text{bar} = \pm 0.$<br>= 0.002 or ±2% | 07;<br>whichever                            |  |
|                            |                             |  |   | is great   | er.            |  |   |  |
|                            |                             |  |   | REFERENCE  |                |  |   |  |
|                            |                             |  |   |  |                | G. and Hiza,<br>Engng., <u>1970</u>              |   |  |
|                            |                             |  |   |  |                |  |   |  |
|                            |                             |  |   |  |                |  |   |  |

| COMPON | COMPONENTS:   |   |  |                      | MEASUREMENTS:                                    |                    |
|--------|---|---|--|----------------------|--|--------------------|
|        |   |   |  | Parrish,<br>J. Chem. | W. R. and Stewart,<br>Engng. Data, <u>1975</u> , | W. G.,<br>20, 412. |
| г/к    | P/bar   | Mole fractio<br>in liquid,<br><sup>#</sup> He | n of helium<br>in vapor,<br><sup>y</sup> He  |                      |  |                    |
| 100.0  | 27.4<br>27.9<br>29.3<br>39.0<br>41.4<br>57.0<br>69.8<br>70.2                                |   | 0.7594<br>0.7596<br>0.7712<br>0.8195<br>0.8279<br>0.8668<br>0.8863<br>0.8863<br>0.8865                     | _                    |  |                    |
| L20.0  | 103.9<br>131.0<br>131.8<br>132.7<br>132.9<br>29.3<br>42.5<br>56.7<br>70.5<br>103.8<br>137.1 |   | 0.9154<br>0.9274<br>0.9275<br>0.9281<br>0.9282<br>0.2401<br>0.4053<br>0.5082<br>0.5806<br>0.6735<br>0.7256 |                      |  |                    |
|        |   |   |  |                      |  |                    |
|        |   |   |  |                      |  |                    |
|        |   |   |  |                      |  |                    |
|        |   |   |  |                      |  |                    |
|        |   |   |  |                      |  |                    |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| COMENTS.  | OLIGINAL MEASUREMENIS:   |
| (l) Helium; He; 7440-59-7   | Sinor, J. E. and Kurata, F., J. Chem.  |
| (2) Carbon monoxide; CO; 630-08-0   | Eng. Data, <u>1966</u> , 11, 537.  |
|   |  |
|   |  |
| VARIABLES:  | PREPARED BY:   |
| Temperature, pressure   | C. L. Young  |
|   | -  |
| EXPERIMENTAL VALUES:  | ······································   |
| T/K P/bar Mole fraction o   | f helium in liquid, <i>x</i> <sub>He</sub>   |
| 77.35 17.2 34.5   | 0.0030<br>0.0045   |
| 51.7<br>68.95   | 0.0062<br>0.0073   |
| 86.18   | 0.0094   |
| 103.4<br>120.7  | 0.0106<br>0.0122   |
| 137.9   | 0.0134   |
| 93.15 17.2<br>34.5  | 0.0042<br>0.0090   |
| 51.7  | 0.0135   |
| 68.95<br>86.18  | 0.0189<br>0.0221   |
| 103.4   | 0.0249   |
| 120.7<br>137.9  | 0.0300<br>0.0328   |
| 11.15 34.5<br>51.7  | 0.0164   |
| 68.95   | 0.0290<br>0.0396   |
| 86.18<br>103.4  | 0.0510<br>0.0605   |
| 120.7   | 0.0700   |
| 137.9<br>128.15 51.7  | 0.0781<br>0.0424   |
| 68.95   | 0.0693   |
| 86.18<br>103.4  | 0.0965<br>0.1214   |
| 120.7<br>137.9  | 0.1455   |
|   | INFORMATION  |
| METHOD/APPARATUS/PROCEDURE:   | SOURCE AND PURITY OF MATERIALS:  |
| Static equilibrium cell (0.1 & capa-                                      | 1. U.S. Bureau of Mines sample maxi-   |
| city) fitted with magnetic stirrer.<br>Temperature measured with platinum | mum impurity 12 parts per million.<br>2. Olin-Matheson sample purity 99.5  |
| resistance thermometer. Pressure  | mole per cent.   |
| measured with Bourdon gauge.<br>Contents charged into cell, equili-       |  |
| brated liquid samples withdrawn and                                       |  |
| analysed by G.C. Details in source and ref. 1.                            |  |
|   |  |
|   |  |
|   | ESTIMATED ERROR:   |
|   | $\delta T/K = \pm 0.02;  \delta P/bar = \pm 0.1; \\ \delta x_{He} = \pm 1 \$ \text{ or } \pm 0.0003 \text{ (whichever is}$   |
|   | He greater)  |
|   | REFERENCES:  |
|   | <ol> <li>Sinor, J. E., Schindler, D. L.<br/>and Kurata, F., Am. Inst. Chem.<br/>Engnrs. J., <u>1966</u>, 12, 353.</li> </ol> |
|   |  |
|   |  |
|   |  |

| COMPONENTS:   | EVALUATOR:  |
|---|---|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Carbon dioxide; CO<sub>2</sub>; 124-38-9</li> </ol> | Colin Young,<br>School of Chemistry,<br>University of Melbourne,<br>Parkville, Victoria, 3052<br>AUSTRALIA. |

CRITICAL EVALUATION:

The solubility of helium in carbon dioxide has been studied at high pressures by Tsiklis (1), MacKendrick *et al.* (2) and Burfield *et al.* The study of Tsiklis covered the temperature range 298 K to 353 K and its main aim was to discover the phase behaviour in order to establish that this mixture exhibits gas-gas immiscibility. It was found to exhibit gas-gas immiscibility of the first kind (3). Since only graphical data were presented, these are rejected for the present purposes.

The data of MacKenrick *et al.* (2), while not of the highest precision, appear to be self-consistent and are classified as tentative. The data of Burfield *et al.* (4) are slightly ( $\sim$  5%) lower than those of MacKendrick *et al.* and are classified as tentative.

## References

- 1. Tsiklis, D. S., Doklady Acad. Nauk S.S.S.R., 1952. 86, 1159.
- MacKendrick, R. F., Heck, C. K. and Barrick, P. L., J. Chem. Engng. Data 1968, 13, 352.
- Schneider, G. M., in Chemical Thermodynamics Vol. 2 Specialist Periodical Report, Chapter 4, ed. McGlashan, M. L., Chemical Society, London, <u>1978</u>.
- 4. Burfield, D. W., Richardson, H. P. and Guereca, R. A., Am. Inst. Chem. Engnrs. J., 1970, 16, 97.

| COMPONENT   | TS:   |   |  | ORIGINAL MEASUREMENTS:<br>Burfield, D. W., Richardson, H. P.<br>and Guereca, R. A., Am. Inst. Chem.<br>Engnrs. J., <u>1970</u> , 16, 97. |  |  |  |
|---|---|---|--|--|--|--|--|
|   |   | e; 7440-59-7<br>xide; CO <sub>2</sub> ; 1   | 24-38-9  |  |  |  |  |
| VARIABLE  | S:  | <u> </u>  |  | PREPARED   | BY:  | <del></del>  |  |
| Tempera   | Temperature, pressure   |   |  |  | oung   |  |  |
| EXPERIME  | NTAL VALU   | ES:   |  |  |  |  |  |
| T/K   | P/bar   | Mole fraction<br>in liquid,<br><sup>x</sup> He  |  |  | P/bar  | Mole fraction<br>in liquid,<br><sup><i>xx</i></sup> He                                 | of helium<br>in vapor<br><sup>y</sup> He   |
| 293.13  | 57.31<br>66.06<br>77.42<br>88.04<br>97.03<br>106.77<br>121.10<br>129.09<br>141.11<br>34.99<br>37.81<br>40.84<br>49.48<br>51.70<br>61.67<br>67.30<br>75.50 | 0.0069<br>0.0137<br>0.0190<br>0.0237<br>0.0303<br>0.0370<br>0.0427<br>0.0493<br>0.0000<br>0.0010<br>0.0010<br>0.0022<br>0.0029<br>0.0048          | 0.0000<br>0.0705<br>0.1380<br>0.2466<br>0.2843<br>0.3429<br>0.3889<br>0.4160<br>0.0000<br>0.0448<br>0.0941<br>0.1434<br>0.2225<br>0.3197<br>0.3630<br>0.4232 | 273.26   | 81.98<br>89.00<br>108.15<br>129.12<br>136.38<br>19.84<br>29.84<br>35.37<br>47.36<br>55.36<br>64.07<br>77.43<br>90.70<br>110.20<br>117.19<br>138.88 | 0.0210<br>0.0268<br>0.0293<br>0.0310<br>0.0000<br>0.0020<br>0.0041<br>0.0055<br>0.0070 | 0.4594<br>0.4983<br>0.5775<br>0.6394<br>0.6569<br>0.0000<br>0.2860<br>0.3494<br>0.5070<br>0.5723<br>0.6300<br>0.6836<br>0.7323<br>0.7876<br>0.7991<br>0.8183 |
| Recircu<br>with ma<br>measure<br>against<br>tempera<br>couple.<br>analyse | lating v<br>gnetic p<br>d with f<br>dead we<br>ture mea<br>Samp]  | S/PROCEDURE:<br>vapor flow app<br>pump. Pressu<br>transducer cal<br>eight piston b<br>asured with the<br>les of coexist<br>as spectromete<br>rce. | re<br>ibrated<br>alance;<br>ermo-<br>ing phases  | SOURCE AN<br>1. Bur<br>tot<br>mil<br>2. Pur<br>cen<br>ESTIMATE   | ND PURITY<br>eau of M<br>al impur<br>lion.<br>ity bett<br>t.<br>D ERROR:   | OF MATERIALS;<br>Mines, Ultrapun<br>rities 35 parts<br>fer than 99.98                  | s per<br>mole per  |
|   |   |   |  | δТ/К =   | ±0.05;<br>to 0.00  | $\delta P/bar = \pm 0.1;$<br>005; $\delta y_{He} = \pm 0$                              |  |

| COMPONE   | COMPONENTS:  |   |   |   | ORIGINAL MEASUREMENTS:  |  |   |  |
|---|--|---|---|---|---|--|---|--|
|   |  |   |   |   | MacKendrick, R. F., Heck, C. K. and<br>Barrick, P. L., J. Chem. Engng. Data,<br><u>1968</u> , 13, 352.  |  |   |  |
| VARIABL   | ES:  |   |   | PREPARED  | RV ·  |  |   |  |
|   | Temperature, pressure  |   |   |   | foung   |  |   |  |
|   |  |   |   |   |   |  |   |  |
| EXPERIM   | ENTAL VAL  |   |   |   |   |  |   |  |
| т/к   | P/bar  | Mole fraction<br>in liquid,<br><sup>x</sup> He  |   |   |   | lole fraction<br>n liquid,<br><sup>x</sup> He  | of helium<br>in vapor,<br><sup>y</sup> He   |  |
| 219.9<br>229.9<br>244.9   | $\begin{array}{r} 9.93\\ 11.75\\ 16.52\\ 36.17\\ 90.38\\ 123.0\\ 145.4\\ 162.2\\ 193.3\\ 14.6\\ 14.8\\ 29.8\\ 45.4\\ 63.9\\ 91.0\\ 122.9\\ 160.1\\ 161.5\\ 194.3\\ 196.1\\ 19.76\\ 29.79\\ 40.12\\ 49.95\\ 52.79\end{array}$ | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>0.00581<br>0.00868<br>0.0103<br>0.0114<br>0.0141<br>0.00241<br>0.00241<br>0.00241<br>0.00529<br>0.00944<br>0.0129<br>0.0167<br>-<br>-<br>-<br>-<br>-<br>-<br>0.0195<br>-<br>-<br>-<br>-<br>0.00195<br>-<br>-<br>-<br>-<br>0.00440<br>0.000443 | 0.372<br>0.460<br>0.621<br>0.817<br>0.9225<br>0.9419<br>0.9498<br>0.9543<br>0.9612<br>0.354<br>0.674<br>0.779<br>0.836<br>0.880<br>0.9118<br>0.9325<br>0.9407<br>0.198<br>0.441<br>0.570<br>0.653 | 244.9<br>259.9<br>274.9                         | $\begin{array}{c} 85.32\\ 99.20\\ 99.60\\ 108.8\\ 140.2\\ 157.1\\ 159.5\\ 176.7\\ 177.3\\ 190.5\\ 200.3\\ 202.2\\ 40.2\\ 45.3\\ 59.1\\ 61.6\\ 88.3\\ 104.0\\ 104.8\\ 141.7\\ 168.4\\ 197.1\\ 43.16\\ 46.31\\ 56.03 \end{array}$ |  | 0.784<br>0.810<br>0.823<br>0.864<br>0.874<br>0.883<br>0.893<br>0.322<br>0.383<br>0.515<br>0.529<br>0.653<br>0.708<br>0.771<br>0.801<br>0.824<br>0.109<br>0.149<br>0.247 |  |
|   |  |   | AUXILIARY   | INFORMATI                                       | LON   |  |   |  |
| METHOD  | /APPARAT   | US/PROCEDURE:   |   | SOURCE AND PURITY OF MATERIALS;                 |   |  |   |  |
| METHOD /APPARATUS/PROCEDURE:<br>Vapor recirculated through cell.<br>Liquid and vapor samples analysed by<br>gas chromatography. Pressure measu-<br>red by Bourdon gauge and temperature<br>with platinum resistance thermometer.<br>Details in source and ref. 1 and 2. |  |   | · · ·   |   | 5 or better.<br>or better.  |  |   |  |
|   |  |   |   | $\delta T/K = bar) = \pm \delta x_{He} \approx$ | 0.3 (abov $\delta(1-y)_{He}$  | <pre>P/bar = ±0.1 ve 100 bar); = ±5%.</pre>  | (up to 100  |  |
|   |  |   |   | Adv.<br>2. Span<br>Barr                         | ing, R. M<br>Cryogeni<br>o, J. O.,  | N. and Barric<br><i>ic Eng.</i> , <u>1965</u><br>, Heck, C. K.<br>L., <i>J. Chem</i> .<br>13, 168. | <i>, 10</i> , 151.<br>and   |  |

| COMPONE   | ENTS:                   |  |   | ORIGINAL MEASUREMENTS:   |  |  |
|---|-------------------------|--|---|--|--|--|
| <ul> <li>(1) Helium; He; 7440-59-7</li> <li>(2) Carbon dioxide; CO<sub>2</sub>; 124-38-9</li> </ul> |                         |  |   | MacKendrick, R. F., Heck, C. K. and<br>Barrick, P. L., J. Chem. Engng. Data,<br>1968, 13, 352. |  |  |
| EXPERI  | MENTAL V                | ALUES:   |   |  |  |  |
| т/к   | P/bar                   | Mole fraction<br>in liquid,<br><sup>x</sup> He |   |  |  |  |
| 274.9   |                         | 0.0162<br>0.0241<br>0.0371                     | 0.461<br>0.527<br>0.618<br>-<br>0.695<br>0.696<br>0.736 |  |  |  |
| 289.9   | 62.01<br>84.10<br>85.72 | 0.0184   | 0.0760  |  |  |  |

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| COMPONEI   | OMPONENTS:   |  |  | ORIGINAL MEASUREMENTS:  |  |  |  |
|--|--|--|--|---|--|--|--|
|  | Helium; He <sup>3</sup> ;<br>h-Deuterium;  | <pre>: 14762-55-1<br/>n-D₂; 7782-39-0</pre>  |  | M. J., Nat. 1<br>Note 621, <u>19</u>  | Bur. Standards,<br>1 <u>2</u> .  |  |  |
| VARIABL  | ES:  |  | PREPARED BY:   |   |  |  |  |
|  | cature, press  | sure   | C. L.  |   |  |  |  |
|  | ENTAL VALUES:  |  |  |   |  |  |  |
|  |  |  |  |   |  |  |  |
| т/к  | Mole<br>P/bar  | fraction of helium<br>in liquid,<br><sup>x</sup> He <sup>3</sup>   | т/к  | Mole<br>P/bar   | e fraction of helium<br>in liquid,<br><sup>°°</sup> He <sup>3</sup>  |  |  |
| 20.00<br>22.00<br>24.00  | 0.2945<br>3.496<br>6.244<br>9.418<br>11.859<br>14.637<br>0.6082<br>5.078<br>7.553<br>9.722<br>12.432<br>16.338<br>1.1204<br>4.071<br>5.730<br>6.578<br>8.840<br>9.219<br>9.342 | 0.0000<br>0.0065(2)<br>0.0065(2)<br>0.0083(2)<br>0.0086(3)<br>0.0080<br>0.0072(5)<br>0.0086(8)<br>0.0090(5)<br>0.0104<br>0.0000<br>0.0060(5)<br>0.0104<br>0.0091(5)<br>0.0098(1)<br>0.0107<br>0.0109 | 24.00<br>26.00<br>28.00<br>30.00   | 11.301<br>13.769<br>13.927<br>1.8892<br>5.816<br>7.040<br>8.718<br>11.348<br>15.651<br>2.9820<br>9.457<br>11.876<br>15.010<br>4.4678<br>9.105<br>10.656<br>13.534<br>17.816 | 0.0114<br>0.0118<br>0.0124<br>0.0000<br>0.0090(8)<br>0.0106<br>0.0122<br>0.0142<br>0.0170<br>0.0000<br>0.0122<br>0.0158<br>0.0187<br>0.0000<br>0.0130<br>0.0155<br>0.0192<br>0.0257<br>(cont.) |  |  |
|  | <u></u>  | AUXILIARY  | INFORMAT   | 10N   |  |  |  |
| METHOD   | /APPARATUS/P   | ROCEDURE :   | SOURCE A   | AND PURITY OF MA  | ATERIALS:  |  |  |
| METHOD /APPARATUS/PROCEDURE:<br>Recirculating vapor flow apparatus<br>with copper equilibrium cell. Re-<br>circulating pump described in ref. 1.<br>Temperature measured with platinum<br>resistance thermometer and pressure<br>measured with a double-revolution<br>Bourdon gauge. Samples of gas and<br>liquid analysed by gas chromatography<br>using thermistor thermal conductivity<br>detectors. Details in source and<br>ref. 2. |  |  | per  | cent He4.   | ontaining 1.4 mole<br>.2% HD and 0.02% H <sub>2</sub> .  |  |  |
|  |  |  | $\delta T/K = \delta x_{He^{3}},$<br>REFEREN<br>1. Hizz<br><i>Rev</i><br>2. Dunc | CES:<br>A, M. J. and<br>Sci. Instr.<br>Can, A. G. an  | <pre>ar = ±0.004;<br/>or 0.001 whichever<br/>is greater.<br/>Duncan, A. G.,<br/>, <u>1969</u>, 40, 513.<br/>d Hiza, M. J.,<br/>g., <u>1970</u>, 15, 42.</pre>                                  |  |  |

| COMPON  | ENTS:                    |                               | ORIGINAL MEASUREMENTS:            |  |  |  |
|---|--------------------------|-------------------------------|-----------------------------------|--|--|--|
| (1) H   | elium; He <sup>3</sup> ; | 14762-55-1                    | Hiza, H. J., Nat. Bur. Standards, |  |  |  |
| (2) n-Deuterium; n-D <sub>2</sub> ; 7782-39-0 |                          |                               | Tech. Note 621, <u>1972</u> .     |  |  |  |
| (2) 11  | beacer 1 mm,             |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
| EXPERIN                                       | MENTAL VALUES            | :                             |                                   |  |  |  |
|   |                          | le fraction of hel            | ium                               |  |  |  |
| Т/К   | P/bar                    | in vapor,<br><sup>Y</sup> He³ |                                   |  |  |  |
|   |                          | •не•                          |                                   |  |  |  |
| 20.00   | 0.2945                   | 0.0000                        |                                   |  |  |  |
|   | 5.286 5.664              | 0.9284(7)<br>0.9305(8)        |                                   |  |  |  |
|   | 8.553                    | 0.9488(8)                     |                                   |  |  |  |
|   | 12.604                   | 0.9597(5)                     |                                   |  |  |  |
| 24 00   | 15.844<br>1.1205         | 0.9641(3)                     |                                   |  |  |  |
| 24.00   | 3.682                    | 0.0000<br>0.6501              |                                   |  |  |  |
|   | 8.343                    | 0.8202                        |                                   |  |  |  |
|   | 12.504                   | 0.8635                        |                                   |  |  |  |
| 28.00   | 16.044<br>2.9820         | 0.8846<br>0.0000              |                                   |  |  |  |
| 20.00   | 8.808                    | 0.5813                        |                                   |  |  |  |
|   | 12.404                   | 0.6725                        |                                   |  |  |  |
| 30.00   | 14.603<br>4.4678         | 0.7078<br>0.0000              |                                   |  |  |  |
| 30.00   | 7.501                    | 0.3259                        |                                   |  |  |  |
|   | 10.035                   | 0.4531                        |                                   |  |  |  |
|   | 13.321                   | 0.5542                        |                                   |  |  |  |
|   | 17.161                   | 0.6192                        |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
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|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
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|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |
|   |                          |                               |                                   |  |  |  |

| COMPONENT | rs:                        |                                       | ORIGINAL                          | MEASUREMENTS:                          |   |  |
|-----------|----------------------------|---------------------------------------|-----------------------------------|--|---|--|
| (1) H     | Helium; He <sup>4</sup> ;  | 7440-59-7                             | Hiza, M. J., Nat. Bur. Standards, |  |   |  |
|           |                            | n-D <sub>2</sub> ; 7782-39-0          | 1                                 | Note, 621, 1                           |   |  |
|           | -Deuterrun;                | n-D <sub>2</sub> ; //82-39-0          |                                   |  |   |  |
|           |                            |                                       |                                   |  |   |  |
| VARIABLE  | S:                         |                                       | PREPARED BY:                      |  |   |  |
| Temper    | ature, pressu              | ıre                                   | с. г.                             | Young                                  |   |  |
|           |                            |                                       |                                   |  |   |  |
| EXPERIMEN | NTAL VALUES:<br>Mole       | fraction of helium                    | ı                                 | Mole                                   | fraction of helium                                  |  |
| т/к       | P/bar                      | in liquid,                            | т/к                               | P/bar                                  | in liquid,  |  |
|           |                            | <sup>"</sup> He <sup>4</sup>          |                                   |  | <sup>x</sup> He <sup>4</sup>                        |  |
| 20.00     | 0.0045                     | 0.00000                               |                                   |  | 0.0100  |  |
| 20.00     | 0.2945<br>9.846            | 0.00000<br>0.0085(5)                  | 26.00                             | 12.069<br>13.983                       | 0.0182<br>0.0200                                    |  |
|           | 13.420                     | 0.0092(6)                             |                                   | 17.375                                 | 0.0212  |  |
|           | 16.941<br>19.450           | 0.0099(7)<br>0.0101                   |                                   | 19.664<br>20.154                       | 0.0252<br>0.0247                                    |  |
| 22.00     | 0.6082                     | 0.00000                               | 28.00                             | 2,9820                                 | 0.0000  |  |
|           | 8.515                      | 0.0099(2)                             |                                   | 6.805                                  | 0.0103  |  |
| 1         | 10.363<br>14.093           | 0.0106<br>0.0133                      |                                   | 7.112<br>10.294                        | 0.0109<br>0.0148                                    |  |
| [         | 17.285                     | 0.0136                                |                                   | 15.461                                 | 0.0236  |  |
| 24 00     | 20.063                     | 0.0154                                |                                   | 18.795                                 | 0.0278  |  |
| 24.00     | 1.1204<br>8.712            | 0.00000<br>0.0126                     |                                   | 19.153<br>20.016                       | 0.0277<br>0.0292                                    |  |
|           | 10.639                     | 0.0143                                | 30.00                             | 4.4678                                 | 0.0000  |  |
|           | 13.841                     | 0.0157                                |                                   | 8.943                                  | 0.0136  |  |
|           | 17.127<br>20.257           | 0.0195<br>0.0200                      |                                   | 11.604<br>14.210                       | 0.0192<br>0.0249                                    |  |
| 26.00     | 1.8892                     | 0.00000                               |                                   | 16.493                                 | 0.0290  |  |
|           | 8.643                      | 0.0146                                |                                   | 20.670                                 | 0.0367  |  |
|           | 9.329                      | 0.0142                                |                                   | 20.684                                 | 0.0341  |  |
|           |                            |                                       |                                   |  | (cont.)   |  |
|           |                            | AUXILIARY                             | INFORMATI                         | 0N                                     |   |  |
| METHOD /  | APPARATUS/PRO              | CEDURE :                              | SOURCE AN                         | D PURITY OF MAT                        | ERIALS:   |  |
|           |                            | flow apparatus                        |                                   |  | lines A grade                                       |  |
| with c    | opper equilib              | rium cell. Re-                        | sam                               | ple.                                   | -   |  |
|           |                            | scribed in ref. 1.<br>d with platinum | 2. USA                            | EC sample 1.1                          | 2% HD and 0.02%                                     |  |
|           |                            | ter and pressure                      | H <sub>2</sub> .                  |  |   |  |
|           |                            | ble revolution                        |                                   |  |   |  |
| Bourdon   | n gauge. Sa<br>analysed by | mples of gas and gas chromatography   |                                   |  |   |  |
| using     | thermistor th              | ermal conductivity                    | ļ                                 |  |   |  |
| detecto   | ors. Detail                | s in source and                       |                                   |  |   |  |
| ref. 2    | •                          |                                       |                                   |  |   |  |
|           |                            |                                       | ESTIMATEI                         | FRROP.                                 |   |  |
|           |                            |                                       | δ π / κ =                         | ±0.01: δP/b                            | $ar = \pm 0.004;$                                   |  |
|           |                            |                                       | δ <sup>x</sup> He <sup>4</sup>    | $\delta y_{\mathrm{He}^{4}} = \pm 3\%$ | or 0.001 whichever<br>is greater.                   |  |
|           |                            |                                       | REFERENCE                         | S:                                     |   |  |
|           |                            |                                       | l. Hiza                           | a, M. J. and                           | Duncan, A. G.,<br>, 1969, 40, 513.                  |  |
|           |                            |                                       | 2. Dunc                           | can, A. G. an                          | d Hiza, M. J.,<br>g., <u>1970</u> , <i>15</i> , 42. |  |
|           |                            |                                       | ]                                 |  |   |  |
|           |                            |                                       | I                                 |  |   |  |

COMPONENTS: (1) Helium; He<sup>+</sup>; 7440-59-7 (2) n-Deuterium; n-D<sub>2</sub>; 7782-39-0 EXPERIMENTAL VALUES:

| т/к   | P/bar                               | Mole fraction of helium<br>in vapor,<br><sup>y</sup> He <sup>4</sup> |
|-------|-------------------------------------|--|
| 20.00 | 6.832<br>10.042<br>13.696<br>18.254 | 0.9397(1)<br>0.9542(5)<br>0.9607(8)<br>0.9651(1)                     |
| 24.00 | 4.037<br>8.453<br>14.221<br>20.439  | 0.6857<br>0.8240<br>0.8783<br>0.8995                                 |
| 28.00 | 8.098<br>10.642<br>15.744<br>19.281 | 0.5564<br>0.6312<br>0.7116<br>0.7477                                 |
| 30.00 | 7.243<br>10.556<br>15.431<br>20.274 | 0.2095<br>0.4665<br>0.5873<br>0.6444                                 |

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |
|--|---|
| COMPONENTS.  |   |
| (1) Helium; He; 7440-59-7  | Cannon, W. A. and Crane, W. E.,<br>Cryogenic Tech., <u>1968</u> , 4, 178.                               |
| (2) Fluorine; F <sub>2</sub> ; 7782-41-4                                   |   |
|  |   |
|  |   |
| VARIABLES:   | PREPARED BY:  |
| Temperature, pressure  | C. L. Young   |
| -  |   |
| EXPERIMENTAL VALUES:   |   |
| Mole fraction of<br>T/K P/bar helium in liquid<br>phase, <sup>x</sup> He   |   |
|  |   |
| 77 4.5 0.0002<br>77 18.3 0.0007  |   |
| 77 35.5 0.0013   |   |
| 12020.80.001612031.20.0059   |   |
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|  |   |
|  |   |
| AUXILIARY  | INFORMATION   |
| METHOD /APPARATUS/ PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:   |
| System equilibrated in stainless steel                                     |   |
| equilibrium cell (which was occasional-<br>ly agitated). Samples of liquid | cent.<br>2. Sample purity 98.5 mole per cent  |
| phase analysed by mass spectrometry.                                       | passed through sodium fluoride  |
| Details in source.   | pellets to remove hydrogen fluoride.  |
|  |   |
|  |   |
|  |   |
|  |   |
|  | ESTIMATED ERROR:  |
|  | $\delta T/K = \pm 0.2;  \delta P/bar = \pm 0.3;$<br>$\delta x_{He} = \pm 0.0001  (\text{estimated by})$ |
|  | He compiler)  |
|  | REFERENCES :  |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |

| COMPO | NENTS:    |                   |            | EVALUATOR:  |
|-------|-----------|-------------------|------------|---|
| 1.    | Helium-3; | He <sup>3</sup> ; | 14762-55-1 | Colin Young,  |
| 2.    | Hydrogen; | H <sub>2</sub> ;  | 1333-74-0  | School of Chemistry,<br>University of Melbourne,<br>Parkville, Victoria 3052,<br>AUSTRALIA. |

There are two sets of data reported for this system. Matyash, Mank and Starkov (2) report one isotherm at 20.4 K up to 9.3 bar and a few points at higher and lower temperatures to indicate the temperature dependence. Hiza (1) has reported a more detailed study at 22.00 K to 28.00 K up to pressures of 15.4 bar. There is some discrepancy between the values of Matyash *et al.* (2) and those extrapolated to the same temperature using Hiza's data. Matyash *et al.*'s mole fraction of helium in the liquid phase is consistently lower than Hiza's extrapolated data particularly at lower pressures.

It is difficult to classify these data as both appear to be of high precision but in view of the accuracy of other studies by Hiza in the same publication (1) we classify Hiza's data as tentative and Matyash etal.'s (2) data as doubtful.

1. Hiza, M. J., Nat. Bur. Standards Techn. Note 621, 1972.

 Matyash, I. V., Mank, V. V. and Starkov, M. G., Ukr. Fiz. 2h., <u>1966</u>, 11, 497.

```
COMPONENTS:
                                             ORIGINAL MEASUREMENTS:
 1. Helium-3; He<sup>3</sup>; 14762-55-1
                                              Matyash, I. V., Mank, V. V. and
                                              Starkov, M. G., Ukran. Fiz. Zhur.,
 2. Hydrogen; H<sub>2</sub>; 1333-74-0
                                              1966, 11, 497.
VARIABLES:
                                             PREPARED BY:
 Temperature, pressure
                                              C. L. Young
EXPERIMENTAL VALUES:
                         Mole fraction of helium-3
 T/K
            P/bar
                               in liquid, x<sub>He<sup>3</sup></sub>
 17.2
              5.7
                                  0.0039
              7.4
                                  0.0041
 19.0
              4.3
                                  0.0036
              6.1
                                  0.0059
                                  0.0072
              8.1
 20.4
              2.0
                                  0.0019
              3.6
                                  0.0041
              4.3
                                  0.0051
              4.9
                                  0.0053
              8.1
                                  0.0092
              9.3
                                  0.0103
 23.0
              4.9
                                  0.0065
 24.0
              4.9
                                  0.0082
                                   AUXILIARY INFORMATION
METHOD :
                                             SOURCE AND PURITY OF MATERIALS:
Helium in liquid estimated by
                                                      No details given.
measuring nuclear magnetic resonance
absorption.
                                             ESTIMATED ERROR:
                                             \delta T/K = \pm 0.1; \quad \delta P/bar = \pm 0.1;
                                             \delta x_{\rm He} = ±0.0003 (estimated by compiler)
                                             REFERENCES:
```

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
|   |  |
| (1) Helium; He <sup>3</sup> ; 14762-55-1                                      | Hiza, M. J., Nat. Bur. Standards<br>Tech. Note 621, 1972.                                    |
| (2) n-Hydrogen; n-H <sub>2</sub> ; 1333-74-0                                  | 1972.  |
|   |  |
|   |  |
| VARIABLES:  | PREPARED BY:   |
| Temperature, pressure .   | C. L. Young  |
|   |  |
| EXPERIMENTAL VALUES:  |  |
| Mole fraction of<br>T/K P/bar helium in liquid,                               |  |
| <sup><i>x</i></sup> <sub>He</sub> <sup>3</sup>                                |  |
| 22.00 1.5824 0.0000   |  |
| 8.298 0.0123<br>10.601 0.0151   |  |
| 13.724 0.0201<br>15.134 0.0215  |  |
| 24.00 2.565 0.0000  |  |
| 7.967 0.0137<br>10.374 0.0176   |  |
| 12.790 0.0221   |  |
| 14.979 0.0285<br>26.00 3.9334 0.0000  |  |
| 7.825 0.0113<br>10.435 0.0178   |  |
| 13.621 0.0285   |  |
| 15.375 0.0331<br>28.00 5.7295 0.0000  |  |
| 9.301 0.0148<br>11.700 0.0227   |  |
| 13.172 0.0280   |  |
| 15.406 0.0368   |  |
|   |  |
|   |  |
|   |  |
| AUXILIARY   | INFORMATION  |
| METHOD /APPARATUS/PROCEDURE:  |  |
| Recirculating vapor flow apparatus.   | SOURCE AND PURITY OF MATERIALS:  |
| Copper equilibrium cell. Recircula-   | He <sup>4</sup> .  |
| ting pump described in ref. 1. Tem-<br>perature measured with platinum resis- | 2. Purified sample equilibrated for several months.  |
| tance thermometer and pressure measu-   |  |
| red with a double-revolution Bourdon<br>gauge. Samples of gas and liquid      |  |
| analysed by gas chromatography using thermistor thermal conductivity de-      |  |
| tectors. Details in source and ref.   |  |
| 2.  |  |
|   | ESTIMATED ERROR:   |
|   | $\delta T/K = \pm 0.01;  \delta P/bar = \pm 0.004; \\ \delta x_{He^3} = \pm 0.001.$          |
|   | He'  |
|   | REFERENCES :   |
|   | 1. Hiza, M. J. and Duncan, A. G.,  |
|   | <i>Rev. Sci. Inst.</i> , <u>1969</u> , <i>40</i> , 513.<br>2. Duncan, A. G. and Hiza, M. J., |
|   | Adv. Cryog. Engng., <u>1970</u> , 15, 42.  |
|   |  |
| ~   |  |
|   |  |

| COMPO | NENTS:    |                   |           | EVALUATOR:                |
|-------|-----------|-------------------|-----------|---------------------------|
| 1.    | Helium-4; | He <sup>4</sup> ; | 7440-59-7 | Colin Young,              |
|       |           |                   |           | School of Chemistry,      |
| 2.    | Hydrogen; | H <sub>2</sub> ;  | 1333-74-0 | University of Melbourne,  |
|       |           |                   |           | Parkville, Victoria 3052, |
|       |           |                   |           | AUSTRALIA.                |

There are five sets of data on this system but no two sets are in complete accord. The unpublished data by Smith (1) at 17.4 K, 20.4 K and 21.7 K are consistent within a few percent of those of Streett *et al.* (2) only at 20.4 K. Smith's (1) data at 21.7 K appear quite erratic and there is a discrepancy of 30-50 percent between the data of Streett *et al.* (2) and those of Smith (1) at 17.4 K. Smith's data are therefore rejected.

The helium-4 + normal hydrogen data of Streett *et al.* (2), Sneed *et al.* (3) and the helium-4 + para hydrogen data of Sonntag *et al.* (4) are broadly consistent with the data of Hiza (5). However there appears to be some discrepancies of up to 20 percent in the mole fraction of helium in the liquid phase in the lower pressure range (below 10 bar). The consistency of the data of Streett *et al.* (2), Sneed *et al.* (3) and Sonntag *et al.* (4) should not be over-emphasised since the apparatus was essentially the same and all compositions were estimated by mass spectrometry in all three studies. The data of Streett *et al.* (2), Sneed *et al.* (3) Sonntag *et al.* (4) and Hiza (5) are all classified as tentative.

The only other data are those of Roellig and Giese (6) which are of lower precision than and not completely consistent with those measurements discussed in the previous paragraph and are therefore classified as doubtful.

## References

- 1. Smith, S. R., Ph.D. Thesis, Ohio State University, Columbus, 1952.
- Streett, W. B., Sonntag, R. E. and Van Wylen, G. J., J. Chem. Phys., 1964, 40, 1390.
- Sneed, C. M., Sonntag, R. E. and Van Wylen, G. J., J. Chem. Phys., <u>1968</u>, 49, 2410.
- Sonntag, R. E., Van Wylen, G. J. and Crain, R. W., J. Chem. Phys., <u>1964</u>, 41, 2399.
- 5. Hiza, M. J., Nat. Bur. Standards Techn. Note 621, 1972.
- 6. Roellig, L. O. and Giese, C., J. Chem. Phys., <u>1962</u>, 37, 114.

|  |   | ORIGINAL MEASUREMENTS:  |
|--|---|---|
| (1) Helium   | ; He; 7440-59-7   | Roellig, L. O. and Giese, L.,   |
| · · · · · · · · · · · · · · · · · · ·  | ,, ,440-33-7  | J. Chem. Phys., 1962, 37, 114.  |
| (2) Hydroge  | en; H <sub>2</sub> ; 1333-74-0  |   |
| VARIABLES:   |   | PREPARED BY:  |
| Temperature  | , pressure  | C. L. Young   |
| EXPERIMENTAL V   | VALUES:   |   |
| т/к  | $P^{\dagger}$ /bar  | 10 <sup>2</sup> Mole fraction of helium   |
|  |   | in liquid, x <sub>He</sub>  |
| 16.3±0.2   | 1.88±0.07   | 1.26±0.32   |
| 17.7±0.3   | 3.82±0.19   | 3.80±0.52   |
| 19.8±0.5<br>20.7±0.5   | 7.10±0.20<br>1.79±0.19  | $11.05\pm0.50$<br>0.69±0.40   |
| 20.7±0.5<br>21.6±0.5   | 3.72±0.19   | 3.01±0.61   |
| 22.3±0.4   | 7.74±0.18   | 8.35±0.74   |
| 26.8±0.2   | 2.01±0.15   | 0.59±0.06   |
| 27.3±0.3<br>28.6±0.3   | 4.38±0.26<br>6.59±0.40  | $1.03\pm0.10$<br>2.89±0.27  |
|  |   |   |
|  |   |   |
|  |   | AUXILIARY INFORMATION   |
|  | RATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:   |
| Static glass<br>with stirren<br>sampling val<br>of helium de<br>vapor phase<br>Bourdon gaug<br>sition deter<br>total amount<br>in cell and | s equilibrium cell<br>r and vapor and l<br>lues. Partial p<br>etermined from and<br>and pressure meas   | SOURCE AND FURITY OF MATERIALS:<br>l fitted<br>iquid No details given.<br>ressure<br>alysis of<br>sured with<br>le compo-<br>edge of<br>hydrogen<br>apor or                   |
| Static glass<br>with stirrer<br>sampling val<br>of helium de<br>vapor phase<br>Bourdon gaug<br>sition deter<br>total amount<br>in cell and | s equilibrium cell<br>r and vapor and l<br>lues. Partial p<br>etermined from and<br>and pressure mean<br>ge. Liquid samp<br>rmined from knowle<br>ts of helium and l<br>composition of va | SOURCE AND PURITY OF MATERIALS:<br>l fitted<br>iquid No details given.<br>ressure<br>alysis of<br>sured with<br>le compo-<br>edge of<br>hydrogen<br>apor or                   |
| Static glass<br>with stirrer<br>sampling val<br>of helium de<br>vapor phase<br>Bourdon gaug<br>sition deter<br>total amount<br>in cell and | s equilibrium cell<br>r and vapor and l<br>lues. Partial p<br>etermined from and<br>and pressure mean<br>ge. Liquid samp<br>rmined from knowle<br>ts of helium and l<br>composition of va | SOURCE AND PURITY OF MATERIALS:<br>l fitted<br>iquid No details given.<br>ressure<br>alysis of<br>sured with<br>le compo-<br>edge of<br>hydrogen<br>apor or<br>quid.          |
| Static glass<br>with stirren<br>sampling val<br>of helium de<br>vapor phase<br>Bourdon gaug<br>sition deter<br>total amount<br>in cell and | s equilibrium cell<br>r and vapor and l<br>lues. Partial p<br>etermined from and<br>and pressure mean<br>ge. Liquid samp<br>rmined from knowle<br>ts of helium and l<br>composition of va | SOURCE AND FURITY OF MATERIALS:<br>1 fitted<br>iquid No details given.<br>alysis of<br>sured with<br>le compo-<br>edge of<br>hydrogen<br>apor or<br>quid.<br>ESTIMATED ERROR: |

| COMPONENTS:   | <u> </u>   |   | ORIGINAL MEASUREMENTS:   |  |   |   |  |
|---|--|---|--|--|---|---|--|
| ,_, .   | He; 7440-59-7<br>n; H <sub>2</sub> ; 1333-74-                      |   | Sneed, C. M., Sonntag, R. E. and<br>Van Wylen, G. J., <i>J. Chem. Phys.</i> ,<br><u>1968</u> , 49, 2410. |  |   |   |  |
| VARIABLES:  |  |   | PREPAREI   | D BY:  |   |   |  |
| Temperature,  | pressure   |   | с. г.  | Young  |   |   |  |
| EXPERIMENTAL VA   | LUES:  | <u>, , , , , , , , , , , , , , , , , , , </u>               | 1  |  |   |   |  |
| T/K P/ba  | Mole fraction<br>r in liquid,<br><sup>x</sup> He                   | of helium<br>in vapor<br><sup>y</sup> He                    |  | <i>P/</i> bar  | Mole fraction<br>in liquid,<br><sup>x</sup> He              | of helium<br>in vapor,<br><sup>Y</sup> He                   |  |
| 15.50 26.6<br>34.5<br>41.4<br>51.8  | 0.0095<br>0.0112<br>0.0113<br>0.0118                               | 0.971<br>0.970<br>0.973<br>0.975                            | 26.00<br>27.80   | 103.4<br>23.6<br>34.5<br>51.6  | 0.144<br>0.066<br>0.102<br>0.166                            | 0.736<br>0.530<br>0.558<br>0.567                            |  |
| 52.5<br>17.00 29.0<br>41.3<br>51.7<br>65.4                                      | 0.0120<br>0.0157<br>0.0166<br>0.0182                               | 0.974<br>0.951<br>0.957<br>0.960                            |  | 65.5<br>82.7<br>88.1<br>91.1<br>92.9                                     | 0.205<br>0.242<br>0.253<br>0.260                            | 0.556<br>0.543<br>0.549<br>0.556                            |  |
| 82.8<br>20.40 34.5<br>41.4<br>51.8<br>65.5<br>82.8                              | 0.0189<br>0.0196<br>0.0335<br>0.0356<br>0.0405<br>0.0432<br>0.0431 | 0.962<br>0.966<br>0.897<br>0.902<br>0.903<br>0.912<br>0.920 | 28.05  | 92.9<br>103.6<br>70.3<br>90.1<br>97.3<br>103.4<br>58.6                   | 0.257<br>0.264<br>0.255<br>0.297<br>0.314<br>0.328<br>0.212 | 0.561<br>0.576<br>0.504<br>0.497<br>0.509<br>0.517<br>0.521 |  |
| 103.4<br>23.00 41.4<br>51.6<br>65.5<br>82.7                                     | 0.0450<br>0.058<br>0.065<br>0.071<br>0.076                         | 0.927<br>0.824<br>0.828<br>0.837<br>0.851                   | 28.45  | 68.7<br>70.8<br>72.7<br>78.5<br>42.9                                     | 0.264<br>0.269<br>0.279<br>0.321<br>0.150                   | 0.486<br>0.475<br>0.477<br>0.441<br>0.515                   |  |
| 103.4<br>26.00 41.3<br>52.1<br>65.5<br>82.9                                     | 0.078<br>0.092<br>0.111<br>0.138<br>0.157                          | 0.867<br>0.688<br>0.695<br>0.705<br>0.716                   |  | 51.7<br>59.6<br>63.2<br>64.9<br>66.7                                     | 0.191<br>0.252<br>0.276<br>0.297<br>0.363                   | 0.496<br>0.474<br>0.441<br>0.416<br>0.376                   |  |
|   |  | AUXILIARY   | INFORMAT   | ION  |   |   |  |
| Recirculating<br>with magnetic<br>ture. Sampl<br>spectrometry.<br>with platinum | n resistance then<br>sured using Bourd                             | t tempera-<br>nass<br>neasured<br>rmometer.                 | 1. Β<br>5. Μ<br>ESTIMATI<br>δT/K   | ureau of<br>ample.<br>atheson<br>ED ERROR:<br>= ±0.01;<br>= ±0.003<br>1. | $\delta P/\text{bar} = \pm 0$ .                             | le.   |  |
|   |  |   |  |  |   |   |  |

| COMPON  | ENTS:                                |  |   | ORIGINAL MEASUREMENTS: |                                      |  |   |  |  |
|---|--------------------------------------|--|---|------------------------|--------------------------------------|--|---|--|--|
| <ol> <li>Helium; He; 7440-59-7</li> <li>Hydrogen; H<sub>2</sub>; 1333-74-0</li> </ol> |                                      |  |   | Van Wy                 |                                      | Sonntag, R. E.<br>J., J. Chem. P               |   |  |  |
| EXPERIN<br>T/K  | MENTAL V<br>P/bar                    | ALUES:<br>Mole fraction<br>in liquid,<br><sup>x</sup> He |   |                        | P/bar                                | Mole fraction<br>in liquid,<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>y</sup> He |  |  |
| 29.00   | 29.8<br>36.3<br>41.4<br>51.7<br>52.0 |  | 0.457<br>0.469<br>0.465<br>0.380<br>0.365 | 29.80                  | 28.4<br>34.5<br>38.6<br>40.1<br>40.3 | 0.195  | 0.387<br>0.390<br>0.358<br>0.327<br>0.317 |  |  |

.

| COMPONEN   | TS:   |  |  | ORIGINAL   | MEASUREM   | ENTS:  |  |  |
|--|---|--|--|--|--|--|--|--|
|  |   | He; 7440-59-<br>H <sub>2</sub> ; 1333-7  |  | Sonntag, R. E., Van Wylen, G. J. and<br>Crain, R. W., <i>J. Chem. Phys.</i> , <u>1964</u> ,<br><i>41</i> , 2399. |  |  |  |  |
| VARIABLE   | S:<br>ature, pi   | ressure  |  | PREPARED BY:<br>C. L. Young  |  |  |  |  |
| FYPERIME   | NTAL VALUE  | ·····  |  |  |  |  |  |  |
| т/к  | P/bar   | Mole fractic   |  |  | P/bar  | Mole fraction<br>in liquid,<br><sup>x</sup> He   | of helium<br>in vapor,<br><sup>y</sup> He  |  |
| 20.40  | $\begin{array}{c} 2.39\\ 3.48\\ 5.17\\ 6.89\\ 8.62\\ 10.34\\ 12.07\\ 13.79\\ 17.24\\ 17.24\\ 20.68\\ 27.58\\ 34.47\\ 34.47\\ 4.45\\ 5.17\\ 6.96\\ 8.62\\ 10.38\\ 12.07\\ 13.79\\ 17.24\\ 20.68\\ 27.58\\ 34.57\\ 5.17\\ 5$ | 0.0023<br>0.0058<br>0.0060<br>0.0087<br>0.0102<br>0.0117<br>0.0155<br>0.0177<br>0.0225<br>0.0204<br>0.0225<br>0.0266<br>0.0294<br>0.0308<br>0.0316<br>0.0054<br>0.0055<br>0.0105<br>0.0138<br>0.0175<br>0.0227<br>0.0240<br>0.0240<br>0.0300<br>0.0365<br>0.0473 | 0.4940<br>0.6279<br>0.7280<br>0.7821<br>0.8083<br>0.8300<br>0.8471<br>0.8579<br>-<br>0.8664<br>0.8680<br>0.8872<br>0.8856<br>-<br>0.8599<br>0.4560<br>0.5220<br>0.6170<br>0.6700<br>0.7950<br>0.7910 | 23.00<br>26.00<br>29.00<br>31.00   | 34.47<br>6.96<br>10.34<br>13.79<br>17.24<br>20.68<br>27.58<br>34.47<br>9.79<br>12.03<br>13.79<br>17.34<br>20.72<br>27.61<br>34.54<br>13.79<br>17.13<br>17.24<br>20.68<br>22.34<br>22.89<br>24.13 | 0.0562<br>0.0079<br>0.0200<br>0.0303<br>0.0367<br>0.0390<br>0.0595<br>0.0637<br>0.0782<br>0.0810<br>0.0.9<br>0.0222<br>0.0305<br>0.0478<br>0.0633<br>0.1006<br>-<br>-<br>0.0217<br>0.0440<br>0.0455<br>0.0752<br>0.0908<br>- | $\begin{array}{c} 0.8250\\ 0.2966\\ 0.4557\\ 0.5355\\ 0.5877\\ 0.5952\\ 0.6300\\ 0.6651\\ 0.6505\\ 0.6715\\ 0.6804\\ 0.1760\\ 0.2615\\ 0.3115\\ 0.3790\\ 0.4190\\ 0.4600\\ 0.4190\\ 0.4600\\ 0.1317\\ 0.2010\\ -\\ 0.2314\\ -\\ 0.2368\\ 0.2394 \end{array}$ |  |
|  |   |  | AUXILIARY  | INFORMATI  | ON   |  |  |  |
| Recircu<br>with ma<br>ture.<br>conduct<br>with pl<br>Pressur | ulating v<br>agnetic p<br>Samples<br>tivity.<br>Latinum p   | esistance th<br>ed with Bour   | thermal<br>measured<br>ermometer.  | 1. No đ<br>2. Hydr   | details<br>cogen co<br>1% ortho  | OF MATERIALS:<br>given.<br>ntained appro:<br>-H <sub>2</sub> , 99.79% pa   |  |  |
|  |   |  |  | $\delta T/K = \delta x_{He}, \delta REFERENCE 1. Str$  | $\pm 0.005;$<br>$5y_{He} = \pm$<br>ES:   | δP/bar = ±0<br>0.001.<br>. B., Cryogen   |  |  |

| COMPONENTS:<br>(1) Helium; He; 7440-59-7<br>(2) Hydrogen; H <sub>2</sub> ; 1333-74-0 |   |  |  | ORIGINAL MEASUREMENTS:<br>Sonntag, R. E., Van Wylen, G. J. and<br>Crain, R. W., J. Chem. Phys., <u>1964</u> ,<br>41, 2399. |   |  |  |  |
|--|---|--|--|--|---|--|--|--|
| EXPERI   | MENTAL V                                  | VALUES:  |  |  |   |  |  |  |
| T/K  | P/bar                                     | Mole fraction<br>in liquid,<br><sup>x</sup> He |  |  | P/bar                                     | Mole fraction<br>in liquid,<br><sup>x</sup> He | of helium<br>in vapor,<br><sup>y</sup> He      |  |
| 31.00<br>31.50   | 25.27<br>26.92<br>12.17<br>14.00<br>15.51 | 0.1812<br>0.0107                               | 0.2353<br>0.1844<br>0.0634<br>0.1099<br>0.1402 | 31.50  | 17.24<br>18.96<br>20.68<br>21.72<br>22.89 | 0.0808<br>0.0928                               | 0.1568<br>0.1697<br>0.1713<br>0.1870<br>0.1657 |  |

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ORIGINAL MEASUREMENTS: COMPONENTS: (1) Helium; He; 7440-59-7 Streett, W. B., Sonntag, R. E. and Van Wylen, G. J., J. Chem. Phys., (2) Hydrogen; H<sub>2</sub>; 1333-74-0 1964, 40, 1390. VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: Mole fraction of helium Mole fraction of helium P/bar in liquid, T/K P/bar in liquid, T/K in vapor, in vapor,  $x_{\rm He}$ <sup>x</sup>He <sup>y</sup><sub>He</sub> <sup>y</sup>He 15.50 0.9378 3.41 20.40 12.07 0.0154 0.8603 0.0029 0.9551 5.17 13.79 0.0167 0.8713 6.89 0.0046 0.9631 17.24 0.0205 0.8841 0.8897 0.0051 20.68 0.0236 8.62 0.9677 10.34 0.0055 0.9702 27.58 0.0296 0.9008 0.9714 12.07 0.0064 34.47 0.0339 0.9035 13.79 0.0071 0.9729 23,00 3.45 0.0038 0.3700 17.24 0.0082 0.9741 5.17 0.0075 0.5344 0.0087 20.68 0.9748 6.89 0.0115 0.6290 17.07 3.90 0.0036 0.8967 8.62 0.0136 0.6787 5.17 0.0043 0.9186 10.34 0.0172 0.9828 6.89 0.9785 0.0057 0.9330 12.07 0.0215 8.62 0.0072 0.9412 13.79 0.0239 0.9761 10.34 0.0080 0.9464 17.24 0.0291 0.9709 12.07 0.0089 0.9503 20.68 0.0355 0.9645 13.79 0.0100 0.9515 27.58 0,0458 0.9542 17.24 0.0114 0.9556 34.47 0.0546 0.9454 0.9582 26,00 0.9933 20.68 0.0131 5.58 0.0067 27.58 0.9590 0.9903 0.0151 6.89 0.0097 20.40 2.41 0.0034 0.5360 8,62 0.0143 0.9857 10.34 3.45 0.0041 0.6545 0.0192 0.9808 5.17 0.0061 0.7540 13.79 0.0286 0.9714 0.0084 0.0364 6.89 0.8030 17.24 0.9636 8.62 0.0105 0.8320 20.68 0.0476 0.9524 27.58 0.9336 10.34 0.0130 0.8480 0.0664 AUXILIARY INFORMATION METHOD / APPARATUS / PROCEDURE : SOURCE AND PURITY OF MATERIALS: Details of apparatus given in ref. 1. Recirculating vapor flow apparatus No details given. with magnetic pump at ambient tempera-ture. Samples of coexisting phases analysed by mass spectrometry. ESTIMATED ERROR:  $\delta T/K = \pm 0.02$  or less;  $\delta P/bar = \pm 0.03$ ;  $\delta x_{\rm He} = \pm 0.0002; \quad \delta y_{\rm He} = \pm 0.002$ (estimated by compiler). **REFERENCES**: 1. Streett, W. B., Cryogenics, 1965, 5, 27.

| СОМРО          | NENTS:   |  |  | ORIGI  | NAL MEA   | SUREMENTS:   |   |
|----------------|--|--|--|--|---|--|---|
|                |  | He; 7440-59-7<br>H <sub>2</sub> ; 1333-74                          |  | Streett, W. B., Sonntag, R. E. and<br>Van Wylen, G. J., <i>J. Chem. Phys.</i> ,<br><u>1964</u> , 40, 1390. |   |  |   |
| EXPERI         | IMENTAL V  | ALUES:   |  |  |   |  |   |
| т/к            | <i>P/</i> bar  | Mole fracti<br>in liquid,<br><sup>x</sup> He                       | on of helium<br>in vapor,<br><sup>y</sup> He                       |  | P/bar   | Mole fractic<br>in liquid,<br><sup>x</sup> He                      | on of helium<br>in vapor,<br><sup>Y</sup> He                  |
| 26.00<br>29.00 | 34.47<br>8.76<br>10.41<br>12.07<br>13.79<br>17.24                    | 0.0848<br>0.0091<br>0.0150<br>0.0220<br>0.0307<br>0.0459           | 0.9152<br>0.9909<br>0.9850<br>0.9780<br>0.9693<br>0.9541           | 31.50  | 15.51<br>17.27<br>18.96<br>20.68<br>22.41<br>24.20          | 0.0361<br>0.0483<br>0.0626<br>0.0818<br>0.1047<br>0.1659           | 0.1564<br>0.1835<br>0.2030<br>0.2137<br>0.2149<br>0.1758      |
| 30.60          | 20.68<br>27.58<br>34.47<br>20.68<br>27.58<br>34.47                   | 0.0621<br>0.0963<br>0.1335<br>0.0729<br>0.1324<br>0.1795           | 0.9379<br>0.9037<br>0.8665<br>0.3032<br>0.3260<br>0.3036           | 31.90  | 12.03<br>13.79<br>15.17<br>16.44<br>17.27<br>18.03          | 0.0081<br>0.0207<br>0.0317<br>0.0429<br>0.0499                     | 0.0400<br>0.0831<br>0.1175<br>0.1386<br>0.1482<br>0.1562      |
| 31.00          | 12.17<br>13.72<br>17.24<br>20.68<br>22.41<br>24.13<br>25.86<br>27.58 | 0.0149<br>0.0251<br>0.0478<br>0.0749<br>0.0873<br>0.1103<br>0.1293 | 0.9851<br>0.9749<br>0.9522<br>0.9251<br>0.9127<br>0.8897<br>0.8707 | 32.50  | 19.00<br>19.96<br>20.68<br>21.27<br>13.00<br>13.79<br>15.17 | 0.0687<br>0.0871<br>0.1010<br>0.1202<br>0.0098<br>0.0168<br>0.0310 | 0.1619<br>0.1635<br>0.1588<br>-<br>0.9688<br>0.9520<br>0.9255 |
| 31.50          | 27.38<br>28.48<br>12.20<br>13.72                                     | 0.1564<br>0.2087<br>0.0127<br>0.0230                               | 0.8436<br>0.7913<br>0.0767<br>0.1194                               |  | 16.69<br>17.24<br>17.79                                     | 0.0509<br>0.0599<br>0.0675   | -<br>-<br>-   |
|                |  |  |  |  |   |  |   |
|                |  |  |  |  |   |  |   |

| (1) H            |                      | COMPONENTS:  |                            |                                  | ORIGINAL MEASUREMENTS: |   |                  |  |  |
|------------------|----------------------|--|----------------------------|----------------------------------|------------------------|---|------------------|--|--|
|                  | lelium;              | He; 7440-59-   | -7                         | Streett                          | t, W. В                | ., Astrophysi   | cal J.,          |  |  |
| (2) H            | lydrogen;            | ; H <sub>2</sub> ; 1333-                                       | 74-0                       | <u>1973</u> , <i>186</i> , 1107. |                        |   |                  |  |  |
|                  |                      |  |                            |                                  |                        |   |                  |  |  |
| /ARIABI          | ES:                  |  |                            | PREPARED                         | BY:                    | <u></u>   |                  |  |  |
| ſemper           | ature, p             | pressure   |                            | С. г. у                          | Young                  |   |                  |  |  |
| EXPERIN          | ENTAL VAL            | UES:   | ······                     |                                  |                        |   |                  |  |  |
| г/к              | <i>P/</i> bar        | Mole fraction<br>in hydrogen<br>rich phase,<br><sup>x</sup> He | in helium                  | т/к                              | P/bar                  | Mole fractio<br>in hydrogen<br>rich phase,<br><sup>x</sup> He | in helium        |  |  |
| 26.00            | 5.9                  | 0.0058   | 0.2637                     | 27.80                            | 124                    | 0,2660  | 0.6295           |  |  |
|                  | 8.7<br>13.1          | 0.0137   | 0.4290                     | 28.47                            | 145<br>145             | 0.3735  | 0.6770           |  |  |
| 27.18            | 13.1<br>59           | 0.0258<br>0.1624   | 0.5700<br>0.6264           | 20.4/                            | 145                    | 0.3755  | 0.5833           |  |  |
|                  | 70<br>83             | 0.1795<br>0.2015   | 0.6409<br>0.6513           |                                  | 159<br>172             | 0.3147  | 0.6150<br>0.6853 |  |  |
|                  | 97                   | 0.2142   | 0.6665                     |                                  | 207                    | 0.2347  | 0.7335           |  |  |
|                  | 110<br>124           | 0.2157<br>0.2133   | 0.6775<br>0.7045           | 29.00                            | 22<br>25               | 0.0664<br>0.0801  | 0.4498<br>0.4698 |  |  |
|                  | 138                  | 0.2061   | 0.7236                     |                                  | 30                     | 0.1059  | 0.4865           |  |  |
|                  | 172<br>210           | 0.1846<br>0.1619   | 0.7734<br>0.8163           |                                  | 35<br>179              | 0.1335<br>0.3650  | 0.4913<br>0.5695 |  |  |
|                  | 241                  | 0.1461   | 0.8470                     |                                  | 188                    | 0.3271  | 0.6196           |  |  |
|                  | 275<br>310           | 0.1314<br>0.1176   | 0.8686<br>0.8800           |                                  | 207<br>241             | 0.2839<br>0.2335  | 0.6815<br>0.7485 |  |  |
|                  | 345                  | 0.1079   | 0.8910                     |                                  | 276                    | 0.1999  | 0.7933           |  |  |
|                  | 414<br>486           | 0.0897   | 0.923<br>0.944             |                                  | 345<br>414             | 0.1566<br>0.1270  | 0.8473<br>0.8715 |  |  |
|                  | 552                  | 0.0747<br>0.0640   | 0.963                      |                                  | 468                    | 0.1101  | 0.903            |  |  |
|                  | 621<br>637           | 0.0549<br>0.0532   | 0.967<br>0.973             |                                  | 552<br>621             | 0.0911<br>0.0778  | 0.931<br>0.9495  |  |  |
| 27.80            | 69                   | 0.2092   | 0.5787                     |                                  | 683                    | 0.0689  | 0,963            |  |  |
|                  | 83<br>103            | 0.2459<br>0.2721   | 0.5704<br>0.5973           | 31.00                            | 755<br>299             | 0.0610<br>0.3574  | 0.969<br>0.6180  |  |  |
|                  |                      |  | AUXILIARY                  | INFORMAT                         | ION                    |   |                  |  |  |
| METHOD           | APPARATI             | IS/PROCEDURE:  |                            | SOURCE A                         | ND PURIT               | Y OF MATERIALS:   |                  |  |  |
|                  |                      | vapor flow a   | oparatus                   | No                               | o detai                | ls given.   |                  |  |  |
| compon<br>stainl | ents mad<br>ess stee | le of special  | ly selected<br>ture measu- |                                  |                        | -   |                  |  |  |
|                  |                      | re measured v<br>tance gauge.                                  |                            |                                  |                        |   |                  |  |  |
| of lig           | uid and              | gas analysed   |                            |                                  |                        |   |                  |  |  |
| conduc           | tivity.              |  |                            |                                  |                        |   |                  |  |  |
|                  |                      |  |                            |                                  |                        |   |                  |  |  |
|                  |                      |  |                            | ESTIMATE                         | D ERROR:               |   |                  |  |  |
|                  |                      |  |                            | δт/К =                           | ±0.02;                 | $\delta P/\text{bar} = \pm 0$                                 | .18;             |  |  |
|                  |                      |  |                            | <sup>o</sup> <sup>x</sup> He'    | <sup>y</sup> He = :    | £0.0002.  |                  |  |  |
|                  |                      |  |                            | REFERENC                         | CES:                   |   |                  |  |  |
|                  |                      |  |                            |                                  |                        |   |                  |  |  |
|                  |                      |  |                            |                                  |                        |   |                  |  |  |
|                  |                      |  |                            | 1                                |                        |   |                  |  |  |
|                  |                      |  |                            | REFERENC                         | CES:                   |   |                  |  |  |

| COMPO  | NENTS:   |   |  | ORIGINAL MEASUREMENTS:    |  |   |   |  |
|--------|--|---|--|---------------------------|--|---|---|--|
| (1)    | Helium; H  | le; 7440-59-7   |  |                           | tt, W. 1<br>186, 1   | B., Astrophysa<br>107.  | ical J.,  |  |
| (2)    | Hydrogen;  | ; H <sub>2</sub> ; 1333-74  | -0   | <u>1575</u> , 1007, 1107. |  |   |   |  |
|        |  |   |  |                           |  |   |   |  |
| EXPERI | IMENTAL V  | ALUES:  |  |                           |  |   |   |  |
| T/K    | P/bar  | Mole fractic<br>in hydrogen<br>rich phase<br><sup>x</sup> He  |  | n T/K                     | <i>P/</i> bar  | Mole fractio<br>in hydrogen<br>rich phase<br><sup>x</sup> He                          | n of helium<br>in helium<br>rich phase<br><sup>y</sup> He               |  |
| 31.00  | 311<br>371<br>412<br>483<br>552<br>621<br>689<br>758         | 0.2066<br>0.2234<br>0.1930<br>0.1521<br>0.1273<br>0.1074<br>0.0919<br>0.0831                            | 0.6770<br>0.7960<br>0.8297<br>0.8735<br>0.908<br>0.902<br>0.948<br>0.954<br>0.968          | 61.50<br>70.30            | 3789<br>3668<br>3723<br>3864<br>4071<br>4282<br>4346<br>4482<br>4016 | 0.1445<br>0.393<br>0.362<br>0.311<br>0.261<br>0.232<br>0.222<br>0.197                 | 0.911<br>0.754<br>0.778<br>0.810<br>0.844<br>0.870<br>0.982             |  |
| 34.95  | 896<br>507<br>524<br>531<br>586<br>689<br>824<br>965<br>1103 | $\begin{array}{c} -\\ 0.4455\\ 0.3614\\ 0.3413\\ 0.2780\\ 0.1877\\ 0.1419\\ 0.1137\\ 0.0899\end{array}$ | 0.908<br>0.6300<br>0.7105<br>0.7266<br>0.7880<br>0.841<br>0.887<br>0.946<br>0.946<br>0.964 | 77.61<br>84.82            | 4916<br>4491<br>4640<br>5192<br>5912<br>5516<br>5654<br>5864         | 0.157<br>0.4243<br>0.3527<br>0.3061<br>0.1944<br>0.1655<br>0.3711<br>0.3326<br>0.2843 | 0.914<br>0.7042<br>0.7715<br>0.8187<br>0.8980<br>0.905<br>              |  |
| 38.88  | 1179<br>745<br>769<br>831<br>897<br>1036<br>1173<br>1380     | 0.0824<br>0.4301<br>0.3517<br>0.3051<br>0.2347<br>0.1851<br>0.1427<br>0.1095                            | 0.968<br>0.7055<br>0.7563<br>0.7895<br>0.822<br>0.860<br>0.907                             | 93.00                     | 6205<br>6584<br>6984<br>6550<br>6902<br>7239<br>7564<br>7943         | 0.2403<br>0.2066<br>0.1756<br>0.4270<br>0.3578<br>0.2703<br>0.2360<br>0.2020          | 0.842<br>0.870<br>0.895<br>0.7330<br>0.7960<br>0.8357<br>0.864<br>0.885 |  |
| 61.50  | 1493<br>2758<br>2785<br>2896<br>3110<br>3349<br>3527<br>3544 | $\begin{array}{c} 0.0939\\ 0.3731\\ 0.3449\\ 0.2989\\ 0.2515\\ 0.2033\\ -\\ 0.1764 \end{array}$         | 0.957<br>0.7750<br>0.7912<br>0.821<br>0.850<br>0.882<br>0.901                              | 100.00                    | 8137<br>7598<br>7957<br>8274<br>8618<br>8977<br>9170<br>9377         | 0.1837<br>0.4351<br>0.3420<br>0.2876<br>0.2464<br>0.2185<br>0.2020<br>0.1870          | 0.889<br>0.7203<br>0.7850<br>0.8210<br>                                 |  |

| COMPONENT | :S:                                  |                  |                              | ORIGINA                | L MEASUREME        | NTS:           |                                    |                              |
|-----------|--------------------------------------|------------------|------------------------------|------------------------|--------------------|----------------|------------------------------------|------------------------------|
| (1) He    | lium; He <sup>4</sup> ; <sup>.</sup> | 7440-59-7        |                              | Hiza.                  | M. T. No           | t Bu           | r. Standard                        | 8                            |
|           | Hydrogen; n·                         |                  | -0                           |                        | Note 621,          |                |                                    | 5                            |
| (2) 11-   | nyurogen, n                          | -112; 1333-14    | J                            | 10011.                 | 1000 021           | 1972           | <b>_</b> •                         |                              |
|           |                                      |                  |                              |                        |                    |                |                                    |                              |
| VARIABLES | 5:                                   |                  |                              | PREPARE                | D BY:              |                |                                    |                              |
| Tempera   | ture, pressu                         | re               |                              | с. г.                  | Young              |                |                                    |                              |
|           |                                      |                  |                              |                        |                    |                | ·····                              |                              |
| EXPERIMEN | VTAL VALUES:                         |                  |                              |                        |                    |                |                                    |                              |
|           | Mole                                 | fraction of      | helium                       | L                      |                    | Mole           | fraction of                        | helium                       |
| т/к       | P/bar                                | in liquid,       | <sup>x</sup> He <sup>4</sup> | т/К                    | <i>P/</i> bar      |                | in liquid,                         | <sup>x</sup> He <sup>4</sup> |
| 20.00     | 0.9067                               | 0.0000           |                              | 26.00                  | 3,9334             | <u></u>        | 0.0000                             |                              |
| 20.00     | 7.346                                | 0.0110           |                              | 20.00                  | 8.481              |                | 0.0150                             |                              |
|           | 11.208<br>15.965                     | 0.0172<br>0.0211 |                              |                        | 10.925<br>12.490   |                | 0.0238<br>0.0283                   |                              |
|           | 20.112                               | 0.0244           |                              |                        | 13,959             |                | 0.0307                             |                              |
| 22.00     | 1.5824<br>5.8606                     | 0.0000<br>0.0107 |                              |                        | 16.024<br>18.050   |                | 0.0373<br>0.0430                   |                              |
|           | 9.777                                | 0.0204           |                              | 20.00                  | 20.257             |                | 0.0471                             |                              |
|           | 14.655<br>20.623                     | 0.0266<br>0.0343 |                              | 28.00                  | 5.730<br>8.356     |                | 0.0000<br>0.0141                   |                              |
| 24.00     | 2.5648<br>7.388                      | 0.0000<br>0.0155 |                              |                        | 11.707<br>11.793   |                | 0.0267<br>0.0264                   |                              |
|           | 10.908                               | 0.0231           |                              |                        | 17.020             |                | 0.0458                             |                              |
|           | 16.547<br>20.067                     | 0.0333<br>0.0411 |                              |                        | 19.981             |                | 0.0566                             |                              |
|           | 201007                               | 010122           |                              |                        |                    | 100            | ont.)                              |                              |
|           |                                      |                  |                              |                        |                    | ,              |                                    |                              |
|           |                                      |                  |                              |                        |                    |                |                                    |                              |
|           |                                      |                  |                              |                        |                    |                |                                    |                              |
|           |                                      |                  |                              |                        |                    |                |                                    |                              |
|           |                                      | A11              |                              | TNEODMA                | TON                |                |                                    |                              |
|           |                                      |                  |                              | INFORMAT               |                    | 07. 14.5       | PDT 41 C .                         |                              |
| · ·       | APPARATUS/PRC                        |                  |                              | ľ                      | AND PURITY         |                |                                    |                              |
|           | lating vapor<br>pper equilibn        |                  | Re-                          |                        | mple.              | OIM            | ines A grade                       | 3                            |
| circula   | ting pump des<br>ture measured       | scribed in re    |                              | (2) D                  | -                  | mplo           | equilibrated                       | for                          |
| resista   | nce thermomet                        | er and press     | ure                          |                        | everal mon         |                | equilibrated                       | 1 101                        |
|           | d with a doub<br>gauge. Sam          |                  |                              | 1                      |                    |                |                                    |                              |
| liquid a  | analysed by g                        | jas chromatog    | raphy                        |                        |                    |                |                                    |                              |
|           | hermistor the<br>rs. Details         |                  |                              |                        |                    |                |                                    |                              |
| ref. 2.   |                                      | Dour oo u        |                              |                        |                    |                |                                    |                              |
|           |                                      |                  |                              | ESTIMAT                | ED ERROR:          |                | <u> </u>                           |                              |
|           |                                      |                  |                              | ł                      |                    | δ <i>P/</i> ba | $r = \pm 0.004;$                   |                              |
|           |                                      |                  |                              | $\delta x_{\rm He}$ 4' | δy <sub>He</sub> = | ±3% o          | r 0.001 which<br>is great          | chever<br>ter.               |
| ]         |                                      |                  |                              | REFEREN                | VCES:              |                |                                    |                              |
|           |                                      |                  |                              |                        |                    |                | uncan, A. G.                       |                              |
|           |                                      |                  |                              |                        |                    |                | <u>1969</u> , 40, 5<br>Hiza, M. J. |                              |
|           |                                      |                  |                              |                        |                    |                | ., <u>1970</u> , <i>15</i> ,       |                              |
|           |                                      |                  |                              |                        |                    |                |                                    |                              |

| OMP | ONENTS: |                  |                  | ORIGINAL MEASUREMENTS:   |  |  |  |  |
|-----|---------|------------------|------------------|--|--|--|--|--|
| (1) | Helium  | n; He; 7440-     | 59-7             | Hiza, M. J., Nat. Bur. Standards,<br>Tech. Note 621, <u>1972</u> . |  |  |  |  |
| (2) | n-Hydr  | ogen; n-H2;      | 1333-74-0        | 1864. 1000 001, <u>1972</u> .                                      |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
| XPE | RIMENTA | L VALUES:        |                  |  |  |  |  |  |
|     | m /17   | Mo:<br>P/bar     | le fraction of   | helium   |  |  |  |  |
|     | т/К     | P/Dai            | in vapor, y      | He <sup>4</sup>  |  |  |  |  |
|     | 20.00   | 0.9067           | 0.0000           |  |  |  |  |  |
|     |         | 6.233<br>10.414  | 0.8049<br>0.8630 |  |  |  |  |  |
|     |         | 15.062           | 0.8867           |  |  |  |  |  |
|     | 24.00   | 19.281<br>2.565  | 0.8953<br>0.0000 |  |  |  |  |  |
|     |         | 6.726<br>10.852  | 0.5301<br>0.6543 |  |  |  |  |  |
|     |         | 15.517           | 0.7161           |  |  |  |  |  |
|     | 26.00   | 20.202<br>3.9334 | 0.7506<br>0.0000 |  |  |  |  |  |
|     | 20100   | 8.735            | 0.4151           |  |  |  |  |  |
|     |         | 12.186<br>16.289 | 0.5335<br>0.5990 |  |  |  |  |  |
|     | 28.00   | 19.960<br>5.730  | 0.6218<br>0.0000 |  |  |  |  |  |
|     | 20.00   | 8.749            | 0,2259           |  |  |  |  |  |
|     |         | 11.931<br>16.095 | 0.3540<br>0.4374 |  |  |  |  |  |
|     |         | 20.343           | 0.4909           |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
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|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |
|     |         |                  |                  |  |  |  |  |  |

| · · · · · · · · · · · · |               |  |                             |  |
|-------------------------|---------------|--|-----------------------------|--|
| COMPON                  | ents:         |  |                             | ORIGINAL MEASUREMENTS:   |
| (1) <sup>,</sup>        | Helium;       | He; 7440-59-                             | -7                          | Sneed, C. M., Sonntag, R. E. and<br>Van Wylen, G. J., J. Chem. Phys.,                        |
| (2)                     | p-Hydrog      | en; H <sub>2</sub> ; 1333                | 3-74-0                      | <u>1968</u> , <i>49</i> , 2410.  |
| 1                       |               |  |                             |  |
|                         |               | <u> </u>                                 |                             |  |
| VARIAB                  | rature, p     | rassura                                  |                             | PREPARED BY:<br>C. L. Young  |
| 10                      |               |  |                             | 0. 1. 10ung  |
| EXPERI                  | MENTAL VALU   | JES:                                     |                             |  |
|                         | - 4           | Mole fractio                             |                             |  |
| т/к                     | <i>P/</i> bar | in liquid,<br><sup>x</sup> He            | in vapor<br><sup>Y</sup> He | ,  |
|                         |               |  |                             | -  |
| 20.40                   | 58.0<br>73.2  | 0.0461<br>0.0459                         | 0.903                       |  |
|                         | 86.7<br>103.4 | 0.0442<br>0.0446                         | 0.914<br>0.922              |  |
| 27.80                   | 19.7<br>34.5  | 0.049<br>0.104                           | 0.482<br>0.546              |  |
|                         | 51.7<br>65.6  | 0.170<br>0.227                           | 0.548<br>0.530              |  |
|                         | 82.5<br>89.4  | 0.281<br>0.293                           | 0.509<br>0.493              |  |
| 29.00                   | 100.7<br>36.7 | 0.308<br>0.143                           | 0.483<br>0.447              |  |
|                         | 43.2<br>47.4  | 0.191<br>0.249                           | 0.424                       |  |
|                         | 48.0          | 0.261                                    | 0.359                       |  |
|                         | 48.6          | 0.305                                    | 0.305                       | _  |
|                         |               |  |                             |  |
|                         |               |  |                             |  |
|                         |               |  |                             |  |
|                         |               |  |                             |  |
|                         |               | <u> </u>                                 |                             |  |
| 10101100                | (100100       |  | AUXILIARI                   | INFORMATION<br>SOURCE AND PURITY OF MATERIALS:   |
|                         |               | US/PROCEDURE:<br>vapor flow app          | paratus                     | 1. Bureau of Mines high purity   |
| with n                  | nagnetic p    | pump at ambien<br>s analysed by          | it tempera-                 | sample.  |
| specti                  | cometry.      | Temperature                              | measured                    | <ol> <li>Matheson ultrapure sample obtained<br/>as boil-off gas from equilibrated</li> </ol> |
| Pressi                  | ire measu     | resistance the<br>red using Bour<br>rce. | don gauge.                  | liquid at 0.68 bar.  |
| Detail                  | ls in soui    | cce.                                     |                             |  |
|                         |               |  |                             |  |
|                         |               |  |                             |  |
|                         |               |  |                             | ESTIMATED ERROR:   |
|                         |               |  |                             | $\begin{array}{llllllllllllllllllllllllllllllllllll$   |
|                         |               |  |                             | REFERENCES:  |
|                         |               |  |                             |  |
|                         |               |  |                             |  |
|                         |               |  |                             |  |
|                         |               |  |                             |  |

| COMPONENTS:  |  |  | ORIGINAL N  | MEASUREMENTS:  |  |  |  |
|--|--|--|---|--|--|--|--|
|  | ·  | ; 7440-59-7<br>r; 7439-90-9  | Kidnay, A. J., Miller, R. C. and<br>Hiza, M. J., Ind. Eng. Chem. Fundam.,<br><u>1971</u> , 10, 459. |  |  |  |  |
| VARIABLES:   | · · · · ·  |  | PREPARED I  | BY:  |  |  |  |
| Temperatu  | ire, pres  | sure   | С. L. Ус  | oung   |  |  |  |
| EXPERIMENTAL   | L VALUES:  |  |   |  |  |  |  |
| т/к  | P/bar  | Mole fraction of<br>helium in liquid<br>phase, x <sub>He</sub>                                     | т/К   | P/bar Mole fraction of helium in liquid phase, $x_{ m He}$   |  |  |  |
| 117.09<br>120.85   | 10.03<br>19.91<br>41.01<br>10.13<br>20.21<br>40.36<br>80.65                  | 0.000252<br>0.000794<br>0.00155<br>0.000294<br>0.000806<br>0.00182<br>0.00376                      | 150.00  | 10.380.00041720.570.0019720.570.0019740.820.0051881.870.0116115.110.0159   |  |  |  |
| 129.60   | 121.4<br>4.77<br>10.22<br>20.42<br>20.42<br>42.04<br>80.25<br>120.6<br>120.6 | 0.00571<br>0.0000315<br>0.000507<br>0.00124<br>0.00144<br>0.00272<br>0.00521<br>0.00816<br>0.00824 |   |  |  |  |  |
| 139.56   | 10.35<br>20.52<br>40.51<br>80.6<br>118.8                                     | 0.000526<br>0.00161<br>0.00364<br>0.00778<br>0.0116  |   |  |  |  |  |
|  |  |  | INFORMATIC  |  |  |  |  |
| METHOD /APP  |  |  |   | ND PURITY OF MATERIALS:  |  |  |  |
| Recircula<br>Temperatu<br>resistanc<br>measured<br>samples a | ting vap<br>re measu<br>te thermon<br>with Bou<br>nalysed J                  | or flow apparatus.<br>red with platinum  | 1. Bure<br>2. Kryp<br>puri<br>per   | eau of Mines Grade A sample.<br>pton Research grade sample<br>ity better than 99.9975 mole<br>cent.  |  |  |  |
|  |  |  | $\delta x_{\rm He} = \pm$<br>REFERENCE  | <pre>±0.05; δP/bar = ±0.3%;<br/>±1% (estimated by compiler)<br/>ES:<br/>can, A. G. and Hiza, M. J.,<br/>Inst. Chem. Eng. J., <u>1970</u>, 16</pre> |  |  |  |
|  |  |  |   |  |  |  |  |

| COMPO          | NENTS:       |              | EVALUATOR:                |
|----------------|--------------|--------------|---------------------------|
| l. Helium; He; | 7440-59-7    | Colin Young, |                           |
| <b>+ •</b>     | neradin, ne, |              | School of Chemistry,      |
| 2.             | Neon; Ne;    | 7440-01-9    | University of Melbourne,  |
|                | 10011/ 110/  |              | Parkville, Victoria 3052, |
|                |              |              | AUSTRALIA.                |

There are only two published sets of results on this system. The temperature and pressure ranges of the data of Knorn (1) and Heck and Barrick (2) do not overlap appreciably. It is therefore difficult to establish the extent of agreement of the two sets of data solely on the basis of values in the overlapping range. Knorn's data are thought to be more accurate at low pressure. Both sets of data are classified as tentative.

## References

- 1. Knorn, M., Cryogenics, <u>1967</u>, 7, 177.
- 2. Heck, C. K. and Barrick, P. L., Adv. Cryog. Engng., <u>1966</u>, 12, 714.

| COMPONEN   | TS:  |  |   | ORIGINA   | MEASUREM   | ENTS:  |   |
|--|--|--|---|---|--|--|---|
| (1) Helium; He; 7440-59-7<br>(2) Neon; Ne; 7440-01-9 |  |  | Heck, C. K. and Barrick, P. L.,<br>Adv. Cryog. Engng., <u>1966</u> , 12, 714. |   |  |  |   |
| VARIABLE   | 2S :   | ·····  | · · · · · · · · · · · · · · · · · · ·   | PREPAREI  | D BY:  | <u> </u>   |   |
| Temperature, pressure                                |  |  |   | С. L.   | Young  |  |   |
| EXPERIME   | NTAL VALU  |  | - 6 1 1 2   |   |  | N-7 - 7  |   |
| т/к  | P/bar  | Mole fraction<br>in liquid,<br><sup>x</sup> He   |   | л<br>. т/к  | P/bar  | Mole fraction<br>in liquid,<br><sup>x</sup> He                       | of helium<br>in gas,<br><sup>y</sup> He                                   |
| 41.90  | 23.0<br>25.6<br>28.0<br>29.2<br>34.1<br>38.1<br>39.9                   | 0.0100<br>0.0219<br>0.0307<br>0.0366<br>0.0602<br>0.0801<br>0.0993   | 0.0784<br>0.119<br>0.153<br>0.172<br>0.215<br>0.221<br>0.221                  | 35.90   | 36.7<br>45.6<br>47.6<br>54.1<br>55.4<br>64.2   | 0.0562<br>0.0598<br>0.0831<br>0.103<br>0.111<br>0.134                | 0.613<br>0.633<br>0.637<br>0.631  |
| 38.88  | 42.3<br>15.9<br>23.3<br>28.6<br>37.3<br>49.8<br>58.0<br>61.5<br>63.8   | 0.173<br>0.0248<br>0.0416<br>0.0701<br>0.113<br>0.169<br>0.205   | 0.225<br>0.140<br>0.339<br>0.408<br>0.461<br>0.485<br>0.463<br>0.443<br>0.443 | 32.89   | 73.3<br>84.1<br>91.4<br>96.9<br>8.1<br>22.3<br>40.8<br>57.1<br>76.9  | 0.168<br>0.212<br>0.256<br>-<br>0.0271<br>0.0563<br>0.0870<br>0.1170 | 0.615<br>0.580<br>-<br>0.537<br>0.410<br>0.702<br>0.760<br>0.763<br>0.753 |
| 35.90  | 64.1<br>10.7<br>17.8<br>18.4<br>22.3<br>23.5<br>26.1<br>29.0<br>33.9   | 0.230<br>-<br>0.0195<br>0.0311<br>0.0372<br>-  | 0.239<br>0.458<br>0.538<br>-<br>0.587<br>0.605                                | 29.91   | 90.8<br>91.7<br>116.5<br>138.7<br>141.0<br>160.2<br>6.9<br>15.3<br>30.5  | 0.143<br>0.205<br>0.272<br>0.356<br>0.0087<br>0.0279                 | 0.735<br>0.661<br>0.661<br>0.575<br>0.658<br>0.798<br>0.854               |
|  |  | ·······  | AUXILIARY   | INFORMAT  | ION  |  |   |
| Vapor 1<br>Liquid<br>gas chi<br>measure              | recircula<br>and vapo<br>romatogra<br>ed by Bon<br>easured w<br>neter. | US/PROCEDURE:<br>ated through ce<br>or samples anal<br>aphy. Pressur<br>urdon gauge and<br>with platinum r<br>Details in sou | ysed by<br>ed<br>tempera-<br>esistance  | 1. Im<br>ma<br>2. Im<br>ma<br>2. Im<br>ma<br>saturna<br>$\delta T/K =$<br>$\delta x_{He} =$<br>REFEREN<br>1. He | purities<br>inly nec<br>purities<br>inly hel<br>ED ERROR:<br>$\pm 0.05;$<br>$\pm 0.3$ bet<br>$\delta y_{He} =$<br>CES:<br>rring, R | of 80 parts p  | up to 100<br>00 bar;<br>ck, R. L.,  |
|  |  |  |   |   |  |  | ,   |

| (2) Ne<br>T/K | -              | e; 7440-59-7<br>e; 7440-01-9 |                  | Heck, C. K. and Barrick, P. L.,<br>Adv. Cryog. Engng., <u>1966</u> , 12, 714. |
|---------------|----------------|------------------------------|------------------|---|
| I/K           | eon; No        | e; 7440-01-9                 |                  | Adv. Cryog. Engng., <u>1966</u> , 12, 114.                                    |
| I/K           |                |                              |                  |   |
|               |                |                              |                  |   |
|               |                |                              |                  |   |
|               |                | Mole fraction                | of helium        |   |
|               | P/bar          | in liquid,                   | in gas,          |   |
|               |                | x <sub>He</sub>              | <sup>y</sup> He  | _   |
| 29.91         | 50.4           | 0.0492                       | 0.863            |   |
|               | 71.5           | 0.0734                       | 0.855            |   |
|               | 90.9           | 0.0893                       | 0.844            |   |
|               | 112.7<br>130.2 | 0.106<br>0.126               | 0.831            |   |
|               | 131.9          | -                            | 0.815            |   |
|               | 156.4          | 0.155                        | -                |   |
|               | 162.1          | -                            | 0.794            |   |
|               | 190.5          | -                            | 0.770            |   |
|               | 199.6          | 0.197                        | 0 700            |   |
| 26.95         | 203.4<br>2.8   |                              | 0.760<br>0.625   |   |
| 20.95         | 5.4            | -                            | 0.810            |   |
|               | 9.8            | -                            | 0.877            |   |
|               | 20.6           | 0.0111                       | 0.9013           |   |
|               | 41.6           | 0.0291                       | 0.9262           |   |
|               | 61.8           | 0.0420                       | -                |   |
|               | 62.0           | 0.0532                       | 0.9220<br>0.9132 |   |
|               | 83.6<br>113.0  | 0.0532                       | 0.9033           |   |
|               | 120.6          | 0.0723                       | -                |   |
|               | 142.1          | -                            | 0.8919           |   |
|               | 142.3          | 0.0824                       | -<br>0.885       |   |
|               | 172.3<br>194.9 | 0.0896<br>0.103              | 0.005            |   |
|               | 203.1          | -                            | 0.875            |   |
|               |                |                              |                  | -   |
|               |                |                              |                  |   |
|               |                |                              |                  |   |
|               |                |                              |                  |   |
|               |                |                              |                  |   |
|               |                |                              |                  |   |

| COMPONENTS            | •             |                              |                 | ORIGINAL MEASUREMENTS:   |
|-----------------------|---------------|------------------------------|-----------------|--|
|                       |               | 7440-59-7                    |                 | Knorn, M., Cryogenics, 1967, 7, 177.                                   |
|                       |               |                              |                 |  |
| (2) Neo:              | n; Ne;        | 7440-01-9                    |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 |  |
| VARIABLES:            | •             |                              |                 |  |
|                       |               |                              |                 | PREPARED BY:   |
| Temperature, pressure |               |                              |                 | C. L. Young  |
|                       |               |                              |                 |  |
| EXPERIMENT            | TAL VALUES:   | Mole fract                   | ion of          |  |
| т/к                   | <i>P/</i> bar | helium                       |                 |  |
|                       |               | in liquid<br><sup>x</sup> He | <sup>y</sup> He |  |
|                       |               | пе                           | не              |  |
| 24.71                 | 6.1           | 0.0024                       | 0.897           |  |
|                       | 11.1          | 0.0041                       | 0.931           |  |
|                       | 16.2<br>21.3  | 0.0057<br>0.0073             | 0.944<br>0.950  |  |
|                       | 26.3          | 0.0086                       | 0.951           |  |
| 26.00                 | 31.4<br>6.1   | 0.0105<br>0.0029             | 0.951<br>0.842  |  |
|                       | 11.1          | 0.0048                       | 0.900           |  |
|                       | 16.2<br>21.3  | 0.0068<br>0.0086             | 0.924<br>0.931  |  |
|                       | 26.3          | 0.0107                       | 0.936           |  |
| 26.00                 | 31.4<br>41.5  | 0.0130<br>0.0170             | 0.938<br>0.938  |  |
|                       | 51.7          | 0.0204                       | 0.937           |  |
| 27.03                 | 6.1<br>11.1   | 0.0030<br>0.0054             | 0.803           |  |
|                       | 16.2          | 0.0076                       | 0.900           | · ·  |
|                       | 21.3<br>26.3  | 0.0106<br>0.0135             | 0.910<br>0.914  |  |
|                       | 31.4          | 0.0150                       | 0.915           |  |
|                       | 41.5<br>51.7  | 0.0206<br>0.0255             | 0.914<br>0.913  |  |
|                       |               | -                            |                 | -  |
|                       |               |                              |                 |  |
|                       |               |                              | AUXILIARY       | INFORMATION  |
| METHOD /A             | PPARATUS /    | PROCEDURE:                   |                 | SOURCE AND PURITY OF MATERIALS:  |
| Flow appa             | aratus des    | scribed in re                | ef. 1.          | No details given.  |
|                       |               | ises analysed<br>and gas int |                 |  |
| ferometer             |               | und gub int                  |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02;  \delta P/bar = \pm 0.01;$ |
|                       |               |                              |                 | $\delta x_{\rm He} = \pm 0.002;  \delta y_{\rm He} = \pm 0.001;$       |
|                       |               |                              |                 |  |
|                       |               |                              |                 | REFERENCES:  |
|                       |               |                              |                 | 1. Schmidt, K., Kaltetechnik, 1966,                                    |
|                       |               |                              |                 | 18, 331.   |
|                       |               |                              |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 |  |
|                       |               |                              |                 | 1  |

| COMPON | ENTS:                                | EVALUATOR:                |
|--------|--------------------------------------|---------------------------|
| 1.     | Helium; He; 7440-59-7                | Colin Young,              |
|        |                                      | School of Chemistry,      |
| 2.     | Nitrogen; N <sub>2</sub> ; 7727-37-9 | University of Melbourne,  |
|        |                                      | Parkville, Victoria 3052, |
|        |                                      | AUSTRALIA.                |

This is the most extensively studied system containing helium. The data of Kharakhorin (1) and Gonikberg and Fastowsky (2) appear to be higher than the data obtained by interpolation of more recent results and are both classified as doubtful.

The data of Tully *et al.* (3), Burch (4), De Vaney *et al.* (5), Rodewald *et al.* (6), Davis *et al.* (7) and Streett and coworkers (8), (9) and (10) are in reasonable agreement in overlapping ranges of pressure and temperature. The data of Streett and coworkers (8), (9) and (10) cover a much wider range of pressure than other data on this system. These six sets of data are classified as tentative.

The data of Skripka and Dykhno (11) are slightly lower than the data obtained by interpolation of the results given in references above and are therefore classified as doubtful.

The data of Davydov and Budnevich (12) are rejected as they are presented in small scale graphical form.

## References

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- 10. Streett, W. B. and Erickson, A. L., Physics Earth Planetary Interiors, <u>1972</u>, 5, 357.
- 11. Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., 1964, 8, 163.
- Davydov, I. A. and Budnevich, S. S., Inzh. Fiz. Zhur., <u>1971</u>, 20, no. 6, 82.

| COMPONEN   | NTS:  |  |   | ORIGINAL M   | EASUREMENT  | S:   |  |  |
|--|---|--|---|--|---|--|--|--|
| (l) Helium; He; 7440-59-7                                    |   |  |   | Streett, W. B. and Hill, J. L. E.,                               |   |  |  |  |
| (2) N  | itrogen;  | N <sub>2</sub> ; 7727-3  | 57-9  | J. Chem.   | Phys., ]  | <u>1970</u> , <i>52</i> , 14   | 102.   |  |
| VARIABL  | ES :  |  |   | PREPARED E   |   |  | ······································                                 |  |
|  |   |  |   | C. L. Yo   |   |  |  |  |
| -  | ature, pr   |  |   | С. Б. 10   |   | ······   |  |  |
| EXPERIM  | ENTAL VALUE   |  | on of heliu   |  |   | ole fraction   |  |  |
| т/к  | P/bar   | in liquid,<br><sup>x</sup> He  | in vapor<br><sup>y</sup> He   | , т/к  | P/bar ir  | n liquid,<br><sup>x</sup> He   | in vapor,<br><sup>Y</sup> He   |  |
| 77.48<br>87.82<br>95.47                                      | 344.5<br>548.2<br>686.0<br>820.7<br>931.2<br>130.7<br>272.6<br>410.4<br>548.2<br>693.1<br>827.8<br>958.5<br>1103.4<br>1216.9<br>1376.0<br>1516.8<br>1654.6<br>1789.4<br>1826.9<br>713.3<br>827.8<br>965.6<br>1103.4 | 0.0426<br>0.0542<br>0.0592<br>0.0623<br>0.0648<br>0.065<br>0.0366<br>0.0632<br>0.0805<br>0.0927<br>0.1010<br>0.1064<br>0.1074<br>0.1120<br>0.1132<br>0.1148<br>0.1153<br>0.1151<br>0.1153<br>0.115<br>0.1153<br>0.115<br>0.124<br>0.1429<br>0.1498<br>0.1546 | 0.9868<br>0.9814<br>-<br>0.9860<br>0.985<br>0.9550<br>0.9677<br>0.9709<br>0.9755<br>0.9773<br>0.9773<br>0.9792<br>0.9803<br>0.9822<br>0.9814<br>0.9837<br>0.9851<br>0.9851<br>0.9851<br>0.9851<br>0.9870<br>0.9870<br>0.9579<br>-<br>0.9539<br>0.9630 | 95.47  | 1379.0<br>1661.7<br>1930.2<br>2205.8<br>2482.5<br>2623.3<br>2068.0<br>2202.8<br>2340.6<br>2482.5<br>2620.3<br>713.3<br>827.8<br>965.6<br>1103.4<br>1234.1<br>1379.0<br>1661.7<br>1930.2<br>2205.8<br>2482.5<br>2623.3<br>2761.1<br>3058.0 | 0.1600<br>0.1606<br>0.1612<br>0.1616<br>0.1605<br>0.1591<br>0.1591<br>0.1557<br>0.1539<br>0.151<br>0.1557<br>0.1539<br>0.151<br>0.1822<br>0.1885<br>0.1948<br>0.1983<br>0.2000<br>0.2010<br>0.2003<br>0.1981<br>0.1981<br>0.1943<br>0.1903<br>0.1884<br>0.1862<br>0.1815 | 0.9665<br>0.9695<br>0.9715<br>0.9715<br>0.9715<br>0.9715<br>0.9722<br> |  |
|  | 1234.1  | 0.1582   | 0.9704  | INFORMATIO   | 3102.6  | 0.182  | 0.979  |  |
| MERUOD   | />>>>>  |  |   |  |   | MATERIALS:   |  |  |
| Recircu<br>with ma<br>ture.<br>conduct<br>with pl<br>Pressur | ulating v<br>agnetic p<br>Samples<br>tivity.<br>latinum re<br>ce measure  | S/PROCEDURE:<br>apor flow ap<br>ump at ambie<br>analysed by<br>Temperature<br>esistance th<br>ed with Bour<br>ce and ref.  | paratus<br>nt tempera-<br>thermal<br>measured<br>ermometer.<br>don gauge.   | N  | o details   |  |  |  |
|  |   |  |   | $\delta x_{\text{He}} \simeq \delta x_{\text{He}}$<br>REFERENCE: | $0.01; \delta^P$<br>$y_{He} = \pm 0.$<br>S:<br>tt, W. B.  | /bar = ±7;<br>001.<br>, Cryogenic  | 8, <u>1965</u> ,   |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Streett, W. B. and Hill, J. L. E., (1)Helium; He; 7440-59-7 J. Chem. Phys., 1970, 52, 1402. (2)Nitrogen; N<sub>2</sub>; 7727-37-9 EXPERIMENTAL VALUES: Mole fraction of helium Mole fraction of helium т/к P/bar in liquid, in gas, T/K P/bar in liquid, in gas,  $x_{\rm He}$ ₽He  $x_{\rm He}$  $y_{\rm He}$ 107.32 454.9 0.2052 0.8931 120.59 971.7 0.5570 0.7188 0.9029 0.2230 552.2 1010.2 0.5393 0.7399 689.0 0.9119 0.2411 1027.4 0.5346 0.7501 830.9 0.9185 0.2515 1089.2 0.5231 968.7 0.2581 0.9264 1120.7 0.5166 0.7712 1103.4 0.2614 0.9308 1224.0 0.5006 0.7977 1241.2 0.2628 0.9470 0.8182 1323.3 0.4890 1379.0 0.2628 0.9430 1523.9 0.4648 0.8490 0.9454 1516.8 0.2621 1775.2 0.4433 0.8714 1654.6 0.2600 0.9493 2062.0 0.4225 0.8926 1799.5 0.2589 0.9530 2402.4 0.3999 0.9098 1930.2 0.2561 0.9572 2719.6 0.3820 0.9236 2199.8 0.2509 0.9618 3102.6 0.3640 0.9358 3447.1 2482.5 0.2435 0.9647 0.3474 0.9438 3764.2 2751.0 0.2380 0.9670 0.3357 0.9491 3033.7 0.2316 0.9701 124.05 1613.1 0.6400 0.6970 3309.3 0.2257 0.9730 1657.7 0.5856 0.9759 3584.9 0.2207 1696.2 0.5782 0.7844 3964.8 0.2150 0.9796 1792.4 0.5517 0.8071 /053.0 0.2118 0.9827 1930.2 0.5225 0.8341 112.10 0.8589 0.5011 551.2 0.2808 2072.0 0.8503 689.0 0.3008 0.8723 2126.8 0.6185 0.7333 827.8 0.3111 0.8850 2161.3 0.6032 0.7694 965.6 0.3171 0.8943 2202.8 0.5919 0.7899 0.9031 1103.4 0.3197 2350.7 0.5554 0.8317 1241.2 0.3197 0.9098 2482.5 0.5265 0.8485 1351.7 0.3189 0.9174 2774.30.4911 0.8768 1516.8 0.3167 0.9238 3092.4 0.4600 0.8980 0.9344 1792.4 0.3124 3451.1 0.4354 0.9123 2068.0 0.3043 0.9423 3802.7 0.4126 0,9247 0.9497 0.2946 2344.7 4137.1 0.3945 0,9313 2620.3 0.2870 0.9540 130.00 2778.3 0.5988 2895.9 0.2785 0.9604 2830.0 0.5862 0.2708 3122.8 0,9630 2896.9 0.5733 \_ 117.13 489.4 0.3545 0.7699 3047.9 0.5469 0.8124 620.1 0.3869 0.7914 3316.4 0.5126 0.8552 689.0 0.3970 0.8015 0.4716 0.8930 3726.7 0.4086 0.8198 827.8 4137.1 0.4450 0,9083 965.6 0.4091 0.8376 134.00 3481.5 0.6181 ---0.6085 1103.4 0.4072 0.8539 3515.8 1241.2 0.4034 0.8675 3596.0 0.5905 0.8139 1379.0 0.3984 0.8794 0.5819 3653.8 0.3922 1516.8 0.8841 3795.6 0.5620 0,8489 1654.6 0.3859 0.8986 4133.0 0.5184 0.8802 1792.4 0.3814 0.9069 136.50 3930.4 0.6400 0.7405 0.3677 2068.0 0.9211 4036.8 0.6073 0.7733 2344.7 0.3556 0.9304 4109.7 0.5910 0,7750 2551.4 0.3999 0.9367 2854.3 0.3355 0.9451 0.4905 119.60 562.4 0.6772 689.0 0.5011 0.7159 830.9 0.7429 0.5058 965.6 0.4938 0.7763 1106.5 0.4792 0.2082

| COMPONENT   | :S :   |   |  | ORIGINAL M   | EASUREMEN  | TS:  |   |  |
|---|--|---|--|--|--|--|---|--|
| <pre>(1) Helium; He; 7440-59-7 (2) Nitrogen; N<sub>2</sub>; 7727-37-9</pre> |  |   |  | Streett, W. B., and Erickson, A. L.,<br>Physics Earth Planetary Interiors<br><u>1972</u> , 5, 357. |  |  |   |  |
|   |  |   |  |  |  |  |   |  |
| VARIABLES   | S:   |   |  | PREPARED B   | SY:  |  |   |  |
| Tempera   | ture, pr   | essure  |  | С. L. У  | oung   |  |   |  |
| EXPERIMEN   | NTAL VALUE   | S:<br>Nole fraction   | of holium  |  | M  | olo fractio  | n of helium   |  |
| т/К   | P/bar i  | n liquid,<br><sup>x</sup> He  | in vapor,<br><sup>y</sup> He   | т/к  |  | n liquid,<br><sup>x</sup> He   | in vapor<br><sup>y</sup> He   |  |
| 112.10  | 2463<br>3102<br>3453<br>3798<br>4171<br>4505<br>4515<br>4710<br>4828<br>4839<br>4921<br>1005<br>1368<br>1969<br>2803<br>3446<br>3798<br>4149<br>4508<br>5112<br>5574<br>5652<br>5721<br>2420<br>2741<br>2782 | $\begin{array}{c} 0.3035\\ 0.2866\\ 0.2780\\ 0.2694\\ 0.2603\\ 0.2517\\ 0.251\\ 0.2474\\ 0.2457\\ 0.2456\\ 0.244\\ 0.4224\\ 0.4106\\ 0.3835\\ 0.3248\\ 0.3126\\ 0.3051\\ 0.3003\\ 0.2757\\ 0.2660\\ \hline \end{array}$ | 0.9544<br>0.9644<br>0.9680<br>0.9716<br>0.975<br>0.9769<br>0.9763<br>0.9975<br>0.99975<br>0.99984<br>0.9979<br>0.8568<br>0.8754<br>0.9135<br>0.9441<br>0.9565<br>0.9602<br>0.9662<br>0.9665<br>0.9725<br>0.9725<br>0.9760<br>0.9765<br>0.977<br>0.8850<br>0.8950<br>0.9948 | 124.05   | 3123<br>3151<br>3598<br>4177<br>4672<br>5059<br>5522<br>6072<br>6603<br>6841<br>6962<br>4083<br>4563<br>4918<br>5600<br>6268<br>6736<br>7204<br>7681<br>7864<br>7913<br>7983<br>8051<br>8111<br>8175<br>4145 | 0.4294<br>-<br>0.4017<br>0.3768<br>-<br>0.3263<br>0.3122<br>0.3006<br>0.2948<br>0.290<br>0.4521<br>0.4247<br>0.4247<br>0.4073<br>0.3811<br>0.3578<br>0.3434<br>0.3247<br>0.3219<br>0.3164<br>0.3150<br>0.3143<br>0.3123<br>0.312 | 0.9206<br>0.9217<br>0.9289<br>0.9463<br>0.9539<br>0.9592<br>0.9642<br>0.9691<br>0.9695<br>0.9733<br>0.974<br>0.9157<br>0.9290<br>0.9406<br>0.9525<br>0.9602<br>0.9783<br>0.9781<br>0.9693<br>0.9680<br> |  |
|   |  |   |  | INFORMATIO   |  |  |   |  |
| Recircu<br>with ma<br>measure<br>thermom<br>magnani<br>of liqu              | lating v<br>gnetic p<br>d with p<br>eter.<br>n resist<br>id and g  | S/PROCEDURE:<br>apor flow ap<br>ump. Tempe<br>latinum resi<br>Pressure mea<br>ance gauge.<br>as analysed<br>Details in  | paratus<br>rature<br>stance<br>sured with<br>Samples<br>by thermal   | }  | O PURITY C   | OF MATERIALS:  |   |  |
|   |  |   |  | δx <sub>He</sub> ,δ  | $\pm 0.01;$<br>$y_{\text{He}} = \pm 1$<br>ted by c   | $\delta P/bar = \pm 1$<br>mole per compiler).  | 5;<br>cent  |  |

l

ORIGINAL MEASUREMENTS: COMPONENTS: Helium; He; 7440-59-7 Streett, W. B., and Erickson, A. L., (1) Physics Earth Planetary Interiors Nitrogen; N<sub>2</sub>; 7727-37-9 1972, 5, 357. (2)P/bar Mole fraction of helium Mole fraction of helium T/K т/к P/bar in liquid, in liquid, in vapor, in vapor <sup>х</sup>не  $x_{\text{He}}$ <sup>y</sup>He <sup>y</sup>He 134.00 4851 0.4737 0.9141 144.00 5693 0.6121 0.8694 5383 0.4475 0.9255 5783 0.6019 0.8735 0.9399 0.8789 0.4124 5892 5884 0.5929 6386 0.3949 0.9473 5996 0.5826 0.8852 6954 0.3756 0.9534 6255 7617<sup>b</sup> 0.5532 0.8987 7430 0.3611 154.00 0.755 0.755 7918 0.3483 0.9564 7734 0.6723 0.8805 0.3354 0.8643 0.9581 8209 7927 0.6388 8446 0.3324 0.960 8064 0.6210 0.8754 8824 0.3252 0.9666 8292 0.9192 0.6025 8974 9057<sup>a</sup> 4163<sup>b</sup> 0.3218 0,9693 8458 0.5851 0.8878 0.970 0.321 8692 0.5679 0.9147 138.00 0.734 0.734 8967 0.5480 0.9118 4250 0.6468 0.9292 9313 0.5295 0.9188 0.8159 4282 0.6307 9643 0.5136 0.9243 9808 8568<sup>b</sup> 4251 0.6181 0.8447 0.9329 0.5042 4428 0.6051 0.8578 158.0 0.760 0.760 0.6938 4494 0.5926 0.8651 8581 0.8626 4563 0.5855 0.8706 8623 0.6880 0.8665 0.5733 0.8774 4651 0.8622 8664 0.6780 4983 0.5429 0.8938 8699 0.6744 0.8580 0.9089 5398 0.5093 8719 0.6699 0.8473 5877 0.4817 0.9234 8802 0.6512 0.8576 6355 0.4577 0.9345 8989 0.6316 0.8716 0.9349 6362 0.4540 9250 0.9041 0.6071 6913 0.4315 0.9391 9505 0.5871 0.8971 7427 0.4105 0.9430 0.9000 9726 0.5682 7948 0.3970 0.9505 9926 0.9096 0.559 8407 0.3802 0.9562 0.9138 10133 0.5461 8822 0.3716 0.9574 162.00 9574 0.767 0.767 9379 0.3597 9657 0.6887 0.8445 9557 9926<sup>a</sup> 5356<sup>b</sup> 0.9628 0.3566 9726 0.6719 0.852 9781 0.347 0.963 0.6639 0.8585 144.0 0.749 0.749 9912 0.6442 0.8699 5432 0.6653 0.8663 10064 0.6289 0.8789 5528 0.8529 0.6311 10201 0.6152 0.8861 0.6312 0.8634 5610 <sup>a</sup> Three-phase pressure ±10 bar. <sup>b</sup> Critical pressure ±20 bar.

| COMPON  | ENTS:   |   |  | ORIGINAL   | MEASUREM  | ENTS:  |  |  |
|---|---|---|--|--|---|--|--|--|
| (l) Helium; He; 7440-59-7<br>(2) Nitrogen; N <sub>2</sub> ; 7727-37-9 |   |   |  | Kharakhorin, F. F., Zhur. Tekh. Fiz.,<br><u>1940</u> , 10, 1533 (Russian); Foreign<br>Petrol.Tech., <u>1941</u> , 9, 397 (Eng.<br>Trans.). |   |  |  |  |
| VARIAB  | LES:  | . <del></del>   |  | PREPARED   | BY:   |  |  |  |
| Tempe   | rature, p   | pressure  |  | с. г.  | Young   |  |  |  |
| EXPERI  | MENTAL VAL  |   |  | J  | ·····   | <u> </u>   |  |  |
| т/к   |   | Mole fraction<br>in liquid,<br><sup>x</sup> He  | of helium<br>in vapor,<br><sup>y</sup> He  | T/K  | P/bar   | Mole fraction<br>in liquid,<br><sup>x</sup> He   | of helium<br>in vapor<br><sup>Y</sup> He   |  |
| 68.0<br>77.3<br>90.1  | $\begin{array}{r} 4.54\\ 11.77\\ 22.60\\ 49.14\\ 93.98\\ 96.97\\ 109.43\\ 146.41\\ 4.91\\ 11.75\\ 22.60\\ 34.35\\ 49.14\\ 59.38\\ 72.19\\ 79.03\\ 98.59\\ 112.88\\ 122.60\\ 146.92\\ 148.44\\ 160.30\\ 160.60\\ 4.90\\ 11.80\\ \end{array}$ | $\begin{array}{c} 0.00107\\ 0.00195\\ 0.00370\\ 0.00885\\ 0.01145\\ 0.01145\\ 0.01160\\ 0.01240\\ 0.01480\\ 0.0098\\ 0.00300\\ 0.00460\\ 0.00730\\ 0.00460\\ 0.00730\\ 0.00960\\ 0.01125\\ 0.01520\\ 0.01525\\ 0.01525\\ 0.02030\\ 0.02100\\ 0.02325\\ 0.02545\\ 0.02550\\ 0.02715\\ 0.02740\\ 0.0003\\ 0.0038\\ \end{array}$ | 0.8325<br>0.9648<br>0.9745<br>0.9822<br>0.9860<br>0.9865<br>0.9880<br>0.9896<br>0.8060<br>0.9190<br>0.9600<br>0.9600<br>0.9659<br>0.9775<br>0.9800<br>0.9815<br>0.9822<br>0.9822<br>0.9830<br>0.9847<br>0.9853<br>0.9847<br>0.9853<br>0.9860<br>0.9874<br>0.1575<br>0.6320 | 90.1   | 18.75<br>19.35<br>22.60<br>29.38<br>30.40<br>34.45<br>41.64<br>49.14<br>58.77<br>68.65<br>74.98<br>84.61<br>88.66<br>102.84<br>107.91<br>137.80<br>167.69<br>181.07<br>195.25<br>207.21<br>217.34<br>23.406<br>35.464<br>50.460<br>74.778 | $\begin{array}{c} 0.0054\\ 0.0084\\ 0.0110\\ 0.0112\\ 0.0130\\ 0.0135\\ 0.0162\\ 0.0208\\ 0.0227\\ 0.0234\\ 0.0283\\ \hline \\ 0.0283\\ \hline \\ 0.0372\\ 0.0382\\ 0.0437\\ 0.0500\\ 0.0505\\ 0.0563\\ 0.0600\\ 0.0618\\ 5 0.0085\\ 4 0.0220\\ 0.0330\\ \hline \end{array}$ | 0.8025<br>0.8070<br>0.8170<br>0.8500<br>0.8540<br>0.8695<br>0.9045<br>0.9045<br>0.9280<br>0.9295<br>0.9280<br>0.9295<br>0.9295<br>0.9415<br>0.9570<br>0.9595<br>0.9595<br>0.9610<br>0.9621<br>0.9623<br>0.5225<br>0.6165<br>0.7160 |  |
|   |   |   | AUXILIARY  | INFORMATI  | LON   |  |  |  |
| METHOD  | /АРРАВАТ  | US/PROCEDURE:   |  | SOURCE A   | ND PURITY   | OF MATERIALS:  |  |  |
| Vapor<br>pump.  | recircul<br>Analys<br>ermal con   | ated using mag<br>is of samples<br>ductivity. D   | of liquid  | No det   | ails giv  | ven.   |  |  |
|   |   |   |  | $\delta T/K = 6 bar$   | , ±0.1 (<br>above 75<br>01; δy <sub>H</sub>   | $\delta P/bar = \pm 0.01$<br>between 6 and<br>bar); $\delta x_{\rm He} =$<br>$z_{\rm P} = \pm 0.0002$ to   | 75 bar),   |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Kharakhorin, F. F., Zhur. Tekh. Fiz., <u>1940</u>, 10, 1533 (Russian); Foreign Petrol. Tech., <u>1941</u>, 9, 397 (Eng. Helium; He; 7440-59-7 (1) (2) Nitrogen; N<sub>2</sub>; 7727-37-9 Trans.). Mole fraction of helium Mole fraction of helium *P/*bar т/к T/K P/bar in liquid, in vapor, in liquid, in vapor  $x_{\rm He}$  $x_{\text{He}}$  $y_{\text{He}}$  $y_{\rm He}$ 107. 98.285 0.0682 0.7685 111.5 69.91 0.0575 0.6120 0.0792 0.7900 73.46 0.0612 0.6155 115.511 153.000 0.1012 0.8235 92.21 0.0765 0.6800 111.5 19.66 0.0033 0.1390 118.04 0.0945 0.7195 0.0998 0.7315 0.0037 0.1510 20.47 122.10 22.49 0.0065 0.1925 127.16 0.1040 0.7395 135.78 0.1080 0.7575 24.62 0.0080 -142.36 0.1145 28.67 0.0140 -0.7640 39.03 0.0275 -177.01 0.1310 0.7805 0.0329 ; 0.5070 45.39 197.58 0.1395 0.7900 N, 57.00 0.0449 0.5655

| COMPONENTS:   |   |   | ORIGINAL M  | EASUREME  | ENTS:   |  |
|---|---|---|---|---|---|--|
| <ol> <li>Helium;</li> <li>Nitroge</li> </ol>  | Tully, P. C., DeVaney, W. E., and<br>Rhodes, H. L., Adv. Cryog. Engng.,<br>1971, 16, 88.  |   |   |   |   |  |
| VARIABLES:  |   |   | PREPARED B  | Y :   | <del></del>   |  |
| Temperature,  | pressure  |   | C. L. Yo  | ung   |   |  |
| EXPERIMENTAL VAL  |   | <u></u>   | L   |   |   | . <u></u>  |
| T/K P/ba  | Mole fraction<br>r in liquid,<br><sup>x</sup> He  |   | , т/к   | P/bar   | Mole fraction<br>in liquid,<br><sup>x</sup> He  | of helium<br>in gas,<br><sup>y</sup> He  |
| 122.00       31.         34.       41.         41.       55.         68.       103.         137.       172.         193.       200.         203.       206.         208.       209.         209.       209.         123.00       34.         41.       55.         68.       103.         124.       138.         144.       148.         151.       151. | $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | 0.0480<br>0.0893<br>0.1608<br>0.2632<br>0.3319<br>0.4319<br>0.4780<br>0.4935<br>0.4858<br>0.4774<br>0.4699<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.4603<br>0.4529<br>0.46051<br>0.4051<br>0.4051<br>0.3984<br>0.3890<br>0.3678 | 123.00<br>123.20<br>123.275<br>124.00<br>124.10<br>124.40<br>124.80<br>125.00<br>125.05<br>125.30 | 153.2<br>138.0<br>138.2<br>34.5<br>41.1<br>55.2<br>68.9<br>82.7<br>96.5<br>103.6<br>106.1<br>106.9<br>107.5<br>108.1<br>103.6<br>68.8<br>68.9<br>37.7<br>41.2<br>55.0<br>68.9<br>70.5<br>71.7<br>68.9<br>55.2 | $\begin{array}{c} 0.3400\\ 0.2558\\ 0.2875\\ 0.0095\\ 0.0253\\ 0.0599\\ 0.0926\\ 0.1296\\ 0.1729\\ 0.2045\\ 0.2202\\ 0.2267\\ 0.2350\\ 0.2267\\ 0.2350\\ 0.2560\\ 0.2163\\ 0.0998\\ 0.1102\\ 0.0159\\ 0.0258\\ 0.0671\\ 0.1228\\ 0.0671\\ 0.1228\\ 0.1360\\ 0.1575\\ 0.1312\\ 0.0744 \end{array}$ | 0.3400<br>0.3756<br>0.3497<br>0.0426<br>0.1014<br>0.1937<br>0.2504<br>0.2871<br>0.3033<br>0.2988<br>0.2886<br>0.2834<br>0.2829<br>0.2560<br>0.2788<br>0.2298<br>0.2298<br>0.2298<br>0.2298<br>0.2298<br>0.2298<br>0.2298<br>0.2298<br>0.2298<br>0.2788<br>0.2298<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2788<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.2798<br>0.1798<br>0.1737<br>0.1575<br>0.1677<br>0.1310 |
|   |   | AUXILIARY   | INFORMATION   | 1   |   |  |
| Recirculating<br>with berylling<br>Vapor recircu<br>loop. Tempe<br>platinum resi<br>pressure meas<br>ducer and Bou  | TUS/PROCEDURE:<br>g vapor flow app<br>im-copper window<br>ilated through e<br>erature measured<br>stance thermome<br>sured by pressur<br>irdon gauge cali<br>ad weight gauge. | ved cell.<br>external<br>with<br>eter and<br>e trans-<br>brated   | <ol> <li>Pure<br/>10 pa</li> <li>Pure<br/>50 pa</li> <li>ESTIMATED</li> </ol>                     | sample<br>sample<br>sample<br>arts pe<br>ERROR:<br>0.01;<br><sup>9</sup> He =   | OF MATERIALS:<br>containing le<br>containing le<br>million imput<br>million imput<br>δP/bar = ±0.1<br>±0.004.   | writy.<br>ess than<br>writy.   |

COMPONENTS: ORIGINAL MEASUREMENTS: Helium; He; 7440-59-7 (1) Tully, P. C., DeVaney, W. E., and Rhodes, H. L., Adv. Cryog. Engng., (2) 1968, 16, 88. Nitrogen; N<sub>2</sub>; 7727-37-9 Mole fraction of helium Mole fraction of helium т/к P/bar in liquid, in gas, T/K P/bar in liquid, in gas,  $x_{\rm He}$ <sup>x</sup>не  $y_{\rm He}$  $y_{\rm He}$ 125.40 37.9 0.0158 0.0416 125.80 41.4 0.0289 0.0504 41.4 0.0264 0.0635 43.1 0.0356 0.0572 44.8 0.0458 53.1 0.0690 0.1181 0.0623 55.2 0.0787 0.1228 45.4 0.0510 0.0626 0.1242 57.2 0.0898 45.9 0.0585 0.0585 125.90 125.93 57.8 0.0975 0.1201 41.4 0.0305 0.0456 57.9 0.0995 0.1190 41.4 0.0431 0.0324 58.4 0.1092 0.1092 126.00 37.0 0.0130 0.0211 125.475 55.2 0.1116 0.0857

0.0333

125.80

38.1

0.0162

39.3

39.6

0.0232

0.0290

0.0318

0.0290

| COMPONENTS   |   |   | ORIGINAL MEASUREMENTS:   |  |
|--|---|---|--|--|
| <pre>(1) Helium; He; 7440-59-7 (2) Nitrogen; N<sub>2</sub>; 7727-37-9</pre>  |   |   | Burch, R. J., J. Chem. Engng. Data<br>1964, 9, 19.   |  |
|  |   |   |  |  |
| VARIABLES:   |   |   | PREPARED BY:   |  |
| Temperature, pressure  |   |   | C. L. Young  |  |
| EXPERIMENT   | TAL VALUES:                                       |   | I  |  |
| т/к  | P/bar   | l0 <sup>2</sup> Mole fractio<br>in liquid,<br>10 <sup>2</sup> x <sub>He</sub> | n of helium<br>in vapor,<br>10 <sup>3</sup> y <sub>He</sub>  |  |
| 82.70  | 5.07<br>10.13<br>15.20<br>20.26<br>30.40<br>40.53 | 0.108<br>0.268<br>0.418<br>0.560<br>0.825<br>1.07                             | 63.8<br>81.8<br>87.7<br>90.5<br>92.9<br>93.5   |  |
| 10.66       1.31         113.13       20.26       0.340         25.33       0.930         30.40       1.47         40.53       2.51         50.66       3.54   |   |   | 94.8<br>8.47<br>20.2<br>28.4<br>40.4<br>49.9   |  |
| ····   |   |   | ······································   |  |
|  |   |   | INFORMATION  |  |
| METHOD /APPARATUS/PROCEDURE:<br>Vapor passed once through magneti-<br>cally stirred cell. Temperature<br>measured using thermocouple and<br>pressure measured with Bourdon gauge.<br>Liquid and vapor samples analysed<br>using mass spectrometer. |   |   | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>1. Bureau of Mines sample purity<br/>better than 99,994 mole per cent.</li> <li>2. Airco prepurified sample purity<br/>better than 99,997 mole per cent.<br/>(Details in source.)</li> </ul> |  |
|  |   |   | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.2;  \delta P/bar = \pm 0.01 \text{ at } 5.07$<br>bar, = $\pm 0.07$ at other pressures;<br>$\delta x_{\text{He}} \leq \pm 2$ % (Details in source).   |  |
|  |   |   | REFERENCES :   |  |

| COMPONENTS:  |  |  | ORIGINAL MEASUREMENTS:   |   |  |
|--|--|--|--|---|--|
| (1) Helium; He; 7440-59-7<br>(2) Nitrogen; N <sub>2</sub> ; 7727-37-9  |  |  | ORIGINAL MEASUREMENTS:<br>Skripka, V. G. and Dykhno, N. M.,<br>Trudy Vses. NauchIssled. Inst.<br>Kriog. Mashinostr., <u>1964</u> , 8, 163.         |   |  |
| VARIABLES:   |  |  | PREPARED BY:   |   |  |
| Temperature, pressure  |  |  | C. L. Young  |   |  |
| Towhergeare, higgare   |  |  |  |   |  |
| EXPERIME   | NTAL VALUES:                             |  | Mole fractio   | n of helium                                     |  |
| <u>т/к</u>   | P/bar                                    | <i>P<sup>†</sup>/bar</i>                 | in liquid, x <sub>He</sub>   | in vapor, y <sub>He</sub>                       |  |
| 67.5   | 6.08<br>11.06<br>16.08<br>21.20<br>26.26 | 5.82<br>10.80<br>15.82<br>20.93<br>26.00 | 0.00068<br>0.00129<br>0.00181<br>0.00242<br>0.00301  | 0.9624<br>0.9777<br>0.9841<br>0.9874<br>0.9893  |  |
| 72.0   | 6.17<br>11.12<br>16.13<br>21.20<br>26.08 | 5.63<br>10.58<br>15.59<br>20.66<br>25.54 | 0.00086<br>0.00167<br>0.00243<br>0.00321<br>0.00397  | 0.9214<br>0.9550<br>0.9677<br>0.9750<br>0.9783  |  |
| 78.0   | 6.02<br>11.05<br>16.13<br>21.19<br>26.22 | 4.88<br>9.92<br>15.00<br>20.05<br>25.09  | 0.00104<br>0.00211<br>0.00314<br>0.00416<br>0.00521  | 0.8144<br>0.8999<br>0.9287<br>0.9452<br>0.9536  |  |
| 84.0   | 6.07<br>11.06<br>16.18<br>21.19<br>26.20 | 3.98<br>8.98<br>14.09<br>19.10<br>24.12  | 0.00114<br>0.00252<br>0.00402<br>0.00536<br>0.00681  | 0.7967<br>0.8611<br>0.8905<br>0.9111            |  |
| 90.3   | 6.01<br>11.06<br>16.13<br>21.20<br>26.25 | 2.23<br>7.29<br>12.35<br>17.42<br>22.47  | 0.00089<br>0.00277<br>0.00470<br>0.00658<br>0.00856  | -<br>0.7392<br>0.7971<br>0.8345                 |  |
| P <sup>+</sup>   | partial pres                             | sure of helium.                          |  |   |  |
|  |  | AUXILIARY                                | INFORMATION  |   |  |
| METHOD /   | APPARATUS/PRO                            | CEDURE:                                  | SOURCE AND PURITY OF MATE  | RIALS:  |  |
| Vapor flow apparatus with magnetic re-<br>circulating pump. Temperature measu-<br>red with platinum resistance thermo-<br>meter, pressure measured with Bourdon<br>gauge. Samples of gas and liquid<br>analysed by gas phase interferometry.<br>Details in source. |  |  | <ol> <li>High purity conta<br/>than 0.008% hydro<br/>nitrogen, 0.005%<br/>hydrocarbons.</li> <li>Purity 99.5 mole<br/>main impurity.</li> </ol>    | gen, 0.02%<br>oxygen and 0.07%                  |  |
|  |  |  | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02 \text{ to } 0.03;$<br>$0.2 \text{ bar; } \delta x_{\text{He}} \approx \delta y_{\text{He}}$<br>0.00002. | $\delta P$ less than<br>$\simeq \pm 0.00001$ to |  |
|  |  |  | REFERENCES:  |   |  |
|  |  |  |  |   |  |

|   | :   |   | ORIGINAL MEASUREMENTS:  |  |  |
|---|---|---|---|--|--|
| (1) Helium; He; 7440-59-7                                 |   |   | Rodewald, N. C., Davis, J. A. and   |  |  |
| (2) Ni  | trogen: Na:   | 7727-37-9   | Kurata, F., Am. Inst. Chem. Engnrs.<br>J., <u>1964</u> , 10, 937.   |  |  |
| (2) Nitrogen; N <sub>2</sub> ; 7727-37-9                  |   | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,                                   | <i>J.</i> , <u>1964</u> , <i>10</i> , 937.  |  |  |
| ARIABLES:   |   |   | PREPARED BY:  |  |  |
| Tomporat  |   |   |   |  |  |
| Temperature, pressure                                     |   |   | C. L. Young   |  |  |
| XPERIMENT.  | AL VALUES:  |   |   |  |  |
| т/к   | <i>P/</i> bar   | Mole fractio  | n of helium<br>in gas,  |  |  |
| 171   | 1/Dai   | <sup>x</sup> He   | <sup>y</sup> He   |  |  |
|   |   |   |   |  |  |
| 77.2  | 13.8  | 0.0031  | 0.920   |  |  |
|   | 27.6  | 0.0062  | 0.955   |  |  |
|   | 41.4<br>55.2  | 0.0091<br>0.01175   | 0.968<br>0.975  |  |  |
|   | 68.9  | 0.0138  | 0.979   |  |  |
| 59.3  | 13.8<br>27.6  | 0.0024<br>0.0046  | 0.973<br>0.980  |  |  |
|   | 41.4  | 0.0066  | 0.983   |  |  |
|   | 55.2<br>68.9  | 0.0083<br>0.0095  | 0.985<br>0.988  |  |  |
| 54.9  | 13.8  | 0.0019  | 0.977   |  |  |
|   | 27.6  | 0.00365   | 0.981   |  |  |
|   | 41.4<br>55.2  | 0.0051<br>0.0063  | 0.985<br>0.988  |  |  |
|   | 68.9  | 0.0073  | 0.992   |  |  |
|   |   |   | · · · · · · · · · · · · · · · · · · ·   |  |  |
|   |   |   |   |  |  |
| ετμορ /ΔΡ   |   |   | INFORMATION   |  |  |
|   | PARATUS/PROCE   | DURE :  | SOURCE AND PURITY OF MATERIALS:   |  |  |
| Static e<br>neasured<br>thermome<br>vith Bou              | quilibrium ce<br>with platinu<br>ter and press<br>rdon gauge.<br>easured for sa | DURE:<br>11 temperature<br>m resistance                                   |   |  |  |
| Static e<br>neasured<br>thermome<br>vith Bou<br>points mo | quilibrium ce<br>with platinu<br>ter and press<br>rdon gauge.<br>easured for sa | DURE:<br>11 temperature<br>m resistance<br>ure measured<br>Dew and bubble | SOURCE AND PURITY OF MATERIALS:   |  |  |
| Static e<br>neasured<br>thermome<br>vith Bou<br>points mo | quilibrium ce<br>with platinu<br>ter and press<br>rdon gauge.<br>easured for sa | DURE:<br>11 temperature<br>m resistance<br>ure measured<br>Dew and bubble | SOURCE AND PURITY OF MATERIALS:   |  |  |
| Static e<br>neasured<br>thermome<br>vith Bou<br>points mo | quilibrium ce<br>with platinu<br>ter and press<br>rdon gauge.<br>easured for sa | DURE:<br>11 temperature<br>m resistance<br>ure measured<br>Dew and bubble | SOURCE AND PURITY OF MATERIALS:<br>No details given.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.7;  \delta P/bar = \pm 0.5$ ;   |  |  |
| Static e<br>neasured<br>thermome<br>vith Bou<br>points mo | quilibrium ce<br>with platinu<br>ter and press<br>rdon gauge.<br>easured for sa | DURE:<br>11 temperature<br>m resistance<br>ure measured<br>Dew and bubble | SOURCE AND PURITY OF MATERIALS:<br>No details given.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.7; \ \delta P/bar = \pm 0.5$ ;<br>$\delta x_{He} = \pm 0.0005; \ \delta y_{He} = \pm 0.002$ |  |  |

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COMPONENTS: ORIGINAL MEASUREMENTS: (1) Helium; He; 7440-59-7 Davis, J. A., Rodewald, N. and Kurata, F., Ind. Eng. Chem., 1963, No.11, 36. 55 (2) Nitrogen; N<sub>2</sub>; 7727-37-9 VARIABLES: PREPARED BY: C. L. Young Temperature, pressure EXPERIMENTAL VALUES: Mole fraction of helium Mole fraction of helium Т/К in gas, T/K P/bar in liquid, P/bar in liquid, in gas,  $x_{\rm He}$  ${}^{y}{}_{\mathrm{He}}$  ${}^{y}{}_{\mathrm{He}}$  $x_{\rm He}$ 77.2 14.4 0.0031 77.2 51.4 0.0105 0.956 -0.977 0.0041 51.4 0.0112 17.9 \_ 29.1 0.0067 -56.4 0.0109 0,981 0.974 29.1 56.4 0.0072 0.0112 0.945 0.962 36.2 0.0080 56.5 0.0124 56.5 36.2 0.0084 0.968 0.0129 0.975 0.0117 36.5 0.0093 0.947 60.8 0.989 36.5 0.0102 0.967 60.8 0.0120 0.974 0.974 42.6 0.946 0.0086 62.6 0.0124 42.6 0.0090 0.966 62.6 0.0131 0.975 44.3 0.0099 0.949 67.4 0.0129 0.977 0.973 44.3 0.0108 67.4 0.0133 0.974 49.7 0.0098 0.951 68.1 0.0134 0.981 49.7 0.974 0.0101 68.1 0.0146 0.976 AUXILIARY INFORMATION METHOD /APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: No details given. Static equilibrium cell temperature measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Composition of vapor and liquid phases estimated from overall composition and amount of each phase. Details in source. ESTIMATED ERROR:  $\delta T/K = \pm 0.5; \quad \delta P/bar = \pm 0.2;$  $\delta x_{\rm He} = \pm 0.0002; \quad \delta y_{\rm He} = \pm 0.002$ (estimated by compiler) **REFERENCES**:

| ······   |   |  |  |
|--|---|--|--|
| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |
| (1) Helium; He; 7440-59-7  | Streett, W. B., Chem. Eng. Prog.  |  |  |
| (2) Nitrogen; N <sub>2</sub> ; 7727-37-9   | Symp. Ser. No. 61, <u>1967</u> , 63, 37.  |  |  |
| VARIABLES:   | PREPARED BY:  |  |  |
| Temperature, pressure  | C. L. Young   |  |  |
| EXPERIMENTAL VALUES:   |   |  |  |
| Mole fraction of helium<br>T/K P/bar in liquid, in vapor,<br><sup>x</sup> He <sup>y</sup> He   |   |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |  |  |
| AUXILIA  | ARY INFORMATION   |  |  |
| METHOD/APPARATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:   |  |  |
| Recirculating vapor flow with magner<br>pump. Samples of phases analysed I<br>thermal conductivity. Temperature<br>measured with platinum resistance<br>thermometer. Pressure measured wi<br>Bourdon gauge. Details in source<br>and ref. 1. | by  |  |  |
|  | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02;  \delta P/bar = \pm 0.1;  \delta x_{He} = \delta y_{He} = \pm 0.002 \text{ to } \pm 0.01 \text{ (at pressure above 500 bar).}$<br>REFERENCES: |  |  |
|  | <pre>1. Streett, W. B., Cryogenics, <u>1965</u>, 5,<br/>27.</pre>   |  |  |

COMPONENTS:

(1) Helium; He; 7440-59-7

(2) Nitrogen; N<sub>2</sub>; 7727-37-9

## ORIGINAL MEASUREMENTS:

Streett, W. B., Chem. Eng. Prog. Symp. Ser. No. 61, <u>1967</u>, 63, 37.

EXPERIMENTAL VALUES:

| т/к    | P/bar  | Mole fraction<br>in liquid,<br><sup>x</sup> He   | of helium<br>in vapor,<br><sup>y</sup> He   |
|--------|--|--|---|
| 119.86 | 507.1<br>515.7<br>524.3<br>534.7<br>540.9<br>552.6<br>569.2<br>580.9<br>606.0<br>655.7<br>689.5<br>757.0<br>827.4<br>221.7<br>277.9<br>348.9<br>415.8<br>449.9<br>484.7<br>503.7<br>669.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>680.9<br>758.4 | 0.5150<br>0.5240<br>0.5240<br>0.5345<br>0.5345<br>0.5435<br>0.5453<br>0.5453<br>0.5453<br>0.5514<br>0.5482<br>0.5470<br>0.5351<br>0.5269<br>0.2732<br>0.3312<br>0.3980<br>0.4513<br>0.4799<br>0.5093<br>0.5556<br>0.5841<br>0.5704<br>0.5671<br>0.5470 | 0.6244<br>0.6274<br>0.6278<br>0.6270<br>0.6270<br>0.6283<br>0.6331<br>0.6320<br>-<br>0.6686<br>0.7001<br>0.7302<br>0.6261<br>0.6393<br>0.6261<br>0.6393<br>0.6349<br>0.6349<br>0.6343<br>0.6524<br>0.6587<br>0.6977 |
| 120.40 | 830.8  | 0.5354   | 0.7261  |
|        | 205.8  | 0.2616   | 0.5970  |
|        | 310.3  | 0.3915   | 0.6051  |
|        | 342.7  | 0.4377   | 0.5890  |
| 121.00 | 357.8  | 0.4665   | 0.5769  |
|        | 67.6   | 0.0707   | 0.3628  |
|        | 145.5  | 0.1937   | 0.5373  |
|        | 206.5  | 0.2837   | 0.5686  |
|        | 276.8  | 0.4039   | 0.5478  |
| 121.74 | 290.3  | 0.4743   | 0.5108  |
|        | 67.2   | 0.0729   | 0.3356  |
|        | 112.0  | 0.1522   | 0.4624  |
|        | 146.9  | 0.2109   | 0.5039  |
|        | 203.1  | 0.3120   | 0.5152  |
|        | 214.8  | 0.3476   | 0.5020  |
|        | 221.3  | 0.3680   | 0.4964  |
|        | 224.1  | 0.3883   | 0.4896  |

| COMPON | ENTS :                                  |  |                  | ORIGINAL                          | MEASUREME                              | NTS:                                  | · · · · · · · · · · · · · · · · · · · |  |
|--------|---|--|------------------|-----------------------------------|--|---------------------------------------|---------------------------------------|--|
| (1)    | (1) Helium; He; 7440-59-7               |  |                  |                                   | DeVaney, W. E., Dalton, B. J. and      |                                       |                                       |  |
| (2)    | 2) Nitrogen; N <sub>2</sub> ; 7727-37-9 |  |                  | Meeks, J. C. Jr., J. Chem. Engng. |  |                                       |                                       |  |
| (2)    | Ni Li Ogen;                             | M2, 7727                               | 57.5             | Data,                             | 1963, <i>8</i> ,                       | 473.                                  |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
| VARIAB | I.FS.                                   |  |                  | PREPARED                          | . PV.                                  | · · · · · · · · · · · · · · · · · · · |                                       |  |
|        | rature, p                               | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ |                  | C. L.                             |  |                                       |                                       |  |
| rempe. | racure, F                               | Jiessuie                               |                  |                                   | roung                                  |                                       |                                       |  |
| EXPERI | MENTAL VAL                              | UES:<br>Mole fraction                  | n of helium      |                                   | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | lole fraction                         | n of helium                           |  |
| т/к    |   | in liquid,                             | in gas,          | T/K                               |  | n liquid,                             | in gas,                               |  |
|        |   | $x_{ m He}$                            | $y_{\text{He}}$  |                                   |  | <sup>x</sup> He                       | <sup>𝔥</sup> He                       |  |
| 76.5   | 13.9                                    | 0.00265                                | 0.9111           | 85.0                              | 82.9                                   | 0.0223                                | 0.9578                                |  |
| ł      | 27.7                                    | 0.0034                                 | 0.9573<br>0.9702 |                                   | 96.3                                   | 0.0248                                | 0.9626                                |  |
|        | 41.4<br>55.7                            | 0.0062<br>0.0091                       | 0.9759           |                                   | 111.0<br>124.1                         | 0.0290<br>0.0326                      | 0.9626<br>0.9653                      |  |
|        | 69.1                                    | 0.0107                                 | 0.9796           |                                   | 137.8                                  | 0.0359                                | 0.9683                                |  |
|        | 83.2                                    | 0.0131                                 | 0.9832           | 90.0                              | 13.9                                   | 0.0041                                | 0.6962                                |  |
|        | 96.2<br>110.5                           | 0.0152<br>0.0172                       | 0.9826<br>0.9836 |                                   | 27.7<br>41.6                           | 0.0097                                | 0.8395                                |  |
|        | 124.1                                   | 0.0172                                 | 0.9836           |                                   | 41.6<br>55.4                           | 0.0133<br>0.0183                      | 0.8799<br>0.9135                      |  |
|        | 138.3                                   | 0.0213                                 | 0.9859           |                                   | 68.9                                   | 0.0224                                | 0.9232                                |  |
| 80.0   | 13.9                                    | 0.0031                                 | 0.8793           |                                   | 82.8                                   | 0.0280                                | 0.9336                                |  |
|        | 27.5<br>41.3                            | 0.0048<br>0.0075                       | 0.9341           |                                   | 96.5                                   | 0.0315                                | 0.9401                                |  |
|        | 41.3<br>55.6                            | 0.0114                                 | 0.9576<br>0.9652 |                                   | 110.8<br>123.9                         | 0.0381<br>0.0412                      | 0.9451<br>0.9467                      |  |
|        | 69.0                                    | 0.0136                                 | 0.9702           |                                   | 137.9                                  | 0.0458                                | 0.9511                                |  |
|        | 83.2                                    | 0.0163                                 | 0.9722           | 95.0                              | 13.9                                   | 0.0048                                | 0.5495                                |  |
|        | 96.2                                    | 0.0189                                 | 0.9769           |                                   | 27.8                                   | 0.0109                                | 0.7703                                |  |
|        | 110.5<br>124.2                          | 0.0215<br>0.0244                       | 0.9771<br>0.9769 |                                   | 41.7<br>55.4                           | 0.0165<br>0.0220                      | 0.8339                                |  |
|        | 138.0                                   | 0.0266                                 | 0.9820           |                                   | 68.7                                   | 0.0272                                | 0.8921                                |  |
| 85.0   | 13.9                                    | 0.0039                                 | 0.8088           |                                   | 83.0                                   | 0.0341                                | 0.9008                                |  |
|        | 27.9                                    | -                                      | 0.8990           |                                   | 96.4                                   | 0.0404                                | 0.9118                                |  |
|        | 41.6<br>55.6                            | 0.0102<br>0.0148                       | 0.9282<br>0.9447 |                                   | 110.5<br>124.0                         | 0.0464<br>0.0515                      | 0.9214<br>0.9233                      |  |
|        | 69.1                                    | 0.0175                                 | 0.9503           |                                   | 137.6                                  | 0.0561                                | 0.9233                                |  |
|        |   |  | AUXILIARY        | INFORMAT                          | ION                                    |                                       |                                       |  |
| METHOL | APPARAT                                 | US/PROCEDURE                           |                  |                                   |  | OF MATERIALS:                         |                                       |  |
|        |   | ibrium cell                            |                  |                                   |  | ty 99.995 mc                          | ole per                               |  |
|        | er and co                               | pper constar                           | tan thermo-      | cent                              | Ξ.                                     |                                       |                                       |  |
| couple |   | sure measure<br>Samples of             |                  |                                   |  |                                       | spectrometry                          |  |
|        |   | d using gas                            |                  | 99.9                              | ) mole pe                              | r cent.                               |                                       |  |
| graphy |   | ils in sourc                           |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  | 1                                 |  |                                       |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  | ESTIMAT                           | ED ERROR:                              |                                       | ·                                     |  |
|        |   |  |                  | δТ/К =                            | ±0.5; δ                                | $P/bar = \pm 0.0$                     | 07; $\delta x_{\text{He}} =$          |  |
|        |   |  |                  | 1                                 |  | <pre>&gt; 0.01, ±0.0</pre>            | пе                                    |  |
|        |   |  |                  |                                   |  |                                       | "He                                   |  |
|        |   |  |                  | REFEREN                           | $\delta y_{\rm He} =$<br>CES:          | ±0.002.                               |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  |                                   |  |                                       |                                       |  |
|        |   |  |                  | 1                                 |  |                                       |                                       |  |
|        |   |  |                  | •                                 |  |                                       |                                       |  |

COMPONENTS:

- (l) Helium; He; 7440-59-7
- (2) Nitrogen; N<sub>2</sub>; 7727-37-9

## ORIGINAL MEASUREMENTS:

DeVaney, W. E., Dalton, B. J. and Meeks, J. C. Jr., J. Chem. Engng. Data, <u>1963</u>, 8, 473.

EXPERIMENTAL VALUES:

| I\K   | P/bar   | Mole fraction<br>in liquid,<br><sup>x</sup> He   | of helium<br>in gas,<br><sup>y</sup> He  |
|-------|---|--|--|
| 100.0 | 14.1<br>27.6<br>41.5<br>55.3<br>68.4<br>82.7<br>96.3<br>110.7                   | $\begin{array}{c} 0.0045 \\ - \\ 0.0197 \\ 0.0275 \\ 0.0345 \\ 0.0438 \\ 0.0507 \\ 0.0586 \end{array}$ | 0.3586<br>0.6294<br>0.7576<br>0.8106<br>0.8370<br>0.8591<br>0.8591<br>0.8677<br>0.8830 |
| 105.0 | 123.9<br>123.9<br>138.4<br>14.1<br>27.6<br>41.5<br>55.5<br>68.9<br>83.2<br>96.9 | 0.0627<br>0.0684<br>0.0027<br>0.0104<br>0.0213<br>0.0315<br>0.0412<br>0.0519<br>0.0613                 | 0.8840<br>0.8933<br>0.1671<br>0.4957<br>0.6330<br>0.7139<br>0.7597<br>0.8086<br>0.8252 |
| 110.0 | 110.5   | 0.0726   | 0.8309   |
|       | 124.0   | 0.0760   | 0.8379   |
|       | 138.0   | 0.0828   | 0.8478   |
|       | 27.6  | 0.0103   | 0.3400   |
|       | 41.6  | 0.0241   | 0.5071   |
|       | 55.4  | 0.0375   | 0.6084   |
|       | 69.0  | 0.0496   | 0.6672   |
|       | 82.8  | 0.0619   | 0.6964   |
| 115.0 | 96.7  | 0.0731   | 0.7350   |
|       | 110.7   | 0.0820   | 0.7729   |
|       | 124.5   | 0.0904   | 0.7883   |
|       | 138.1   | 0.0983   | 0.7940   |
|       | 27.6  | 0.0102   | 0.1860   |
|       | 41.5  | 0.0252   | 0.3694   |
|       | 55.2  | 0.0437   | 0.4712   |
|       | 69.6  | 0.0597   | 0.5524   |
|       | 82.7  | 0.0723   | 0.6109   |
| 120.0 | 96.7  | 0.0860   | 0.6489   |
|       | 110.7   | 0.0962   | 0.6771   |
|       | 124.3   | 0.1051   | 0.6993   |
|       | 138.2   | 0.1068   | 0.7201   |
|       | 41.5  | 0.0253   | 0.2211   |
|       | 55.6  | 0.0495   | 0.3465   |
|       | 69.5  | 0.0749   | 0.4197   |
|       | 82.7  | 0.0915   | 0.4874   |
|       | 96.5  | 0.1026   | 0.5210   |
|       | 110.6   | 0.1190   | 0.5623   |
|       | 124.0   | 0.1300   | 0.5813   |

| COMPONENTS :              |   |  |   | ORIGINAL MEASUREMENTS:  |  |  |  |  |
|---------------------------|---|--|---|---|--|--|--|--|
| (1) Helium; He; 7440-59-7 |   |  |   | Gonikberg, M. G. and Fastowsky, W. G.,<br>Acta Physicochimica U.R.S.S., 1940, |  |  |  |  |
| (2) N                     | litrogen;   | ; N <sub>2</sub> ; 7727-3  | 37-9  | 12, 67.   | -  |  | · · · · · · · · · · · · · · · · · · ·                                |  |
| VARIABLI                  | ES:   |  |   | PREPARED  | BY:  |  | <u> </u>   |  |
| Temper                    | ature, p  | pressure   |   | С. L. У   |  |  |  |  |
| EXPERIM                   | ENTAL VALU  | JES:   |   |   |  |  |  |  |
| т/К                       | P/bar   | Mole fractio<br>in liquid,<br><sup>x</sup> He                        | on of helium<br>in vapor,<br><sup>y</sup> He                | т/к   |  | Mole fraction<br>in liquid,<br><sup>*</sup> He                       | of helium<br>in vapor,<br><sup>y</sup> He                            |  |
| 78.0                      | 18.1<br>43.6<br>67<br>103<br>144<br>204<br>264<br>289 | 0.005<br>0.009<br>0.015<br>0.022<br>0.026<br>0.037<br>0.046<br>0.050 | 0.921<br>0.946<br>0.965<br>0.969<br>0.978<br>0.984<br>0.983 | 90.1<br>109   | 183<br>216<br>248<br>279<br>27.0<br>43.6<br>79<br>110  | 0.056<br>0.062<br>0.070<br>0.079<br>0.023<br>0.035<br>0.065<br>0.082 | 0.931<br>0.941<br>0.944<br>0.945<br>0.455<br>0.583<br>0.663<br>0.705 |  |
| 90.1                      | 20.3<br>34.4<br>58<br>93                              | 0.006<br>0.011<br>0.021<br>0.035                                     | 0.733<br>0.829<br>0.887<br>0.902                            |   | 136<br>177<br>228<br>244                               | 0.106<br>0.131<br>0.159<br>0.167                                     | 0.755<br>0.766<br>0.797<br>0.814                                     |  |
|                           | 154   | 0.049  | 0.923   |   | 280  | 0.183  | 0.825  |  |
|                           |   |  |   | INFORMATI   | 280  |  |  |  |
| METHOD                    | 154   |  | 0.923<br>AUXILIARY  |   | 280<br>0N  |  |  |  |
| Recirc                    | 154<br>/APPARAT<br>ulating<br>describ                 | 0.049  | 0.923<br>AUXILIARY<br>:<br>pparatus.                        |   | 280<br>ON<br>ND PURITY                                 | 0.183  |  |  |
| Recirc                    | 154<br>/APPARAT<br>ulating<br>describ                 | 0.049<br>US/PROCEDURE<br>vapor flow ap                               | 0.923<br>AUXILIARY<br>:<br>pparatus.                        | SOURCE AN<br>ESTIMATEI<br>ST/K =  | 280<br>ON<br>ND PURITY<br>No det.<br>D ERROR:<br>±0.1; | 0.183<br>OF MATERIALS:<br>ails given.                                |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Parrish, W. R. and Stewart, W. G., (1) Helium; He; 7440-59-7 J. Chem. Engng. Data, 1975, 20, 412. (2) Nitrous oxide; N<sub>2</sub>O; 10024-97-2 VARIABLES: PREPARED BY: C. L. Young Temperature, pressure . EXPERIMENTAL VALUES: Mole fraction of helium Mole fraction of helium т/к in liquid, in vapor, T/K P/bar in liquid, in vapor, P/bar  $x_{\rm He}$ <sup>у</sup>не <sup>*x*</sup>не  $y_{\rm He}$ 0.0052 103.3 195.0 \_ 255.0 86.7 0.0147 \_ 103.6 0,0052 ---87.4 0.0154 \_ 136.4 0.0070 ----101.8 0.0186 137.8 0.0068 103.0 0.0182 \_ 215.0 49.9 0.0029 - - - -103.2 0.0180 \_ 51.8 0.0027 104.5 0.0184 -86.1 0,0054 104.7 -0.0185 235.0 51.2 0.0056 121.2 0.0209 -0.0055 51.6 121.7 0.0214 \_ 84.8 0.0096 133.2 0.0241 -----86.2 0.0104 135.4 0.0246 \_ 136.5 0.0170 136.2 0.0242 265.0 52.5 245.0 71.0 0.0098 0.0077 ----103.2 0.0157 52.8 0.0075 0.0155 103.7 71.6 \_ 0.0127 131.3 0,0204 71.7 0.0128 133.9 0.0205 72.1 0.0122 -137.6 0.0209 0.0215 104.9 -137.8 0.0209 105.5 0.0222 -0.0291 255.0 38.8 0.0042 135.4 \_ -38.9 0.0041 136.8 0.0299 58.2 ---0.0087 285.0 81.8 0.0173 58.3 0,0090 \_ 94.3 0.0238 75.6 0.0127 94.6 \_ 0.0233 \_ 76.0 0.0130 114.6 0.0177 86.1 0.0145 116.9 0.0334 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD /APPARATUS/PROCEDURE: Vapor recirculation system similar to 1. No details given. that in ref. 1. Pressure measured 2. Purity better than 98 mole per with Bourdon gauge. Temperature cent. Vapor over liquid vented measured with platinum resistance several times. thermometer. Samples of liquid and vapor analysed by gas chromatography. Details in source. ESTIMATED ERROR:  $\delta T/K = \pm 0.13; \quad \delta P/bar = \pm 0.07;$  $\delta x_{\text{He}} = \delta y_{\text{He}} = \pm 0.002 \text{ or } \pm 2\% \text{ which}$ ever is greater. **REFERENCES**:

| COMPONENTS:  |  |  |  | ORIGINAL MEASUREMENTS: |  |  |  |
|--|--|--|--|------------------------|--|--|--|
| <pre>(1) Helium; He; 7440-59-7 (2) Nitrous Oxide; N<sub>2</sub>O; 10024-97-2</pre> |  |  | Parrish, W. R. and Stewart, W. G.,<br>J. Chem. Engng. Data, <u>1975</u> , 20, 412. |                        |  |  |  |
| т/к  | <i>P/</i> bar                          | Mole fraction<br>in liquid,<br><sup>x</sup> He |  | т/к                    | P/bar                                  | Mole fraction<br>in liquid,<br><sup>x</sup> He |  |
| 285.0  | 135.5<br>136.1                         | 0.0414<br>0.0416                               | -  | 245.0                  | 98.2<br>125.9                          | -  | 0.8211   |
| 235.0  | 136.7<br>19.7<br>35.6<br>52.0<br>69.3  | 0.0418<br>-<br>-<br>-<br>-                     | -<br>0.4563<br>0.6855<br>0.7775<br>0.8269  | 255.0<br>265.0         | 50.0<br>70.1<br>103.8<br>128.5<br>41.6 |  | 0.5611<br>0.6628<br>0.7630<br>0.8042<br>0.3128 |
| 245.0  | 104.5<br>132.9<br>40.3<br>51.7<br>67.6 | -<br>-<br>-<br>-                               | 0.8819<br>0.9055<br>0.6007<br>0.6780<br>0.7470                                     |                        | 72.5<br>98.3<br>99.6<br>106.0<br>136.5 | -<br>-<br>-<br>-                               | 0.5674<br>0.6628<br>0.6670<br>0.6828<br>0.7403 |

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COMPONENTS:
                                         EVALUATOR:
 1. Helium; He; 7440-59-7
                                           Colin Young,
                                           School of Chemistry,
 2. Oxygen; O<sub>2</sub>; 7782-44-7
                                           University of Melbourne,
                                           Parkville, Victoria 3052,
                                           AUSTRALIA.
CRITICAL EVALUATION:
           There are few sets of data for this system.
                                                            Herring and
Barrick(1) did not present tabulated data but gave the following smoothing
 equations for the mole fraction solubility
                   x = D(P - P_{c}) + E(P - P_{c})^{2}
where P is the total pressure in units of atmosphere; P_{c} is the vapor
 pressure of oxygen in units of atmosphere and D and E are constants given
 in Table 1.
 Table 1. Constants given by Herring and Barrick (1)
                          10<sup>3</sup>D
                                              -10<sup>6</sup>E
          T/K
                                          1.6908251
           70
                       2.4356943
           76
                       4.0101437
                                           4.0894999
           90
                       8.8673682
                                           7.0547135
                      23.268528
                                         20.804676
```

are classified as doubtful. The three other sets of data are all in reasonable agreement in the overlapping ranges of temperature and pressure. The solubility values of Skripka and Lobonova (2) are slightly greater than the values of Sinor and Kurata (3) at the highest pressures studied by the latter. The data of Skripka and coworker (2) and (4) and of Sinor and Kurata (3) are

In view of the lack of information regarding the degree of fit of such smoothing equations, these data should be regarded with some caution and

46.479906

74.331705

103.08746

## References

110 130

144

150

classified as tentative.

51.895458

97.089510

135.87904

- Herring, R. N. and Barrick, P. L., Internat. Adv. Cryogenic Engng., <u>1964</u>, 10, 151.
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| COMPONE                                      | NTS:   |  |   | ORIGIN                                      | AL MEASURE   | MENTS:   | <u></u>  |
|--|--|--|---|---|--|--|--|
| (1)<br>(2)                                   | Helium;<br>Oxygen;   | -  |   | Trud  | y Vses. 1  | G. and Lobon<br>NauchIssle<br>nostr., <u>1971</u>  | d. Inst.   |
|  |  | _  |   |   |  |  |  |
| VARIABL                                      | ES:  |  |   | PREPARI                                     | ED BY:   |  | <u></u>  |
| Temp   | erature,   | pressure   |   | с. г.                                       | . Young  |  |  |
| EXPERIM                                      | ENTAL VAL  |  |   |   |  |  | · · · · · · · · · · · · · · · · · · ·  |
| т/к  | P/bar  | Mole fraction<br>in liquid,<br><sup>x</sup> He   | of hellum<br>in vapor,<br><sup>y</sup> He   | т/к   | P/bar  | Mole fracti<br>in liquid,<br><sup>27</sup> He  | ion of helium<br>in vapor<br><sup>y</sup> He   |
| 65.12<br>77.81                               | 9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>107.9<br>117.7<br>127.5<br>137.3<br>147.1<br>156.9<br>166.7<br>176.5<br>186.3<br>196.1<br>205.9<br>215.7<br>9.8<br>19.6<br>29.4<br>39.2<br>49.0 | 0.0002<br>0.0003<br>0.0004<br>0.0005<br>0.0006<br>0.0009<br>0.0010<br>0.0013<br>0.0015<br>0.0016<br>0.0018<br>0.0020<br>0.0021<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0023<br>0.0026<br>0.0030<br>0.0030<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0031<br>0.0032<br>0.0031<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0032<br>0.0031<br>0.0031<br>0.0032<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.0031<br>0.00 | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | 90.58                                       | 68.6<br>78.5<br>88.3<br>98.1<br>107.9<br>117.7<br>127.5<br>137.3<br>147.1<br>156.9<br>166.7<br>176.5<br>186.3<br>196.1<br>205.9<br>215.7 | 0.0023<br>0.0027<br>0.0031<br>0.0036<br>0.0041<br>0.0050<br>0.0055<br>0.0055<br>0.0058<br>0.0062<br>0.0070<br>0.0074<br>0.0079<br>0.0087<br>0.0087<br>0.0092<br>0.0087<br>0.0092<br>0.0006<br>0.0014<br>0.0021<br>0.0029<br>0.0037<br>0.0045<br>0.0054<br>0.0062<br>0.0054<br>0.0070 | 0.9925<br>0.9935<br>0.9940<br>0.9945<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9950<br>0.9710<br>0.9750<br>0.9750 |
|  |  |  | AUXILIARY   | INFORMA                                     | TION   |  |  |
| Rockir<br>with ]<br>gas.<br>interf<br>with p | ng autoc<br>Liquid a<br>Sample<br>Ferometr<br>Slatinum<br>Ced with   | US/PROCEDURE:<br>lave partially<br>nd then pressu<br>s of phases an<br>y. Temperatu:<br>resistance and<br>Bourdon gauge  | filled<br>rized with<br>alysed by<br>re measured<br>d pressure                              | SOURCE<br>1. H<br>m<br>2. H<br>m<br>ESTIMAT | AND PURIT<br>igh puri<br>ole per<br>igh puri<br>ole per<br>TED ERROR:<br>= ±0.01;<br>= $\delta y_{\rm He}$ =                             | cent.<br>ty sample;<br>cent.   | purity 99.9<br>purity 99.8   |

COMPONENTS: ORIGINAL MEASUREMENTS: Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Helium; He; 7440-59-7 (1)Oxygen; 0,; 7782-44-7 Kriog. Mashinostr., <u>1971</u>, 13, 90. (2) Mole fraction of helium Mole fraction of helium in vapor, T/K P/bar in liquid, T/K P/bar in liquid, in vapor  $x_{\text{He}}$  $y_{\rm He}$  $x_{\rm He}$  ${}^{y}$ He 98.1 166.7 90.58 0.0080 0.9765 0.0262 0.9540 103.06 107.9 0.0087 0.9780 176.5 0.0275 0.9555 0.9800 0.9565 117.7 0.0095 186.3 0.0289 127.5 0.9810 196.1 0.9570 0.0103 0.0301 137.3 0.0111 0.9810 205.9 0.0313 0.9570 147.1 0.0119 0.9820 215.7 0.0323 0.9575 116.22 156.9 0.0127 0.9830 9.8 0.0005 19.6 166.7 0.0135 0.9830 0.0036 0.0143 0.9835 29.4 0.0067 0.5650 176.5 0.6700 186.3 0.0150 0.9835 39.2 0.0097 49.0 196.1 0.0155 0.9835 0.0128 0.7290 58.8 0.7680 205.9 0.0165 0.9835 0.0158 0.0172 215.7 0.9830 68.6 0.0188 0.7940 103.06 9.8 0.0012 -78.5 0.0216 0.8130 19.6 0.0030 88.3 0.0243 0.8280 98.1 29.4 0.0049 0.8300 0.0268 0.8410 39.2 0.0066 0.8640 107.9 0.0294 0.8520 49.0 0.0083 0.8905 117.7 0.0320 0.8610 58.8 0.0100 0.9060 127.5 0.0344 0.8690 0.9115 0.0118 0.8760 68.6 137.3 0.0370 0.0133 78.5 0.9230 147.1 0.0394 0.8815 88.3 0.0149 0.9295 156.9 0.0419 0.8865 98.1 0.0165 0.9350 166.7 0.0443 0.8910 107.9 0.0180 0.9390 176.5 0.0467 0.8950 0.0195 0.9430 186.3 0.0490 0.8985 117.7 127.5 0.0208 0.9460 196.1 0.0513 0.9020 0.9485 205.9 0.0536 137.3 0.0221 0.9055 147.1 0.0234 0.9510 215.7 0.0560 0.9085 0.0248 156.9 0.9520

| COMPONENT   | S:  |  | ORIGINAL                         | MEASUREMENTS                              |  |
|---|---|--|----------------------------------|---|--|
|   | elium; He;<br>kygen; O <sub>2</sub> ;   |  | 1                                |   | Kurata, F.,<br><i>ata</i> , <u>1966</u> , <i>11</i> , 537.         |
|   |   |  |                                  |   |  |
| VARIABLES   | 5:  |  | PREPARED                         | BY:                                       |  |
| Tempera   | ature, press  | sure   | C. L. Y                          | oung                                      |  |
| EXPERIMEN   | NTAL VALUES:  |  |                                  |   |  |
| т/к   | Mol<br>P/bar  | e fraction of heli<br>in liquid, <sup>x</sup> <sub>He</sub>                                |                                  | Mol<br>P/bar                              | e fraction of helium<br>in liquid, <sup>x</sup> He                 |
| 77.35   | 17.2<br>34.5<br>51.7<br>68.95<br>86.18  | 0.0004<br>0.0014<br>0.0020<br>0.0025<br>0.0032   | 113.15                           | 68.95<br>86.18<br>103.4<br>120.7<br>137.9 | 0.0154<br>0.0195<br>0.0232<br>0.0267<br>0.0302                     |
| 93.15   | 103.4<br>120.7<br>137.9<br>17.2<br>34.5   | 0.0036<br>0.0043<br>0.0048<br>0.0014<br>0.0033   | 128.15                           | 34.5<br>51.7<br>68.95<br>86.18<br>103.4   | 0.0086<br>0.0159<br>0.0237<br>0.0314<br>0.0384                     |
|   | 51.7<br>68.95<br>86.18<br>103.4<br>120.7  | 0.0053<br>0.0068<br>0.0083<br>0.0099<br>0.0114   | 143.15                           | 120.7<br>137.9<br>51.7<br>68.95<br>86.18  | 0.0446<br>0.0508<br>0.0180<br>0.0330<br>0.0461                     |
| 113.15  | 137.9<br>17.2<br>34.5<br>51.7   | 0.0127<br>0.0027<br>0.0074<br>0.0113   |                                  | 103.4<br>120.7<br>137.9                   | 0.0598<br>0.0725<br>0.0860   |
|   |   | AUXILIAF   | Y INFORMATIC                     | DN  |  |
| METHOD/A  | PPARATUS/PR   | OCEDURE •  | SOURCE AN                        | D PURITY OF                               | MATERIALS:   |
| Static<br>city) f<br>Tempera<br>resista<br>measure<br>Compone<br>equilib<br>and ana | equilibrium<br>itted with<br>ture measur<br>nce thermom<br>d with Bour<br>nts charged<br>rated liquid | cell (0.1 & capa-<br>magnetic stirrer.<br>ed with platinum<br>eter. Pressure<br>don gauge. | 1. U.S.<br>mum<br>2. Lind<br>per | Bureau of<br>impurity l2                  | Mines sample, maxi-<br>2 parts per million.<br>le purity 99.7 mole |
|   |   |  |                                  | ±0.02; δP/                                | /bar = ±0.1;<br>0003 (whichever is<br>greater)                     |
|   |   |  | Kurat                            | c, J. E., S                               | Schindler, D. L. and<br>Inst. Chem. Engnrs.<br>953.                |

|                                      | ITS:  |                          | ORIGINAL MEASUREMENTS:  |            |
|--------------------------------------|---|--------------------------|---|------------|
| (1) I                                | Helium; He;   | 7440-59-7                | Skripka, V. G. and Dykhno, N. M   | ſ.,        |
| (2)                                  | Oxygen; O <sub>2</sub> ;                                | 7700 44 7                | Trudy Vses. NauchIssled. Inst   |            |
|                                      | oxygen, o <sub>2</sub> ,                                | 7782-44-7                | Kislorodn. Mashinostr., <u>1964</u> , 8   | , 163      |
| ARIABLE                              |   |                          | PREPARED BY:  |            |
|                                      |   |                          |   |            |
| rempera                              | ature, press  | sure                     | C. L. Young   |            |
| XPERIME                              | ENTAL VALUES:   |                          | Mole fraction of helium   |            |
| г/к                                  | P/bar   | <i>P<sup>+</sup>/bar</i> | in liquid, $x_{He}$ in vapor, $y_{H}$   | e          |
| 57.5                                 | 6.02  | 5,98                     | 0.000126 0.9956   |            |
|                                      | 11.16   | 11.12                    | 0.000228 0.9973   |            |
|                                      | 16.14   | 16.10                    | 0.000336 0.9974   |            |
|                                      | 21.30<br>26.30  | 21.26<br>26.26           | 0.000433 0.9979   |            |
| 72.0                                 | 20.30   | 20.20                    | 0.000541 0.9983<br>0.000178 0.9828  |            |
|                                      | 11.26   | 11.17                    | 0.000321 0.9904   |            |
|                                      | 16.22   | 16.13                    | 0.000472 0.9929   |            |
|                                      | 21.29<br>25.99  | 21.20<br>25.90           | 0.000619 0.9943   |            |
| 78.0                                 | 25.99   | 25.90                    | 0.000759 0.9952<br>0.000240 0.9539  |            |
|                                      | 11.04   | 10.81                    | 0.000427 0.9732   |            |
|                                      | 16.20   | 15.97                    | 0.000622 0.9819   |            |
|                                      | 21.22   | 20.98                    | 0.000822 0.9858   |            |
| 4.0                                  | 26.26<br>6.01   | 26.03<br>5.48            | 0.000998 0.9881<br>0.000349 0.8939  |            |
|                                      | 11.05   | 10.53                    | 0.000660 0.9418   |            |
|                                      | 16.02   | 15.49                    | 0.000947 0.9606   |            |
|                                      | 21.19   | 20.66                    | 0.001267 0.9687   |            |
| 0.3                                  | 26.30<br>6.05   | 25.78<br>4.99            | 0.001592 0.9737   |            |
| 0.5                                  | 11.05   | 9.99                     | 0.000448 0.7791<br>0.000880 0.8804  |            |
|                                      | 16.13   | 15.07                    | 0.001338 0.9178   |            |
|                                      | 21.14   | 20.07                    | 0.001791 0.9352   |            |
| + part                               | 26.24<br>ial pressur                                    | 25.18<br>e of helium     | 0.002249 0.9472   |            |
| 1                                    | L   |                          | ( INFORMATION   |            |
| TTUOD /                              | APPARATUS/P   |                          | SOURCE AND PURITY OF MATERIALS;   |            |
|                                      |   | us with magnetic         |   |            |
| ecircu<br>easure<br>hermom<br>ourdon | lating pump<br>d with plat<br>neter pressur<br>gauge. S |                          | <pre>than 0.008% hydrogen, 0.02% nitrogen, 0.05% oxygen and ( hydrocarbons. 2. Purity 99.5 mole per cent or</pre>   | 0.07%<br>r |
| eromet                               | ry. Detai   | ls in source.            | better major impurities argo<br>water vapor.  | on and     |
|                                      |   |                          | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02 \text{ to } 0.03;  \delta P \text{ less to } 0.2 \text{ bar; } \delta x_{\text{He}} \simeq \delta y_{\text{He}} = \pm 0.00001$<br>0.00002. |            |
|                                      |   |                          | REFERENCES :  |            |
|                                      |   |                          |   |            |

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
| (1) Helium; He; 7440-59-7   | De Swaan Arons, J. and Diepen, G.A.M.,   |
| (2) Xenon; Xe; 7440-63-3  | J. Chem. Phys., <u>1966</u> , 44, 2322.  |
| VARIABLES:  | PREPARED BY:   |
| Temperature, pressure   | C. L. Young  |
| EXPERIMENTAL VALUES:  |  |
| T <sup>+</sup> /K P <sup>+</sup> /bar Mole fraction<br>of helium  | $T^+/K P^+/bar$ Mole fraction of helium  |
| 278.30 $51.7$ $0.0491$ $283.00$ $58.4$ $0.0491$ $285.35$ $62.2$ $0.0491$ $288.05$ $68.3$ $0.0491$ $289.30$ $73.7$ $0.0491$ $289.30$ $73.7$ $0.0491$ $289.40$ $76.7$ $0.0491$ $287.65$ $92.0$ $0.0491$ $287.65$ $92.0$ $0.0491$ $278.45$ $108.6$ $0.0491$ $278.90$ $59.9$ $0.1054$ $282.50$ $66.5$ $0.1054$ $285.45$ $73.4$ $0.1054$ $287.65$ $80.4$ $0.1054$ $287.65$ $80.4$ $0.1054$ $290.05$ $104.2$ $0.1054$ $290.05$ $104.2$ $0.1054$ $290.15$ $120.0$ $0.1054$ $287.65$ $150.5$ $0.1054$ $287.65$ $150.5$ $0.1054$ $287.65$ $150.5$ $0.1054$ $287.65$ $150.5$ $0.1054$ $287.65$ $150.5$ $0.1054$ $281.25$ $192.8$ $0.1054$ $281.25$ $70.2$ $0.1535$ $285.35$ $81.0$ $0.1535$ | 287.95 90.3 0.1535<br>289.45 98.9 0.1535<br>290.60 109.2 0.1535<br>291.40 127.7 0.1535<br>291.55 133.7 0.1535<br>291.65 139.4 0.1535<br>291.65 139.4 0.1535<br>290.25 205.1 0.1535<br>286.40 263.7 0.1535<br>286.40 263.7 0.1535<br>282.65 91.3 0.2385<br>285.40 101.6 0.2385<br>286.65 107.2 0.2385<br>288.55 118.2 0.2385<br>290.75 137.9 0.2385<br>292.15 163.5 0.2385<br>292.80 187.3 0.2385<br>292.80 187.3 0.2385<br>292.80 187.3 0.2385<br>292.80 187.3 0.2385<br>292.80 187.3 0.2385<br>292.90 189.6 0.2385<br>292.90 189.6 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>293.40 354.5 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.00 253.2 0.2385<br>294.10 1433.5 0.2385<br>(cont.) |
| AUXILIARY   | INFORMATION  |
| METHOD /APPARATUS/PROCEDURE:<br>Sample confined in glass vessel en-<br>closed in autoclave. Sample agitated<br>by electromagnetic stirrer. Pressure<br>measured on pressure balance. Details<br>in source and ref. 1.   | <ul> <li>SOURCE AND PURITY OF MATERIALS:</li> <li>(1) Ohio Chemical and Surgical<br/>Equipment Co. purity 99.99 mole<br/>per cent.</li> <li>(2) Hoechst AG sample.</li> </ul>  |
|   | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.05;  \delta P/bar = \pm 0.01\%;$<br>$\delta x_{He}$ (maximum) = ±1%.<br>REFERENCES:<br>1. van Hest, J.A.M. and Diepen,<br>G.A.M., Symp. Phys. Chem., High<br>Pressure, London, 1962, <u>1962</u> .   |

| COMPONE           | NTS:                |                       | ORIGINAL          | MEASURE             | MENTS:                  |
|-------------------|---------------------|-----------------------|-------------------|---------------------|-------------------------|
| (1) He            | lium; He;           | 7440-59-7             |                   |                     | J. and Diepen, G.A.M.,  |
| (2) Xe            | non; Xe;            | 7440-63-3             | J. Chem.          | Pnys,               | <u>1966</u> , 44, 2322. |
|                   |                     |                       |                   |                     |                         |
|                   |                     |                       |                   |                     |                         |
| EXPERIME          | ENTAL VALU          | JES:<br>Mole fraction |                   |                     | Mole fraction           |
| т <sup>+</sup> /к | P <sup>+</sup> /bar | of helium             | т <sup>+</sup> /к | P <sup>+</sup> /bar | of helium               |
| 278.25 282.10     | 83.3<br>95.1        | 0.2544<br>0.2544      | 299.10<br>302.05  | 465.4<br>574.3      | 0.5053<br>0.5053        |
| 285.70            | 110.3               | 0.2544                | 303.25            | 617.0               | 0.5053                  |
| 289.25            | 134.2               | 0.2544                | 305.45            | 705.9               | 0.5053                  |
| 289.40            | 135.8<br>153.3      | 0.2544<br>0.2544      | 310.40<br>315.90  | 910.1<br>1160.2     | 0.5053<br>0.5053        |
| 292.20            | 191.4               | 0.2544                | 320.60            | 1390.7              | 0.5053                  |
| 292.35            | 196.7               | 0.2544                | 325.60            | 1651.4              | 0.5053                  |
| 292.40<br>292.45  | 199.8<br>200.6      | 0.2544<br>0.2544      | 331.65<br>278.35  | 1965.8<br>181.7     | 0.5053<br>0.5587        |
| 292.55            | 205.1               | 0.2544                | 283.40            | 221.8               | 0.5587                  |
| 293.80            | 285.8               | 0.2544                | 288.45            | 276.3               | 0.5587                  |
| 293.80<br>293.45  | 314.7<br>373.6      | 0.2544<br>0.2544      | 293.25<br>298.30  | 351.5<br>469.8      | 0.5587<br>0.5587        |
| 293.45            | 432.4               | 0.2544                | 298.30<br>303.35  | 469.8               | 0.5587                  |
| 291.00            | 573.6               | 0.2544                | 306.10            | 743.5               | 0.5587                  |
| 289.60            | 705.1               | 0.2544                | 306.45            | 762.7               |                         |
| 287.95<br>288.50  | 973.8<br>1612.2     | 0.2544<br>0.2544      | 307.80<br>315.80  | 808.9<br>1133.1     | 0.5587<br>0.5587        |
| 278.30            | 93.8                | 0.3036                | 322.55            | 1426.9              | 0.5587                  |
| 282.70            | 110.0               | 0.3036                | 329.30            | 1741.2              | 0.5587                  |
| 287.95<br>290.85  | 140.0<br>171.0      | 0.3036<br>0.3036      | 333.75<br>278.45  | 1965.8<br>207.6     | 0.5587<br>0.6028        |
| 293.00            | 223.8               | 0.3036                | 283.70            | 254.2               | 0.6028                  |
| 293.20            | 229.7               | 0.3036                | 287.55            | 296.0               | 0.6028                  |
| 293.25<br>293.40  | 231.8<br>237.7      | 0.3036<br>0.3036      | 293.60<br>298.90  | 394.3<br>516.1      | 0.6028<br>0.6028        |
| 293.40            | 241.5               | 0.3036                | 305.15            | 713.3               | 0.6028                  |
| 293.50            | 242.5               | 0.3036                | 311.15            | 942.4               | 0.6028                  |
| 293.95            | 260.1               | 0.3036                | 313.80            | 1046.6              | 0.6028                  |
| 295.20<br>295.25  | 317.0<br>320.2      | 0.3036<br>0.3036      | 317.30<br>324.80  | 1189.5<br>1504.8    | 0.6028<br>0.6028        |
| 296.70            | 491.2               | 0.3036                | 331.15            | 1786.2              | 0.6028                  |
| 296.80            | 762.7               | 0.3036                | 336.65            | 2046.8              | 0.6028                  |
| 297.70<br>281.60  | 1126.9<br>114.7     | 0.3036<br>0.3537      | 283.00<br>290.70  | 289.4<br>395.0      | 0.6518<br>0.6518        |
| 286.30            | 139.1               | 0.3537                | 297.60            | 532.2               | 0.6518                  |
| 291.15            | 185.9               | 0.3537                | 303.00            | 676.9               | 0.6518                  |
| 292.05<br>294.00  | 198.1<br>242.9      | 0.3537<br>0.3537      | 308.60<br>315.10  | 862.1<br>1105.6     | 0.6518<br>0.6518        |
| 294.00            | 302.3               | 0.3537                | 321.15            | 1349.5              | 0.6518                  |
| 299.15            | 455.9               | 0.3537                | 321.15            | 1350.6              | 0.6518                  |
| 302.75<br>305.95  | 762.7<br>1126.9     | 0.3537<br>0.3537      | 323.85            | 1462.9<br>1759.2    | 0.6518                  |
| 309.78            | 1561.5              | 0.3537                | 330.75<br>336.50  | 2015.3              | 0.6518<br>0.6518        |
| 280.00            | 126.8               | 0.4053                | 278.20            | 265.8               | 0.6786                  |
| 282.80            | 142.0<br>181.6      | 0.4053                | 284.20            | 331.2               | 0.6786                  |
| 288.10            | 259.6               | 0.4053<br>0.4053      | 287.90<br>292.55  | 381.8<br>460.1      | 0.6786<br>0.6786        |
| 296.90            | 380.7               | 0.4053                | 298.50            | 586.3               | 0.6786                  |
| 297.15            | 390.5               | 0.4053                | 303.20            | 711.3               | 0.6786                  |
| 300.85<br>304.25  | 550.0<br>739.4      | 0.4053<br>0.4053      | 309.05<br>315.85  | 897.0<br>1145.4     | 0.6786<br>0.6786        |
| 309.15            | 1078.0              | 0.4053                | 321.70            | 1379.0              | 0.6786                  |
| 313.75            | 1427.9              | 0.4053                | 328.50            | 1664.0              | 0.6786                  |
| 317.80<br>279.55  | 1741.3<br>163.2     | 0.4053<br>0.5053      | 332.05<br>338.60  | 1820.4<br>2109.5    | 0.6786<br>0.6786        |
| 283.75            | 192.8               | 0.5053                | 278.30            | 290.1               | 0.7016                  |
| 289.35            | 249.6               | 0.5053                | 283.40            | 348.2               | 0.7016                  |
| 294.85            | 343.5               | 0.5053                | 289.55            | 437.5               | 0.7016                  |
|                   |                     |                       |                   |                     | (cont.)                 |

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ORIGINAL MEASUREMENTS: COMPONENTS: De Swaan Arons, J. and Diepen, G.A.M., Helium; He; 7440-59-7 (1)J. Chem. Phys., 1966, 44, 2322. Xenon; Xe; 7440-63-3 (2) EXPERIMENTAL VALUES: Mole fraction Mole fraction т+/к  $P^+/bar$ т+/к  $P^+/bar$ of helium of helium 1031.4 0.8270 303.20 0.7016 295.85 557.6 1250.4 710.2 0.7016 310.75 0.8270 302.05 0.8270 1420.2 311.10 991.2 0.7016 316.10 0.7016 318.35 1254.0 322.70 1651.4 0.8270 1875.0 324.95 1519.6 0.7016 328.85 0.8270 0.7016 2100.5 1903.0 0.8270 333.90 334.55 277.85 348.7 0.7534 278.55 717.5 9.8783 816.5 439.6 0.7534 0.8783 283.20 284.65 291.10 548.5 0.7534 288.80 942.7 0.8783 1104.9 0.8783 644.2 0.7534 295.25 295.85 0.7534 1310.4 774.2 302.55 0.8783 301.35 308.95 1509.1 0.8783 307.30 939.0 0.7534 314.80 1146.0 1701.8 0.8783 314.00 0.7534 322.50 1974.8 0.8783 319.70 1344.7 0.7534 0.7534 1314.1 324.85 1538.5 285.75 0.9275 0.9275 330.00 1741.2 0.7534 288.85 1400.0 1519.6 1965.8 0.7534 292.80 0.9275 335.35 1669.4 0.9275 282.05 551.6 0.8270 297.80 647.6 1849.6 0.8270 303.05 0.9275 287.30 2074.0 293.20 770.5 0.8270 308.95 0,9275 298.65 912.0 0.8270

| COMPONENTS:   | ORIGINAL MEASUREMENTS:   |
|---|--|
|   | ORIGINAL MEASUREMENTS:   |
| (1) Helium; He; 7440-59-7   | Grove, N. H., and Whitby, F. P.,                                   |
|   | J. Appl. Chem., 1960, 10, 101.                                     |
| (2) Santowax R;   |  |
|   |  |
|   |  |
| VARIABLES:  | PREPARED BY:   |
|   |  |
| Temperature, pressure   | C. L. Young  |
|   |  |
| EXPERIMENTAL VALUES:  |  |
| T/K P/bar Solubility * Ostwald coefficie  | ent  |
| <u></u>   |  |
| 506         1.81         5.3         0.114           511         2.58         6.3         0.097   |  |
| 511 4.04 9.0 0.089  |  |
| 598         2.13         9.3         0.189  |  |
| 599         3.04         11.0         0.157           600         4.76         16.0         0.146 |  |
| 674 2.43 12.7 0.236   |  |
| 679 3.48 16.3 0.212   |  |
| 679 5.41 24.3 0.203   |  |
|   |  |
| * Moles of helium per mg of Santov  | wax R  |
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|   | INFORMATION  |
| METHOD /APPARATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:                                    |
| Static cell with null pressure trans-   | l. No details given.   |
| ducer. Pressure measured with<br>Bourdon gauge. Temperature measured                              | 2. Analysis by infrared method showed                              |
| with thermocouple. Sample placed in   | sample to be 11.8% σ-terphenyl,<br>56.3% m-terphenyl, 29.3% p-ter- |
| cell and gas added at room tempera-   | phenyl, 2.6% diphenyl and higher                                   |
| ture. Cell then heated to experi-<br>mental temperature. Pressures on                             | polyphenyls. Obtained from   |
| both sides of transducer kept   | Monsanto Chemicals Ltd.  |
| approximately equal. Details in source.   |  |
| source.   |  |
|   |  |
|   | ESTIMATED ERROR:   |
|   | $\delta T/K = \pm 1;  \delta P/bar = \pm 0.01;$                    |
|   | $\delta x_{\rm He} = \pm 10\%.$                                    |
|   |  |
|   | REFERENCES:  |
|   |  |
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|   |  |
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| (2) Methane; CH,; 74-82-8       Progr. Refrig. Sci. Technol. XIII<br>Proc. Internat. Congr. Refrig., $1972$<br>1, 309.         /ARIABLES:       PREPARED BY:<br>C. L. Young         CEXPERIMENTAL VALUES:<br>Mole fraction of neon<br>P/K       Pher in liquid, in vapor,<br>Ne         Mole fraction of neon<br>P/K       Mole fraction of neon<br>Ne         95.26       20.3       0.0059         95.26       20.3       0.0059         112.27       344.5       0.0795       0.9684         34.5       0.0093       -       112.27       344.5       0.0795       0.9684         103.4       0.0222       -       964.6       0.1014       0.9690         137.8       0.0275       -       1102.4       0.0993       0.9738         175.3       0.0310       0.9889       1240.2       0.0919       0.9774         275.6       0.0399       0.9883       117.49       344.5       0.0919       0.9592   | COMPONEN | TS:      |                |             | ORIGINAL           | MEASUREN           | ENTS:           |                      |
|---|----------|----------|----------------|-------------|--------------------|--------------------|-----------------|----------------------|
| (2) Nethane; Ch.; 74-52-5       Proc. Internat. Congr. Refrig., 197;         7, 309.       Proc. Internat. Congr. Refrig., 197;         7, 309.       Prepresentation of neon         Malastes:       Prepresentation of neon         Mole fraction of neon       Mole fraction of neon $N/K$ $P/bar$ in liquid, in vapor, $T/K$ $P/bar$ in liquid, in vapor, $T/K$ $P/bar$ 95.26       20.3       0.0059         103.4       0.0222         -       964.6       0.1014         0.0310       0.9883         175.3       0.0310       0.9883         175.3       0.0310       0.9881         174.5       0.0107       0.9714         205.7       0.0342       0.9801         134.5       0.0107       0.9712         689.0       0.1025       0.9512         205.6       0.0390       1324.3       0.067         137.4       0.0310       0.9801       1324.5       0.1017         137.4       0.0617       0.9261       1325.0       0.9502         213.4       0.0617       0.9201       1325.0       0.1125       0.9501         137.4 <t< td=""><td colspan="4" rowspan="2"></td><td colspan="4"></td></t<>  |          |          |                |             |                    |                    |                 |                      |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $  |          |          |                |             | Progr              | . Refrig           | . Sci. Techn    | ol. XIII             |
| ARIABLES:         PREPARED BY:           C. L. Young           EXPERIMENTAL VALUES:<br>Mole fraction of neon<br>//K         Mole fraction of neon<br>//K         Mole fraction of neon<br>//K $\gamma_{Ne}$ $\gamma_{Ne}$ $\gamma_{Ne}$ $\gamma_{Ne}$ 95.26         20.3         0.0059         -           47.6         0.0111         0.9902         689.0         0.1014         0.9670           68.9         0.0165         0.9914         826.8         0.1027         0.9760           103.4         0.0222         -         964.6         0.1050         0.9742           107.3         0.0310         0.9880         11240.2         0.09903         0.9732           175.3         0.0107         0.9710         689.0         0.1125         0.9561           102.4         0.0990         0.9744         51.2         0.1067         0.9551           0.2.91         34.5         0.0107         0.971         826.8         0.1225         0.9581           102.4         0.0275         -         1240.2         0.1137         0.9661           13.4         0.0275         -         1240.2         0.1137         0.9617           255.1         0.0178   | (2) Me   | cilane,  | CII4, 74-02-0  | ,           | Proc.              | Interna            | t. Congr. Re    | frig., <u>1971</u> , |
| Remperature, pressure         C. L. Young           XXPERIMENTAL VALUES:<br>Mole fraction of neon<br>$\frac{7K}{R}$ $\frac{7}{P/bar}$ in liquid, in vapor,<br>$\frac{x_{Ne}}{V_{Ne}}$ $\frac{y_{Ne}}{V_{Ne}}$ $\frac{x_{Ne}}{K}$ $\frac{y_{Ne}}{V_{Ne}}$ $\frac{x_{Ne}}{V_{Ne}}$ $\frac{y_{Ne}}{V_{Ne}}$ $\frac{x_{Ne}}{V_{Ne}}$ $\frac{y_{Ne}}{V_{Ne}}$ $\frac{y_{NE}}{$ |          |          |                |             | 1, 30              | 9.                 |                 |                      |
| Remperature, pressure         C. L. Young           XXPERIMENTAL VALUES:<br>Mole fraction of neon<br>$\frac{7K}{R}$ $\frac{7}{P/bar}$ in liquid, in vapor,<br>$\frac{x_{Ne}}{V_{Ne}}$ $\frac{y_{Ne}}{V_{Ne}}$ $\frac{x_{Ne}}{K}$ $\frac{y_{Ne}}{V_{Ne}}$ $\frac{x_{Ne}}{V_{Ne}}$ $\frac{y_{Ne}}{V_{Ne}}$ $\frac{x_{Ne}}{V_{Ne}}$ $\frac{y_{Ne}}{V_{Ne}}$ $\frac{y_{NE}}{$ | VARIABLE | s:       |                |             | PPEPAPET           |                    |                 | ···=                 |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $   |          |          |                |             |                    |                    |                 |                      |
| Mole fraction of neon<br>$K$ K p/bar in liquid, in vapor,<br>$N_{\rm Ne}$ Mole fraction of neon<br>$N_{\rm Ne}$ Mole fraction of neon<br>$N_{\rm Ne}$ 95.2620.30.0059-112.27344.50.07950.968434.50.0093-551.20.09530.967747.60.01610.990268.00.10140.9690103.40.0222-964.60.10500.9720137.80.0275-1102.40.099800.9734206.70.03540.98891240.20.099800.9734205.60.03100.9889117.49344.50.99190.9552344.50.04100.988117.49344.50.99190.9552.02.9134.50.01070.9710686.00.11250.9589.02.9134.50.01070.9781964.60.12020.9619173.80.03420.98081102.40.12020.9619137.80.04230.98081102.40.12020.9619137.80.04230.98081102.40.12030.9661275.60.05280.98041653.60.11060.973925.120.06630.97601737.60.11770.9664137.80.0627-1515.80.11660.9739275.60.05710.97281730.60.10660.9367137.80.06230.97611730.60.10660.9367275.60.05710.97  | Tempera  | ture, p  | oressure       |             |                    | . Young            |                 |                      |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $   | EXPERIME | NTAL VAL |                | - of noon   |                    |                    | Mole fracti     | on of neon           |
| 95.26 20.3 0.0059 - 112.27 344.5 0.0795 0.9684<br>34.5 0.0093 - 551.2 0.0953 0.9677<br>47.6 0.0111 0.9902 689.0 0.1014 0.9690<br>68.9 0.0165 0.9914 826.8 0.1027 0.9766<br>103.4 0.0222 - 964.6 0.1050 0.9720<br>137.8 0.0316 0.9889 120.2 0.0980 0.9734<br>206.7 0.0354 0.9890 1224.3 0.097 0.975<br>275.6 0.0399 0.9883 117.49 344.5 0.0919 0.9552<br>68.9 0.0166 0.9817 826.8 0.1215 0.9568<br>103.4 0.0275 0.9828 964.6 0.1202 0.9664<br>103.4 0.0275 0.9828 964.6 0.1203 0.9664<br>103.4 0.0275 0.9828 964.6 0.1203 0.9664<br>103.4 0.0275 0.9828 102.4 0.1203 0.9664<br>103.4 0.0275 0.9828 102.4 0.1203 0.9664<br>103.4 0.0275 0.9828 105.4 0.1178 0.9664<br>103.4 0.0275 0.9828 105.4 0.1178 0.9664<br>103.4 0.0275 0.9828 105.4 0.1178 0.9664<br>103.4 0.0617 - 1515.8 0.1137 0.9701<br>551.2 0.0669 0.9806 1102.4 0.203 0.9640<br>266.7 0.0423 - 1240.2 0.1189 0.9664<br>413.4 0.0617 - 1515.8 0.1137 0.9735<br>12.27 34.5 0.0127 0.9507 551.2 0.1504 0.9357<br>12.27 34.5 0.0127 0.9507 551.2 0.1504 0.9357<br>12.27 34.5 0.0127 0.9508 126.61 413.4 0.1337 0.9357<br>12.27 34.5 0.0127 0.9507 551.2 0.1504 0.9358<br>13.7.8 0.0434 0.9728 826.8 0.1641 0.9401<br>172.3 0.0509 0.9732 964.6 0.1679 0.9425<br>206.7 0.0571 0.9728 1240.2 0.1638 0.9496<br>AUXILIARY INFORMATION<br>AUXILIARY INFORMATION<br>AUXILIARY INFORMATION<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02; \delta P/bar = \pm 1; \delta T_{NC}, \delta T_{NC} = \pm 0.001 (estimated by Omegan of the omegan o$  | т/к      | P/bar    | in liquid,     |             | T/K                | P/bar              | in liquid,      |                      |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |          |          | $x_{\sf Ne}$   | ${}^{y}$ Ne |                    |                    | <sup>x</sup> Ne | ${}^{y}$ Ne          |
| $\frac{47.6}{68.9}  0.0165  0.9914 \qquad 68.6  0.1027  0.9706 \\ 68.9  0.0165  0.9914 \qquad 826.8  0.1027  0.9706 \\ 103.4  0.0222  - \\ 1102.4  0.0993  0.9738 \\ 175.3  0.0310  0.9889  11240.2  0.0980  0.9744 \\ 206.7  0.0354  0.9890  1324.3  0.097  0.975 \\ 275.6  0.0399  0.988  551.2  0.1087  0.95581 \\ 0.2.91  34.5  0.0107  0.9710  669.0  0.1125  0.9604 \\ 103.4  0.0275  0.9828  964.6  0.1203  0.9664 \\ 206.7  0.0423  - \\ 275.6  0.0528  0.9808  1102.4  0.1289  0.9664 \\ 206.7  0.0423  - \\ 275.6  0.0528  0.9808  1102.4  0.1203  0.9664 \\ 13.4  0.0617  - \\ 551.2  0.0689  0.9804  1653.6  0.1107  0.9710 \\ 551.2  0.0689  0.9904  1553.8  0.1107  0.97701 \\ 569.0  0.0695  0.9796  1730.6  0.109  0.976 \\ 1771.1  0.071  0.979  126.61  43.4  0.1337  0.9355 \\ 137.8  0.0434  0.9728  826.8  0.1664  0.9366 \\ 137.8  0.0434  0.9728  826.8  0.1664  0.9366 \\ 137.8  0.0434  0.9728  826.8  0.1664  0.9366 \\ 137.8  0.0434  0.9728  1240.2  0.1638  0.9496 \\ 172.3  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 172.3  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 137.8  0.0434  0.9728  1240.2  0.1638  0.9496 \\ 172.3  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 172.3  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 172.3  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 172.3  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 172.3  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 1740.2  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 1740.2  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 1740.2  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 1740.2  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 1740.2  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 1740.2  0.0591  0.9728  1240.2  0.1638  0.9496 \\ 1740.2  0.001  0.9710  0.9728  0.001  0.9710  0.9728  0.001  0.9710  0.9728  0.001  0.9710  0.9728  0.001  0.9710  0.975  0.9755  0.9755  0.9555  0.9555  0.9555  0.9555  0.9555  0.9555  0.9555  0.9555  0.9555  0.9555  0.9555  0.9555  0.9555  0.$  | 95.26    |          |                | -           | 112.27             |                    |                 |                      |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |          |          |                | -           |                    |                    |                 |                      |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |          |          |                |             |                    |                    |                 |                      |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |          |          |                |             |                    |                    |                 |                      |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |          |          |                |             |                    |                    |                 |                      |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |          |          |                |             |                    |                    |                 |                      |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |          |          |                |             | 117 40             |                    |                 |                      |
| $\begin{array}{rcrcrc} 0.2.91 & 34.5 & 0.0107 & 0.9710 & 689.0 & 0.1125 & 0.9589 \\ 68.9 & 0.0196 & 0.9817 & 826.8 & 0.1215 & 0.9604 \\ 103.4 & 0.0275 & 0.9828 & 964.6 & 0.1202 & 0.9619 \\ 137.8 & 0.0342 & 0.9808 & 1102.4 & 0.1203 & 0.9662 \\ 275.6 & 0.0528 & 0.9820 & 1378.0 & 0.1178 & 0.9662 \\ 275.6 & 0.0528 & 0.9804 & 1653.6 & 0.1106 & 0.9739 \\ 689.0 & 0.0695 & 0.9961 & 1730.6 & 0.1106 & 0.9739 \\ 689.0 & 0.0695 & 0.9796 & 1.730.6 & 0.106 & 0.9735 \\ 771.1 & 0.071 & 0.979 & 126.61 & 413.4 & 0.1337 & 0.9357 \\ 12.27 & 34.5 & 0.0127 & 0.9507 & 551.2 & 0.1504 & 0.9356 \\ 137.8 & 0.0434 & 0.9728 & 826.8 & 0.1641 & 0.9401 \\ 172.3 & 0.0509 & 0.9732 & 964.6 & 0.1679 & 0.9425 \\ 206.7 & 0.0571 & 0.9728 & 1240.2 & 0.1638 & 0.9496 \\ \end{array}$   |          |          |                |             | 11/.49             |                    |                 |                      |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 102.91   |          |                |             |                    |                    |                 |                      |
| $\frac{137.8}{206.7} 0.0423 - 1240.2 0.1203 0.9640 \\ 206.7 0.0423 - 1240.2 0.1189 0.9662 \\ 275.6 0.0528 0.9820 1378.0 0.1178 0.9684 \\ 413.4 0.0617 - 1515.8 0.1137 0.9701 \\ 551.2 0.0689 0.9804 1653.6 0.1106 0.9739 \\ 689.0 0.0695 0.9796 1730.6 0.109 0.976 \\ 771.1 0.071 0.979 126.61 413.4 0.1337 0.9357 \\ 68.9 0.0245 0.9681 689.0 0.1606 0.9366 \\ 137.8 0.0434 0.9728 826.8 0.1641 0.9401 \\ 172.3 0.0509 0.9732 964.6 0.1679 0.9425 \\ 206.7 0.0571 0.9728 1240.2 0.1638 0.9496 \\ \hline MAXILLARY INFORMATION \\ \hline METROD/APPARATUS/PROCEDURE: ecirculating vapor flow apparatus witt agnetic pump at ambient temperature. amples analysed by thermal conductivity. Temperature measured with Bourdon gauge. etails in ref. 1. \\ \hline MAXILLARY INFORMATION \\ \hline METROD / APPARATUS / PROCEDURE: ecirculating vapor flow apparatus witt agnetic pump at ambient temperature. May see the second$  |          |          |                |             |                    | 826.8              | 0.1215          | 0.9604               |
| $\frac{206.7 & 0.0423 & - & 1240.2 & 0.1189 & 0.9662 \\ 275.6 & 0.0528 & 0.9820 & 1378.0 & 0.1178 & 0.9684 \\ 413.4 & 0.0617 & - & 1515.8 & 0.1137 & 0.9701 \\ 551.2 & 0.0689 & 0.9804 & 1653.6 & 0.109 & 0.976 \\ 771.1 & 0.071 & 0.979 & 126.61 & 413.4 & 0.1337 & 0.9357 \\ 12.27 & 34.5 & 0.0127 & 0.9507 & 551.2 & 0.1504 & 0.9356 \\ 137.8 & 0.0434 & 0.9728 & 826.8 & 0.1641 & 0.9401 \\ 172.3 & 0.0509 & 0.9732 & 964.6 & 0.1679 & 0.9425 \\ 206.7 & 0.0571 & 0.9728 & 1240.2 & 0.1638 & 0.9496 \\ \hline \\ METHOD /APPARATUS/PROCEDURE: \\ ecirculating vapor flow apparatus with agnetic pump at ambient temperature. amples analysed by thermal conduc-ivity. Temperature measured with Bourdon gauge. etails in ref. 1. \\ \hline \\ ESTIMATED ERROR:  \delta T/K = \pm 0.021 \ \delta P/bar = \pm 1; \\ \delta x_{Ne}, \delta y_{Ne} = \pm 0.001 \ (estimated by compiler) \\ \hline \\ REFERENCES: \\ 1. Streett, W. B. and Jones, C. H.,  Adv. Cryogenic Engng., 1965, 11, \\ \hline \\ $   |          |          |                |             |                    |                    |                 |                      |
| $\frac{275.6}{413.4} 0.0528 0.9820 1378.0 0.1178 0.9684 \\ \frac{413.4}{113.4} 0.0617 - 1515.8 0.1137 0.9701 \\ 1551.2 0.0689 0.9804 1653.6 0.1106 0.9739 \\ 689.0 0.0695 0.9796 1730.6 0.109 0.976 \\ 771.1 0.071 0.979 126.61 413.4 0.1337 0.9357 \\ 12.27 34.5 0.0127 0.9507 551.2 0.1504 0.9350 \\ 68.9 0.0245 0.9681 669.0 0.1606 0.9366 \\ 137.8 0.0434 0.9728 226.8 0.1641 0.9401 \\ 172.3 0.0509 0.9732 964.6 0.1679 0.9425 \\ 206.7 0.0571 0.9728 1240.2 0.1638 0.9496 \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ $  |          |          |                | 0.9808      |                    |                    |                 |                      |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |          |          |                | -           |                    |                    |                 |                      |
| $551.2 & 0.0689 & 0.9804 &   1653.6 & 0.1106 & 0.9739 \\ 689.0 & 0.0695 & 0.9796 &   1730.6 & 0.109 & 0.976 \\ 1771.1 & 0.071 & 0.979 &   26.61 & 413.4 & 0.1337 & 0.9357 \\ 12.27 & 34.5 & 0.0127 & 0.9507 & 551.2 & 0.1504 & 0.9350 \\ 68.9 & 0.0245 & 0.9681 & 669.0 & 0.1606 & 0.9366 \\ 137.8 & 0.0434 & 0.9728 & 826.8 & 0.1641 & 0.9401 \\ 172.3 & 0.0509 & 0.9732 & 964.6 & 0.1679 & 0.9425 \\ 206.7 & 0.0571 & 0.9728 & 1240.2 & 0.1638 & 0.9496 \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ $  |          |          |                |             |                    |                    |                 |                      |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |          |          |                |             |                    |                    |                 |                      |
| 12.27 34.5 0.0127 0.9507 551.2 0.1504 0.9350<br>68.9 0.0245 0.9681 689.0 0.1606 0.9366<br>137.8 0.0434 0.9728 826.8 0.1641 0.9401<br>172.3 0.0509 0.9732 964.6 0.1679 0.9425<br>206.7 0.0571 0.9728 1240.2 0.1638 0.9496<br>AUXILIARY INFORMATION<br>AUXILIARY INFORMATION<br>AUXILIARY INFORMATION<br>AUXILIARY INFORMATION<br>AUXILIARY INFORMATION<br>AUXILIARY INFORMATION<br>ESTIMATED ERROR:<br>ressure measured with Bourdon gauge.<br>etails in ref. 1.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02; \ \delta P/bar = \pm 1; \ \delta x_{Ne}, \ \delta y_{Ne} = \pm 0.001 \ (estimated by compiler)$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., 1965, 11,  |          | 689.0    | 0.0695         | 0.9796      |                    | 1730.6             | 0.109           | 0.976 ·              |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |          |          |                |             | 126.61             |                    |                 |                      |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | 112.27   |          |                |             |                    |                    |                 |                      |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |          |          |                |             |                    |                    |                 |                      |
| $206.7  0.0571  0.9728 \qquad 1240.2  0.1638  0.9496$ $AUXILIARY INFORMATION$ WETHOD/APPARATUS/PROCEDURE: ecirculating vapor flow apparatus with agnetic pump at ambient temperature. amples analysed by thermal conduc-ivity. Temperature measured with latinum resistance thermometer. ressure measured with Bourdon gauge. etails in ref. 1. ESTIMATED ERROR: $\delta T/K = \pm 0.02;  \delta P/bar = \pm 1; \\ \delta x_{Ne},  \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)}$ REFERENCES: 1. Streett, W. B. and Jones, C. H., Adv. Cryogenic Engng., <u>1965</u> , <i>11</i> ,  |          |          |                |             |                    |                    |                 |                      |
| METHOD /APPARATUS/PROCEDURE:SOURCE AND PURITY OF MATERIALS:ecirculating vapor flow apparatus with<br>agnetic pump at ambient temperature.<br>amples analysed by thermal conduc-<br>ivity. Temperature measured with<br>latinum resistance thermometer.<br>ressure measured with Bourdon gauge.<br>etails in ref. 1.SOURCE AND PURITY OF MATERIALS:<br>No details given.ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02;  \delta P/bar = \pm 1;$<br>$\delta x_{Ne},  \delta y_{Ne} = \pm 0.001$ (estimated by<br>compiler)REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,  |          | 206.7    | 0.0571         | 0.9728      |                    | 1240.2             | 0.1638          | 0.9496               |
| ecirculating vapor flow apparatus with<br>agnetic pump at ambient temperature.<br>amples analysed by thermal conduc-<br>ivity. Temperature measured with<br>latinum resistance thermometer.<br>ressure measured with Bourdon gauge.<br>etails in ref. 1.  |          | <u> </u> |                | AUXILIARY   | INFORMAT           | ION                |                 |                      |
| agnetic pump at ambient temperature.<br>amples analysed by thermal conduc-<br>ivity. Temperature measured with<br>latinum resistance thermometer.<br>ressure measured with Bourdon gauge.<br>etails in ref. 1.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02; \ \delta P/bar = \pm 1; \ \delta x_{Ne}, \ \delta y_{Ne} = \pm 0.001 \ (estimated by compiler)$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,   | METHOD / | APPARAT  | US/PROCEDURE:  | <u> </u>    | SOURCE A           | ND PURITY          | OF MATERIALS:   | <u></u>              |
| amples analysed by thermal conduc-<br>ivity. Temperature measured with<br>latinum resistance thermometer.<br>ressure measured with Bourdon gauge.<br>etails in ref. 1.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02; \ \delta P/bar = \pm 1; \ \delta x_{Ne}, \ \delta y_{Ne} = \pm 0.001 \ (estimated by compiler)$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>$Adv. Cryogenic Engng., \underline{1965}, 11,$   |          |          |                |             | H No               | detail             | s given.        |                      |
| ivity. Temperature measured with<br>latinum resistance thermometer.<br>ressure measured with Bourdon gauge.<br>etails in ref. 1.<br>$ESTIMATED ERROR: \delta T/K = \pm 0.02; \delta P/bar = \pm 1; \delta x_{Ne}, \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)}$ $REFERENCES: 1. Streett, W. B. and Jones, C. H., Adv. Cryogenic Engng., 1965, 11,$   | magneti  | c pump   | at ambient ten | perature.   |                    |                    | -               |                      |
| latinum resistance thermometer.<br>ressure measured with Bourdon gauge.<br>etails in ref. 1.<br>$ESTIMATED ERROR: \delta T/K = \pm 0.02; \ \delta P/bar = \pm 1; \delta x_{Ne}, \ \delta y_{Ne} = \pm 0.001 \ (estimated by compiler) \\ REFERENCES: \\1. \ Streett, W. B. and Jones, C. H., Adv. Cryogenic Engng., 1965, 11,$  |          |          |                |             |                    | -                  |                 |                      |
| ressure measured with Bourdon gauge.<br>etails in ref. 1.<br>$ESTIMATED ERROR: \delta T/K = \pm 0.02; \delta P/bar = \pm 1; \delta x_{Ne}, \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)} \\ REFERENCES: \\ 1. Streett, W. B. and Jones, C. H., Adv. Cryogenic Engng., 1965, 11,$  |          | -        |                |             |                    |                    |                 |                      |
| etails in ref. 1.<br>ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02; \ \delta P/bar = \pm 1; \ \delta x_{Ne}, \ \delta y_{Ne} = \pm 0.001 \ (estimated by compiler)$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,  |          |          |                |             |                    |                    |                 |                      |
| ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02;  \delta P/bar = \pm 1;  \delta x_{Ne},  \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)}$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H., <i>Adv. Cryogenic Engng.</i> , <u>1965</u> , <i>11</i> ,   |          |          |                | yuuye.      |                    |                    |                 |                      |
| $\delta T/K = \pm 0.02;  \delta P/bar = \pm 1;$<br>$\delta x_{Ne},  \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)}$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,  |          |          | •              |             |                    |                    |                 |                      |
| $\delta T/K = \pm 0.02;  \delta P/bar = \pm 1;$<br>$\delta x_{Ne},  \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)}$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,  |          |          |                |             | 1                  |                    |                 |                      |
| $\delta T/K = \pm 0.02;  \delta P/bar = \pm 1;$<br>$\delta x_{Ne},  \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)}$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,  |          |          |                |             | 1                  |                    |                 |                      |
| $\delta T/K = \pm 0.02;  \delta P/bar = \pm 1;$<br>$\delta x_{Ne},  \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)}$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,  |          |          |                |             |                    |                    |                 |                      |
| $\delta T/K = \pm 0.02;  \delta P/bar = \pm 1;$<br>$\delta x_{Ne},  \delta y_{Ne} = \pm 0.001 \text{ (estimated by compiler)}$<br>REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,  |          |          |                |             | DOTT VAM           | ID EDDOD           |                 |                      |
| $\delta x_{\rm Ne}, \ \delta y_{\rm Ne} = \pm 0.001 \ (\text{estimated by} \\ \text{compiler})$ REFERENCES: 1. Streett, W. B. and Jones, C. H., <i>Adv. Cryogenic Engng.</i> , <u>1965</u> , <i>11</i> ,  |          |          |                |             | 1                  |                    | 8P/ham - +1     | •                    |
| REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,  |          |          |                |             |                    |                    |                 |                      |
| REFERENCES:<br>1. Streett, W. B. and Jones, C. H.,<br><i>Adv. Cryogenic Engng.</i> , <u>1965</u> , <i>11</i> ,  |          |          |                |             | δ <sup>x</sup> Ne' | <sup>δy</sup> Ne = |                 |                      |
| 1. Streett, W. B. and Jones, C. H.,<br>Adv. Cryogenic Engng., <u>1965</u> , 11,   |          |          |                |             |                    |                    | comp            | oiler)               |
| Adv. Cryogenic Engng., <u>1965</u> , 11,  |          |          |                |             |                    | •                  |                 | _                    |
|   |          |          |                |             | 1. Str             | eett, W            | . B. and Jone   | es, C. H.,           |
|   |          |          |                |             | Adv                | . Cryog            | enic Engng.,    | 1965, 11,            |
| 555.  |          |          |                |             | 1                  |                    |                 | · · ·                |
|   |          |          |                |             |                    | •                  |                 |                      |
|   |          |          |                |             | 1                  |                    |                 |                      |
|   |          |          |                |             |                    |                    |                 |                      |

ORIGINAL MEASUREMENTS: COMPONENTS: Streett, W. B. and Hill, J. L. E., Progr. Refrig. Sci. Technol. XIII Neon; Ne; 7440-01-9 (1)Proc. Internat. Congr. Refrig., 1971, (2) Methane; CH<sub>4</sub>; 74-82-8 1, 309. EXPERIMENTAL VALUES: Mole fraction of neon Mole fraction of neon т/к P/bar in liquid, in vapor, T/K P/bar in liquid, in vapor,  $x_{Ne}$  $y_{Ne}$  $y_{Ne}$  $x_{Ne}$ 0.1592 1653.6 0.4137 126.61 1515.8 0.9557 154.05 0.8188 1791.4 0.1520 0.9611 1791.4 0.3954 0.8381 2067.0 0.1425 0.9680 2067.0 0.3595 0.8682 2411.5 2301.1 0.1329 0.9711 0.3266 0.8931 2394.3 0.129 0.973 2757.1 0.2985 0.9117 0.8873 139.08 344.5 0.1716 3101.6 0.9251 0.2710 0.9358 413.4 0.1922 0.8848 3446.1 0.2528 551.2 0.2237 0.8843 4135.1 0.2199 0.9496 689.0 0.2417 161.49 0.8842 83.1 0.0636 0.6389 0.2508 0.8874 826.8 103.4 0.0845 0.6716 964.6 0.2535 0.8934 137.8 0.1170 0.7023 1102.4 0.2543 0.8996 172.3 0.1546 0.7107 1240.2 0.2507 0.9059 206.7 0.1890 0.7110 1378.0 0.2463 0.9129 241.2 0.2276 0.7057 1653.6 0.2378 275.6 0.9226 0.2699 0.6905 0.9393 2067.0 0.2137 310.1 0.3139 0.6698 2411.5 0.1981 0.9486 344.5 0.3685 0.6356 2757.1 0.1848 0.9567 360.7 0.4100 0.5610 0.515 3100.5 0.1759 0.9615 371.9 0.515 0.967 0.167 3456.2 166.24 2536.2 0.655 0.655 148.08 413.4 0.2490 0.8230 0.5377 2619.3 0.3051 0.8097 0.7774 551.2 2660.8 0.5207 703.2 0.3417 0.8037 2722.6 0.4918 0.7966 826.8 0.3606 0.8070 2853.3 0.4652 0.8183 0.4507 964.6 0.3659 0.8163 2894.9 0.8279 1102.4 0.3634 0.8285 3032.7 0.4236 0.8479 1240.2 0.3539 0.8426 3480.5 0.3655 0.8840 1515.8 0.3342 0.8653 3825.0 0.3326 0.9031 0.8859 0.3173 1791.4 4135.0 0.3144 0.9168 2067.0 0.2926 0.9030 167.16 68.9 0.0534 0.5184 0.9187 2411.5 0.2756 103.4 0.0919 0.5931 2757.1 0.2462 0.9340 137.8 0.1344 0.6257 172.3 0.6505 3156.3 0.2234 0.9437 0.1788 3474.4 206.7 0.9505 0.2083 0.2198 0.6487 3790.6 0.1966 0.9502 234.1 0.2650 0.6250 0.1840 4135.1 0.9618 248.2 0.2959 0.6003 4272.9 0.179 0.964 0.5700 261.4 0.3301 152.95 274.5 0.455 0.455 413.4 0.3087 0.7673 0.3892 0.7345 551.2 170.17 2979.0 0.657 0.657 703.2 0.4835 0.6886 3067.1 0.7766 0.5700 0.6593 0.5133 826.8 3115.7 0.7918 909.9 0.5316 0.8064 0.6639 3170.5 0.4937 964.6 0.5240 0.6858 3308.3 0.4563 0.8300 0.5166 0.7057 1033.5 3446.1 0.4317 0.8480 1102.4 0.4964 0.7266 3517.0 0.3901 0.8790 1378.0 0.4418 0.7905 4135.1 0.3614 0.9499 1791.4 0.3820 0.8486 175.00 34.5 0.0072 0.1090 154.05 344.5 0.2685 0.7701 68.9 0.0550 0.3746 413.4 0.3142 0.7530 103.4 0.1050 0.4585 482.3 0.3649 0.7319 123.6 0.1445 551.2 0.4181 0.7032 0.4844 137.8 0.1660 620.1 0.4718 15?.0 0.4780 0.6642 0,1981 654.6 0.5055 165.2 0.2329 0.4595 0.582 675.8 0.582 172.2 0.2568 1226.0 0.620 0.630 175.3 0.2631 0.4319 1294.9 -0.7404 184.4 0.360 0.360 -1336.5 0.7532 180.50 4076.3 0.664 0.664 0.4818

0.7641

0.7805

0.7954

0.4606

0.4430

4162.4

4231.3

4356.0

0.5610

0.5220

0.4950

0.7688

0.8034

0.8290

1378.0

1446.9

1515.8

154.05

| COMP | ONENTS:              | EVALUATOR:                |
|------|----------------------|---------------------------|
| 1.   | Neon; Ne; 7440-01-9  | Colin Young,              |
|      |                      | School of Chemistry,      |
| 2.   | Argon; Ar; 7440-37-1 | University of Melbourne,  |
|      |                      | Parkville, Victoria 3052, |
|      |                      | AUSTRALIA.                |

## CRITICAL EVALUATION:

This system has been studied by three groups of workers. The data of Streett and coworkers (1,2,3) are the most detailed and are in good agreement with the data of Trappeniers and Schouten (4) where the two sets of data overlap. The solubility values of Skripka and Dykhno (5) and Skripka and Lobonova (6) are somewhat higher than those obtained by Streett (1).

The data of Streett (1,2), Streett and Hill (3) and Trappeniers and Schouten (4) are classified as tentative whereas those of Skripka and Dykhno and Skripka and Lobonova are classified as doubtful.

## References

- 1. Streett, W. B., J. Chem. Phys., 1965, 42, 500.
- 2. Streett, W. B., J. Chem. Phys., 1967, 46, 3282.
- 3. Streett, W. B. and Hill, J. L. E., J. Chem. Phys., <u>1971</u>, 54, 5088.
- 4. Trappeniers, N. J. and Schouten, J. A., Physics, 1974, 73, 539.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr., 1964, no. 8, 163.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, no. 13, 90.

| COMPONENTS :   | ORIGINAL MEASUREMENTS:   |  |  |  |  |
|--|--|--|--|--|--|
| <pre>(1) Neon; Ne; 7440-01-9 (2) Argon; Ar; 7440-37-1</pre>  | Skripka, V. G. and Dykhno, N. M.,<br>Trudy Vses. NauchIssled. Inst.<br>Kriog. Mashinstr., <u>1964</u> , 8, 163.  |  |  |  |  |
| VARIABLES:   | PREPARED BY:   |  |  |  |  |
| Temperature, pressure  | C. L. Young  |  |  |  |  |
| Temperature, pressure  | ·  |  |  |  |  |
| EXPERIMENTAL VALUES:   |  |  |  |  |  |
| T/K P/bar P <sup>+</sup> /bar Mole fract   | zion of neon in liquid, in vapor,<br><sup>x</sup> Ne <sup>y</sup> Ne   |  |  |  |  |
| 90.5       6.06       4.66         11.10       9.70         16.15       14.75         21.21       19.18         26.19       24.79  | 0.0044 0.7242<br>0.0092 0.8589<br>0.0138 0.8903<br>0.0185 0.9098<br>0.0231 0.9220  |  |  |  |  |
|  |  |  |  |  |  |
| AIJXILTARY   | INFORMATION  |  |  |  |  |
| METHOD/APPARATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:  |  |  |  |  |
| Vapor flow apparatus with magnetic<br>recirculating pump. Temperature<br>measured with platinum resistance<br>thermometer, pressure measured with<br>Bourdon gauge. Samples of gas and<br>liquid analysed by gas phase inter-<br>ferometry. Details in source. | <ol> <li>High purity sample, purity 99.69<br/>mole per cent, impurities helium<br/>and nitrogen.</li> <li>No details given.</li> </ol>                               |  |  |  |  |
|  | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02$ to 0.03; $\delta P$ less than<br>0.2 bar; $\delta x_{He} \simeq \delta y_{He} = \pm 0.0001$ to<br>0.0002.<br>REFERENCES: |  |  |  |  |
|  |  |  |  |  |  |

| COMPONE | INTS:          |                        |                              | ORIGINAL MEASUREMENTS:             |                      |                        |   |  |
|---------|----------------|------------------------|------------------------------|------------------------------------|----------------------|------------------------|---|--|
| (1)     | Neon;          | Ne; 7440-01-9          |                              | Streett, W. B. and Hill, J. L. E., |                      |                        |   |  |
| (2)     | Argon;         | Ar; 7440-37-1          |                              | J. Ch                              | em. Phy              | s., <u>1971</u> , 54   | , 5088.                                     |  |
| (2)     | nr gon,        | ,                      |                              |                                    |                      |                        |   |  |
| VARIABI | .ES:           |                        |                              | PREPARE                            | D BY:                |                        |   |  |
| Tempe   | rature.        | pressure               |                              | (                                  | Young                |                        |   |  |
|         |                | F                      |                              |                                    |                      |                        |   |  |
| EXPERIM | ENTAL VA       | LUES:<br>Mole fraction | n of neon                    |                                    |                      | Mole fracti            | on of neon                                  |  |
| т/к     | <i>P/</i> bar  | in liquid,             | in vapor,<br><sup>y</sup> Ne | т/к                                | P/bar                |                        | in vapor<br><sup>y</sup> Ne                 |  |
| 87.34   | 63.8           | 0.0542                 | 0.9590                       | 92.42                              | 845.1                | 0.4369                 | 0.7514                                      |  |
|         | 107.4<br>141.9 | 0.0856<br>0.1094       | 0.9485                       |                                    | 896.7<br>934.2       | 0.4479<br>0.4591       | 0.7434<br>0.7384                            |  |
|         | 210.8          | 0.1457                 | 0.9485                       |                                    | 954.2                | 0.4591                 | 0.7342                                      |  |
|         | 273.6          | 0.1713                 | 0.9186                       |                                    | 1000.1               | 0.465                  | 0.729                                       |  |
|         | 275.6          | 0.1766                 | 0.9160                       | 93.01                              | 872.4                | 0.4868                 | 0.7159                                      |  |
|         | 344.5          | 0.2019                 | 0.9021                       |                                    | 927.1                | 0.5069                 | 0.6990                                      |  |
|         | 415.4          | 0.2243                 | 0.8898                       |                                    | 968.7                | 0.5223                 | 0.6856                                      |  |
|         | 454.9          | 0.2373                 | 0.8826                       |                                    | 1010.2               | 0.5431                 | 0.6711                                      |  |
|         | 491.4          | 0.2445                 | -                            |                                    | 1017.3               | 0.5576<br>0.560        | 0.655                                       |  |
|         | 516.8<br>538.0 | 0.2518<br>0.252        | 0.874                        | 93 25                              | 606.9                | 0.3858                 | 0.035                                       |  |
| 90.47   | 558.3          | 0.3082                 | 0.8379                       | 55.25                              | 693.1                | 0.4181                 | 0.7525                                      |  |
|         | 622.2          | 0.3272                 | 0.8284                       |                                    | 757.9                | 0.4491                 | -   |  |
|         | 689.0          | 0.3420                 | 0.8190                       |                                    | 830.9                | -                      | 0.7102                                      |  |
|         | 757.9          | 0.3547                 | 0.8131                       |                                    | 896.7                | 0.5181                 | 0.6835                                      |  |
|         | 823.8          | 0.365                  | 0.808                        |                                    | 927.1                | -                      | 0.6577                                      |  |
| 91.52   | 686.0          | 0.3681                 | 0.7967                       | 02 40                              | 941.3                | 0.5567                 | -   |  |
|         | 757.9<br>827.8 | 0.3837                 | 0.7892<br>0.7827             | 93.48                              | 793.4<br>862.3       | 0.4818<br>0.5339       | 0.6732                                      |  |
|         | 857.2          | 0.3982                 | 0.7868                       |                                    | 885.6                | 0.5672                 | 0.6459                                      |  |
|         | 902.8          | 0.407                  | 0,785                        | 93.91                              | 462.0                | 0.3305                 | 0.8120                                      |  |
| 92.42   | 361.7          | 0.2554                 | 0.8610                       |                                    | 555.3                | 0.3776                 | 0.7802                                      |  |
|         | 486.4          | 0.3130                 | 0.8280                       |                                    | 651.5                | 0.4318                 | 0.7427                                      |  |
|         | 585.7          | 0.3550                 | 0.8023                       |                                    | 706.2                | 0.4656                 | 0.7171                                      |  |
|         | 631.3<br>765.0 | 0.3707<br>0.4161       | 0.7934<br>0.7654             |                                    | 772.1<br>796.4       | 0.5189<br>0.5572       | 0.6742                                      |  |
|         | 703.0          |                        | AUXILIARY                    | INFORMAT                           |                      | 0.0072                 |   |  |
| METHOD  |                | US/PROCEDURE:          |                              |                                    |                      | Y OF MATERIALS         | · · · · · · · · · · · · · · · · · · ·       |  |
|         |                | vapor flow a           | 000200400                    | 1                                  | tails gi             |                        | i da se se se se se se se se se se se se se |  |
|         |                | pump at ambie          |                              | No de                              | carrs gr             | ven.                   |   |  |
| ture.   |                | es analysed by         |                              |                                    |                      |                        |   |  |
| conduc  | tivity.        |                        |                              |                                    |                      |                        |   |  |
|         |                | resistance th          |                              |                                    |                      |                        |   |  |
|         |                | ured using Bo          | urdon gauge.                 |                                    |                      |                        |   |  |
| Detail  | s in re.       | f. 1.                  |                              |                                    |                      |                        |   |  |
|         |                |                        |                              |                                    |                      |                        |   |  |
|         |                |                        |                              |                                    |                      |                        |   |  |
|         |                |                        |                              |                                    |                      |                        |   |  |
|         |                |                        |                              |                                    |                      |                        |   |  |
|         |                |                        |                              | ESTIMAT                            | ED ERROR:            | -                      |   |  |
|         |                |                        |                              | δт/К =                             | = ±0.2;              | $\delta P/bar = \pm 0$ | .5;   |  |
|         |                |                        |                              | δx <sub>Ne</sub> -                 | <sup>ε δy</sup> Ne = | ±0.001.                |   |  |
|         |                |                        |                              | REFEREN                            | CES:                 | <u> </u>               | <u> </u>                                    |  |
|         |                |                        |                              | 1. St                              | reett,               | W. B., Cryog           | enics, <u>1965</u> ,                        |  |
|         |                |                        |                              | э,                                 | 27.                  |                        |   |  |
|         |                |                        |                              |                                    |                      |                        | ι   |  |
|         |                |                        |                              |                                    |                      |                        |   |  |
|         |                |                        |                              |                                    |                      |                        |   |  |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 (1) Streett, W. B., J. Chem. Phys., 1967, 46, 3282. (2) Argon; Ar; 7440-37-1 VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: Mole fraction of neon Mole fraction of neon T/K т/к P/bar in liquid, in vapor, P/bar in liquid, in vapor,  $x_{Ne}$ <sup>y</sup>Ne  $x_{\rm Ne}$ <sup>y</sup>Ne 95.82 103.3 0.0962 0.9245 110.78 122.0 0.8278 0.1448 140.0 0.9165 0.1290 201.0 0.2552 0.7852 208.6 0.1848 239.2 0.8925 0.3237 0.7423 276.1 0.2357 0.8650 272.7 0.4058 0.6781 0.4503 343.3 0.2842 0.8358 282.0 0.6379 417.1 0.3361 0.8046 286.1 0.4898 0.6034 0.3727 0.7733 477.8 121.36 75.2 0.0925 0.6773 566.1 0.4453 0.7109 99.6 0.1348 0.6991 593.6 0.4917 0.6795 141.3 0.2087 0.6906 606.7 0.5139 0.6642 169.6 0.2783 0.6561 0.5710 187.9 621.2 0.6105 0.3341 0.6122 101.94 114.8 195.1 0.3722 0.8903 0.1213 0.5811 132.0 0.1383 \_ 197.9 0.3990 0.5575 206.2 0.2124 0.8543 129.93 93.1 0.1318 0.5572 275.1 0.2887 113.1 0.8104 0.1787 0.5610 344.7 0.7536 0.3776 129.3 0.2228 0.5463 0.2668 0.5195 382.7 0.4474 0.6932 141.3 396.1 0.5188 0.6362 148.9 0.3090 0.4849 151.7 0.3309 0.4573 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: Recirculating vapor flow apparatus with magnetic pump at ambient tem-No details given. perature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Details in ref. 1. ESTIMATED ERROR:  $\delta T/K = \pm 0.01; \quad \delta P/bar = \pm 0.1;$  $\delta y_{\rm Ne} = \pm 0.001.$  $\delta x_{\rm Ne} = \pm 0.001;$ (estimated by compiler) **REFERENCES:** Streett, W. B., Cryogenics, 1965, 1. 5, 27. 1

| COMPONEN  | ITS:   |  |  | ORIGINAL  | MEASUREME  | NTS:   |  |
|---|--|--|--|---|--|--|--|
|   | eon; Ne;<br>gon; Ar;   | 7440-01-9<br>7440-37-1   |  | Streett, W. B., <i>J. Chem. Phys.</i> , <u>1965</u> ,<br>42, 500. |  |  |  |
| VARIABLI  |  | u  | <u></u>  | PREPARED  |  | <u></u>  |  |
| Tempera   | ature, pre   | ssure  |  | С. L. Y   | oung   |  |  |
|   | ENTAL VALUES   | le fractio   | n of neon  | ·   | M  | ole fractio  | n of neon  |
| т/к   |  | liquid,<br><sup>x</sup> Ne   | in vapor,<br><sup>y</sup> Ne   | т/к   |  | n liquid,<br><sup>x</sup> Ne   | in vapor,<br><sup>y</sup> Ne   |
| 84.42   | 3.83<br>6.96<br>13.65<br>21.20<br>27.72<br>34.47<br>42.16<br>48.19<br>54.99<br>69.19 | 0.0024<br>0.0052<br>0.0111<br>0.0178<br>0.0229<br>0.0284<br>0.0348<br>0.0348<br>0.0408<br>0.0448<br>0.0549 | 0.7984<br>0.8888<br>0.9420<br>0.9505<br>0.9584<br>0.9662<br>0.9665<br>0.9668<br>0.9681<br>0.9693           | 95.82<br>101.94   | 54.81<br>69.40<br>7.45<br>14.27<br>21.37<br>28.17<br>34.82<br>41.61<br>48.57<br>55.23  | 0.0517<br>0.0652<br>0.0038<br>0.0112<br>0.0192<br>0.0262<br>0.0337<br>0.0408<br>0.0487<br>0.0562 | 0.9198<br>0.9228<br>0.4638<br>0.6947<br>0.7772<br>0.8191<br>0.8419<br>0.8592<br>0.8694<br>0.8760 |
| 95.82   | 7.48<br>14.13<br>21.13<br>27.72<br>34.44<br>41.64<br>48.16<br>55.22<br>68.88<br>4.76 | 0.0064<br>0.0118<br>0.0183<br>0.0241<br>0.0293<br>0.0361<br>0.0412<br>0.0475<br>0.0573<br>0.0020           | 0.8486<br>0.9107<br>0.9307<br>0.9445<br>0.9501<br>0.9552<br>0.9582<br>0.9605<br>0.9605<br>0.9623<br>0.4870 | 110.78  | 62.12<br>70.57<br>10.38<br>15.20<br>21.06<br>27.34<br>34.51<br>41.64<br>55.30<br>69.22 | 0.0635<br>0.0726<br>0.0039<br>0.0101<br>0.0171<br>0.0246<br>0.0337<br>0.0422<br>0.0593<br>0.0764 | 0.8819<br>0.8868<br>0.2863<br>0.4813<br>0.5993<br>0.6701<br>0.7200<br>0.7508<br>0.7871<br>0.8103 |
|   | 10.55<br>14.82<br>22.44<br>28.48<br>35.13<br>41.58                                   | 0.0079<br>0.0123<br>0.0194<br>0.0258<br>0.0319<br>0.0387   | 0.7545<br>0.8157<br>0.8661<br>0.8892<br>0.8970<br>0.9064   | 121.36  | 20.27<br>29.13<br>36.27<br>42.37<br>58.05<br>69.88                                     | 0.0092<br>0.0224<br>0.0329<br>0.0417<br>0.0653<br>0.0833   | 0.2901<br>0.4540<br>0.5278<br>0.5747<br>0.6467<br>0.6728   |
|   | · · · · · · · · · · · · · · · · · · ·  |  | AUXILIARY  |   |  |  |  |
| Recircu<br>details<br>measure<br>thermom<br>Bourdon | lating va<br>given in<br>d with pl<br>eter. P<br>gauge.<br>analysed                  | atinum res:<br>ressure mea   | pparatus;<br>Temperature<br>istance<br>asured using<br>f coexisting  | No de   | ND PURITY<br>tails gi  | OF MATERIALS:<br>ven.  |  |
|   |  |  |  | $\delta x_{\text{Ne}} = \pm 0.002.$<br>REFERENC                   | ±0.01;<br>±0.0002<br>ES:<br>reett, W   | δP/bar = ±0<br>to 0.0004;<br>. B., Cryoge  |  |
|   | 1  |  |  | 5,  | 27.  |  |  |

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ORIGINAL MEASUREMENTS: COMPONENTS: Streett, W. B., J. Chem. Phys., <u>1965</u>, 42, 500. (1) Neon; Ne; 7440-01-9 (2) Argon; Ar; 7440-37-1 EXPERIMENTAL VALUES: P/bar Mole fraction of neon
in liquid in vapor, T/K in vapor,  $x_{Ne}$  $y_{Ne}$ 26.44 34.85 129.93 0.0097 0.1703 0.3055 0.0237 42.92 0.0373 0.3877 49.54 0.0487 0.4335 56.19 72.39

0.4709

0.5277

0.0603

0.0898

| COMPONE     | NTS:                  |  |                          | ORIGINAL  | MEASUREM       | ENTS:                         |                         |  |
|-------------|-----------------------|--|--------------------------|---|----------------|-------------------------------|-------------------------|--|
| (1) N       | eon; Ne               | ; 7440-01-9  |                          | Skripka, V. G. and Lobonova, N. N.,                                     |                |                               |                         |  |
| (2) A       | raon. A               | r; 7440-37-1   |                          | Trudy V   | 'ses. Na       | uchIssled.                    | Inst.                   |  |
| (2) A       | 1901 <i>,</i> 1       | 1, 1440 57 1   |                          | Kriog.  | Mashino        | str., <u>1971</u> ,           | 13, 90.                 |  |
| VARIABL     | .ES :                 |  |                          | PREPARED  | BY:            |                               |                         |  |
| Temper      | ature, p              | ressure  |                          | C. L. Y   | oung           |                               |                         |  |
| EXPERIM     | ENTAL VALU            |  |                          | 1   |                |                               |                         |  |
| T/K         | <i>P/</i> bar         | Mole fracti in liquid,                                     | on of neon<br>in vapor,  | т/к   | <i>P/</i> bar  | Mole fracti<br>in liquid,     | on of neon<br>in vapor, |  |
|             | 1 / Dui               | <sup>x</sup> Ne  | <sup>y</sup> Ne          | 1710  | .,             | <sup>x</sup> Ne               | <sup>y</sup> Ne         |  |
| 90.61       | 9.8                   | 0.0092   | -                        | 99.75   | 68.6           | 0.0726                        | 0.8925                  |  |
|             | 19.6                  | 0.0194   | -                        |   | 78.5           | 0.0832                        | 0.8945                  |  |
|             | 29.4                  | 0.0296<br>0.0400   | 0.9245                   |   | 88.3           | 0.0936                        | 0.8960                  |  |
|             | 39.2<br>49.0          | 0.0400   | 0.9340<br>0.9385         |   | 98.1<br>107.9  | 0.1044<br>0.1128              | 0.8960<br>0.8960        |  |
|             | 49.0<br>58.8          | 0.0604   | 0.9400                   |   | 117.7          | 0.1260                        | 0.8950                  |  |
|             | 68.6                  | 0.0706   | 0.9395                   |   | 127.5          | 0.1370                        | 0.8935                  |  |
|             | 78.5                  | 0.0809   | 0.9395                   |   | 137.3          | 0.1480                        | 0.8905                  |  |
|             | 88.3                  | 0.0911   | 0.9390                   |   | 147.1          | 0.1590                        | 0.8870                  |  |
|             | 98.1                  | 0.1005   | 0.9380                   |   | 156.9          | 0.1705                        | 0.8835                  |  |
|             | 107.9                 | 0.1095   | 0.9365                   |   | 166.7          | 0.1815                        | 0.8790                  |  |
|             | 117.7                 | 0.1185   | 0.9350                   | _   | 176.5          | 0.1920                        | 0.8760                  |  |
|             | 127.5<br>137.3        | 0.1275<br>0.1364   | 0.9330<br>0.9310         |   | 186.3<br>196.1 | 0.2025<br>0.2130              | 0.8720<br>0.8690        |  |
|             | 147.1                 | 0.1452   | 0.9290                   | 109.67  | 19.6           | 0.0140                        | 0.0090                  |  |
|             | 156.9                 | 0.1538   | 0.9270                   | 103.07  | 29.4           | 0.0273                        | -                       |  |
|             | 166.7                 | 0.1622   | 0.9245                   |   | 39.2           | 0.0404                        | 0.7305                  |  |
|             | 176.5                 | 0.1700   | 0,9220                   |   | 49.0           | 0.0550                        | 0.7580                  |  |
|             | 186.3                 | 0.1775   | 0.9200                   |   | 58.8           | 0.0675                        | 0.7800                  |  |
|             | 196.1                 | 0.1846   | 0.9180                   |   | 68.6           | 0.0805                        | 0.7955                  |  |
| 99.75       | 9.8                   | 0.0079<br>0.0189   | -                        |   | 78.5           | 0.0930                        | 0.8070                  |  |
|             | 19.6<br>29.4          | 0.0296   | -                        |   | 88.3<br>98.1   | 0.1060<br>0.1190              | 0.8150<br>0.8180        |  |
|             | 39.2                  | 0.0404   | 0.8635                   |   | 107.9          | 0.1320                        | 0.8190                  |  |
|             | 49.0                  | 0.0510   | 0.8780                   |   | 117.7          | 0.1450                        | 0.8000                  |  |
| <del></del> | 58.8                  | 0.0620   | 0.8865                   |   | 127.5          | 0.1594                        | 0.8180                  |  |
|             | /                     |  |                          | INFORMATI   |                |                               |                         |  |
|             |                       | US/PROCEDURE<br>ave partiall                               |                          |   |                | OF MATERIALS:                 | +17 99 7                |  |
| with 1      | iquid and             | d then press   | urized with              | <ol> <li>High purity sample, purity 99.7<br/>mole per cent.</li> </ol>  |                |                               |                         |  |
| red wi      | erometry<br>th platin | of phases a<br>. Temperatu<br>num resistan<br>sure measure | ure measu-<br>ce thermo- | <ol> <li>High purity sample, purity 99.99<br/>mole per cent.</li> </ol> |                |                               |                         |  |
|             |                       | Details in   |                          |   |                |                               |                         |  |
|             |                       |  |                          | ESTIMATE  |                |                               |                         |  |
|             |                       |  |                          |   | ±0.01;         | $\delta P/\text{bar} = \pm 0$ | .4; δx <sub>Ne</sub> =  |  |
|             |                       |  |                          |   |                |                               |                         |  |
|             |                       |  |                          | REFERENC  | ES:            |                               |                         |  |
|             |                       |  |                          |   |                |                               |                         |  |
|             |                       |  |                          |   |                |                               |                         |  |
|             |                       |  |                          | <u> </u>  |                |                               |                         |  |

| COMPONE | ENTS:          |                            |                  | ORIGINAL MEASUREMENTS:   |
|---------|----------------|----------------------------|------------------|--|
|         |                | ; 7440-01-9<br>; 7440-37-1 |                  | Skripka, V. G. and Lobonova, N. N.,<br>Trudy Vses. NauchIssled. Inst.<br>Kriog. Mashinostr., <u>1971</u> , 13, 90. |
| <u></u> |                |                            |                  |  |
| EXPERIM | IENTAL V       | ALUES:<br>Mole fractio     |                  |  |
| т/к     | P/bar          | in liquid,                 | in vapor,        |  |
|         |                | <sup>x</sup> Ne            | <sup>y</sup> Ne  |  |
| 109.67  | 137.3          | 0.1736                     | 0.8155           | _  |
|         | 147.1          | 0.1882                     | 0.8125           |  |
|         | 156.9          | 0.2034                     | 0.8080           |  |
|         | 166.7<br>176.5 | 0.2180<br>0.2328           | 0.8020<br>0.7950 |  |
|         | 186.3          | 0.2484                     | 0.7830           |  |
|         | 196.1          | 0.2644                     | 0.7695           |  |
| 100 00  | 205.9          | 0.2814                     | -                |  |
| 120.09  | 19.6<br>29.4   | 0.0110<br>0.0260           | -                |  |
|         | 39.2           | 0.0400                     | 0.5370           |  |
|         | 49.0           | 0.0555                     | 0.5935           |  |
|         | 58.8           | 0.0700                     | 0.6028           |  |
|         | 68.6<br>78.5   | 0.0860<br>0.1020           | 0.6510<br>0.6670 |  |
|         | 88.3           | 0.1180                     | 0.6765           |  |
|         | 98.1           | 0.1350                     | 0.6840           |  |
|         | 107.9          | 0.1530                     | 0.6880           |  |
|         | 117.7<br>127.5 | 0.1720<br>0.1925           | 0.6880<br>0.6835 |  |
|         | 137.3          | 0.2140                     | 0.6780           |  |
|         | 147.1          | 0.2360                     | 0.6705           |  |
|         | 156.9          | 0.2610                     | 0.6605           |  |
|         | 166.7<br>176.5 | 0.2870<br>0.3140           | 0.6490<br>0.6365 |  |
|         | 170.5          | 0.5140                     | 0.0505           |  |
| ·····   | ····           |                            |                  | -  |
|         |                |                            |                  |  |
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|         |                |                            |                  |  |

| S:  |  |  | ORIGINAL  | MEASUREME   | ENTS:   |   |
|---|--|--|---|---|---|---|
| <pre>(1) Neon; Ne; 7440-01-9 (2) Argon; Ar; 7440-37-1</pre>   |  |  |   |   |   |   |
| :   | <u></u>  |  | PREPARED  | BY:   |   |   |
| ature, p  | ressure  |  | C. L.   | Young   |   |   |
|   |  |  | <u> </u>  |   |   |   |
|   |  |  | т/к   | P/bar   | Mole fracti<br>in liquid,<br><sup>x</sup> Ne  |   |
| 36.02<br>45.94<br>60.03<br>81.55<br>96.68<br>101.46<br>107.54<br>111.80<br>25.65<br>35.04<br>45.70<br>55.91<br>71.06<br>86.26<br>101.42<br>116.61<br>126.74<br>138.69<br>142.000<br>143.96<br>148.07<br>153.13<br>18.76<br>25.68<br>35.68 | $\begin{array}{c} 0.0140\\ 0.0342\\ 0.0755\\ 0.1137\\ 0.1594\\ 0.1753\\ 0.2037\\ 0.2334\\ 0.0086\\ 0.0232\\ 0.0413\\ 0.0593\\ 0.0413\\ 0.0593\\ 0.0896\\ 0.1169\\ 0.1497\\ 0.1837\\ 0.2114\\ 0.2432\\ 0.2641\\\\ 0.2963\\ 0.3302\\ 0.0810\\ 0.0168\\ 0.0326\\ \end{array}$   | 0.1252<br>0.2280<br>0.3457<br>0.3830<br>0.3930<br>0.3923<br>0.3793<br>0.3614<br>0.1559<br>0.3108<br>0.4143<br>0.4745<br>0.5280<br>0.5564<br>0.5564<br>0.5568<br>0.5568<br>0.5568<br>0.55642<br>0.5568<br>0.55642<br>0.5568<br>0.5568<br>0.5247<br>0.5042<br>0.4685<br>0.2488<br>0.4038<br>0.5247 | 103.04  | 66.03<br>81.35<br>101.53<br>126.80<br>152.12<br>177.45<br>192.63<br>202.74<br>10.62<br>20.43<br>50.98<br>91.32<br>152.15<br>212.90<br>273.69<br>334.48<br>364.87<br>374.99  | 0.0766<br>0.1012<br>0.1355<br>0.1801<br>0.2312<br>0.2958<br>0.3510<br>0.4274<br>0.0073  | 0.6176<br>0.6640<br>0.7042<br>0.7026<br>0.6910<br>0.6910<br>0.6492<br>0.6038<br>0.5335<br>0.5709<br>0.7522<br>0.8635<br>0.8853<br>0.8750<br>0.8431<br>0.8059<br>0.7440<br>0.6920<br>0.6549<br>0.7817<br>0.6593<br>0.6338<br>0.6578<br>0.8057<br>0.8908  |
|   |  | AUXILIARY  | INFORMAT  | ION   |   |   |
| high pre<br>re measur<br>and ter<br>chermomet   | essure equili<br>red with dead<br>nperature wit<br>ter. Sample   | l weight<br>ch resis-<br>es analysed   | ESTIMATI<br>T/K =<br>better<br>REFEREN<br>1. Tra  | ED ERROR:<br>= ±0.003;<br><sup>δ</sup> <i>x</i> <sub>Ne</sub><br>CES:<br>ppeniers   | given.<br>$\delta P/bar = \pm 0$<br>$\approx \delta y_{Ne} = \pm 0$<br>s, N. J. and   | ±0.1 or<br>.0005.<br>Schouten,  |
|   | <pre>eon; Ne gon; A gon; A gon; A gon; A finite fin</pre> | <pre>eon; Ne; 7440-01-9 cgon; Ar; 7440-37-1 cgon; Ar; 7440-37-1</pre>  | eon; Ne; 7440-01-9<br>rgon; Ar; 7440-37-1<br>ature, pressure<br>TAL VALUES:<br>Mole fraction of neon<br>P/bar in liquid, in vapor,<br><sup>w</sup> Ne<br><sup>y</sup> Ne<br>36.02 0.0140 0.1252<br>45.94 0.0342 0.2280<br>60.03 0.0755 0.3457<br>81.55 0.1137 0.3830<br>96.68 0.1594 0.3930<br>101.46 0.1753 0.3923<br>107.54 0.2037 0.3793<br>111.80 0.2334 0.3614<br>25.65 0.0086 0.1559<br>35.04 0.0232 0.3108<br>45.70 0.0413 0.4143<br>55.91 0.0593 0.4745<br>71.06 0.0896 0.5280<br>86.26 0.1169 0.5564<br>101.42 0.1497 0.5678<br>16.61 0.1837 0.5642<br>126.74 0.2114 0.5568<br>138.69 0.2432 0.5390<br>142.00 0.2641 0.5247<br>143.96 - 0.5193<br>148.07 0.2963 0.5042<br>153.13 0.3302 0.4685<br>18.76 0.0810 0.2488<br>25.68 0.0168 0.4038<br>35.68 0.0326 0.5247<br>AUXILLARY<br>PPARATUS/PROCEDURE:<br>high pressure equilibrium cell<br>re measured with dead weight<br>and temperature with resis-<br>hermometer. Samples analysed<br>mal conductivity. Details in | son; Ne; 7440-01-9       Trappe         :gon; Ar; 7440-37-1       J. A.,         :mature, pressure       C. L.         TAL VALUES:       Mole fraction of neon         P/bar in liquid, in vapor, T/K       T/K         *Ne <sup>y</sup> Ne         36.02       0.0140       0.1252       121.32         45.94       0.0342       0.2280         60.03       0.0755       0.3457         81.55       0.1137       0.3830         96.68       0.1594       0.3923         101.46       0.1753       0.3923         107.54       0.2037       0.3108         103.04       0.559       0.4745         71.06       0.0896       0.5280         86.26       0.1169       0.5678         116.61       0.1837       0.5642         101.42       0.2641       0.5247         143.96       -       0.5193         18.76       0.0810       0.2488       92.84         18.76       0.0810       0.2488       92.84         25.68       0.0326       0.5247       No deget         AUXILIARY INFORMAT         PPARATUS/PROCEDURE:       No deget <td>Prioring Ne; 7440-01-9       Trappeniers, I         If an end of the second</td> <td>eon; Ne; 7440-01-9       Trappeniers, N. J. and Sc         :gon; Ar; 7440-37-1       Trappeniers, N. J. and Sc         :       PREPARED BY:         ture, pressure       C. L. Young         TAL VALUES:       Mole fraction of neon         Mole fraction of neon       T/K         ?/bar in liquid, in vapor,       T/K         36.02       0.0140       0.1252         121.32       50.78       0.0545         45.94       0.0342       0.2280         66.03       0.0765       0.3457         81.55       0.1137       0.3830         101.46       0.1753       0.3923         107.54       0.2037       0.3773         107.54       0.2037       0.3213         103.46       0.1753       0.3923         118.60       0.2334       0.3614       192.63         107.54       0.2037       0.3733       177.45         71.06       0.0966       0.5529       202.74       0.4274         35.04       0.0232       0.3108       103.04       10.621       0.0161         101.42       0.169       0.5642       122.90       0.2246         116.61       0.1337       0.5139       9</td> | Prioring Ne; 7440-01-9       Trappeniers, I         If an end of the second | eon; Ne; 7440-01-9       Trappeniers, N. J. and Sc         :gon; Ar; 7440-37-1       Trappeniers, N. J. and Sc         :       PREPARED BY:         ture, pressure       C. L. Young         TAL VALUES:       Mole fraction of neon         Mole fraction of neon       T/K         ?/bar in liquid, in vapor,       T/K         36.02       0.0140       0.1252         121.32       50.78       0.0545         45.94       0.0342       0.2280         66.03       0.0765       0.3457         81.55       0.1137       0.3830         101.46       0.1753       0.3923         107.54       0.2037       0.3773         107.54       0.2037       0.3213         103.46       0.1753       0.3923         118.60       0.2334       0.3614       192.63         107.54       0.2037       0.3733       177.45         71.06       0.0966       0.5529       202.74       0.4274         35.04       0.0232       0.3108       103.04       10.621       0.0161         101.42       0.169       0.5642       122.90       0.2246         116.61       0.1337       0.5139       9 |

ORIGINAL MEASUREMENTS: COMPONENTS: Trappeniers, N. J. and Schouten, (1) Neon; Ne; 7440-01-9 J. A., Physica, <u>1974</u>, 73, 539. (2) Argon; Ar; 7440-37-1 EXPERIMENTAL VALUES: Mole fraction of neon T/K P/bar in liquid, in vapor,  $x_{\rm Ne}$  $y_{Ne}$ 50.77 92.84 0.0457 0.9350 91.31 0.0837 0.9420 126.81 0.1131 0.9345 0.9236 167.28 0.1435 207.81 0.1707 0.9110 253.49 0.1992 0.8948 304.10 0.2297 0.8791 354.76 0.2575 0.8635 405.39 648.56 0.2794 0.3818 0.8525 0.7832 952.55 0.4870 0.7195 1013.4 solid phase 0.7225

.

| <ol> <li>Neon; Ne; 7440-01-9</li> <li>Colin Young,<br/>School of Chemistry,</li> <li>Krypton; Kr; 7439-90-9</li> <li>University of Melbourne,<br/>Parkville, Victoria 3052,</li> </ol> | COMPON | ENTS:                  | EVALUATOR: |  |  |  |
|--|--------|------------------------|------------|--|--|--|
| 2. Krypton; Kr; 7439-90-9 University of Melbourne,   | 1.     | Neon; Ne; 7440-01-9    |            |  |  |  |
| •••••••••••••••••••••••••••••••••••••••  |        |                        |            |  |  |  |
| Parkville, Victoria 3052,  | 2.     | Krypton; Kr; 7439-90-9 | • •        |  |  |  |
| AUSTRALIA.   |        |                        |            |  |  |  |

CRITICAL EVALUATION:

There are three sets of measurement on this system. The first measurements by Trappeniers and Schouten (1) were presented in graphical form and were undertaken to establish that this system exhibits gas-gas immiscibility of the second kind (2). These data are rejected. The measurements by Miller *et al.* (3) are restricted to pressures up to 100 bar between 120 K and 150 K and the mole fraction of neon in the liquid phase is generally slightly greater than the value obtained by interpolation of the more extensive data reported by Trappeniers and Schouten in their second paper (4). Both sets of measurement in references (3) and (4) were made with apparatus capable of good precision results and therefore both are classified as tentative.

- 1. Trappeniers, N. J. and Schouten, J. A., Phys. Lett., 1968, A27, 340.
- Scheider, G. M., in Chemical Thermodynamics Vol. 2 Special Periodical Report, Chapter 4, ed. McGlashan, M. L., Chemical Society, <u>1978</u>.
- 3. Miller, R. C., Kidnay, A. J. and Hiza, M. J., J. Chem. Thermodynamics, <u>1972</u>, 4, 807.
- 4. Trappeniers, N. J. and Schouten, J. A., Physica, 1974, 73, 546.

| COMPONEN   | TS:  |  | <u></u>  | ORIGINAL MEASUREMENTS:  |  |  |  |
|--|--|--|--|---|--|--|--|
| (1) Ne   | on; Ne:  | ; 7440-01-9  |  | Trappeniers, N. J. and Schouten, J.   |  |  |  |
| (2) Kr   | ypton;   | Kr; 7439-90•   | -9   | A., Phy   | sica, <u>19</u>  | <u>74</u> , <i>73</i> , 548.   |  |
| VARIABLE   | s:   |  | · · · · · · · · · · · · · · · · · · ·  | PREPARED  | BY:  | <u></u>  |  |
| Tempera  | ature, p   | ressure  |  | с. г. т   | oung   |  |  |
| EXPERIME   | NTAL VALU  | ES:  | ·····•   | <b></b>   | ·  | ······································                                       |  |
| т/к  | P/bar  | Mole fracti<br>in liquid,<br><sup>x</sup> Ne   | on of neon<br>in vapor,<br><sup>y</sup> Ne   | Т/К   |  | Mole fractio<br>in liquid,<br><sup>x</sup> Ne                                | on of neon<br>in vapor,<br><sup>y</sup> Ne   |
| 178.15<br>166.15<br>166.25<br>163.15   | 41.01<br>61.19<br>101.18<br>202.73<br>304.03<br>405.34<br>506.66<br>607.98<br>709.30<br>835.95<br>881.54 | 0.0354<br>0.0718<br>0.1186<br>0.1645<br>0.2660<br>0.3272<br>0.3850<br>0.4070<br>0.4531<br>0.0082<br>0.0200<br>0.0359<br>0.0618<br>0.1294<br>0.1927<br>0.2525<br>0.3109<br>0.3658 | 0.3731<br>0.5190<br>0.6378<br>0.6890<br>0.7023<br>0.6810<br>0.6532<br>0.6192<br>0.6001<br>0.5621<br>0.4055<br>0.5821<br>0.6834<br>0.7642<br>0.8125<br>0.8125<br>0.8124<br>0.7992<br>0.7799<br>0.7587<br>0.7343<br>0.6913<br>0.6598<br>0.6800<br>0.7160<br>0.4678 | 163.15  | $\begin{array}{c} 41.01\\ 61.09\\ 101.17\\ 202.73\\ 304.06\\ 405.37\\ 506.69\\ 608.01\\ 709.33\\ 810.65\\ 1013.3\\ 114.6\\ 1215.9\\ 1317.2\\ 1418.6\\ 1621.2\\ 1874.5\\ 15.85\\ 25.92\\ 41.00\\ 61.17\\ 101.28\\ 202.74\\ 304.04\\ 405.33\\ \end{array}$ | 0.0335<br>0.0594<br>0.1224<br>0.1805<br>0.2329<br>0.2810<br>0.3253<br>0.3628 | 0.6257<br>0.7182<br>0.7901<br>0.8329<br>0.8330<br>0.8237<br>0.8116<br>0.7963<br>0.7836<br>0.7723<br>0.7553<br>0.7553<br>0.7553<br>0.7576<br>0.7655<br>0.7842<br>0.8092<br>0.5738<br>0.7204<br>0.8092<br>0.5738<br>0.7204<br>0.8092<br>0.8899<br>0.8829<br>0.8899<br>0.9074<br>0.9078<br>0.9035 |
|  |  |  | AUXILIARY  |   |  |  |  |
| METHOD/APPARATUS/PROCEDURE:<br>Static high pressure equilibrium cell.<br>Pressure measured with dead weight<br>balance and temperature with resis-<br>tance thermometer. Samples analysed<br>by thermal conductivity. Details in<br>source and ref. 1. |  |  |  | SOURCE A  |  | OF MATERIALS:<br>cails given.  |  |
|  |  |  |  | $\delta T/K = \frac{\delta x_{Ne}}{\delta x_{Ne}}$ , $\delta y$<br>REFERENCE<br>1. Traj | y <sub>Ne</sub> = ±0.<br>CES:<br>ppeniers,   |  |  |

|  | ; 7440-01-9   |  |   |   | I. J. and Scl   |  |
|--|---|--|---|---|---|--|
|  | Kr; 7439-90-  | 9  | ,,  | iysica, <u>1</u>  | <u>.974</u> , 73, 54  | 8.   |
|  |   |  |   |   |   |  |
| ENTAL VA                                       | ALUES:  |  |   |   |   |  |
| P/bar  | Mole fractic<br>in liquid,<br><sup>x</sup> Ne   |  | т/к   | P/bar   | Mole fracti<br>in liquid,<br><sup>x</sup> Ne  | on of neon<br>in vapor,<br><sup>Y</sup> Ne   |
| 506.66<br>607.97<br>709.30                     | 0.1863<br>0.2071<br>0.2230  | 0.9002<br>0.8976<br>0.8958                               | 123.17  | 131.88<br>182.51<br>253.38  | -<br>0.0497<br>0.0629   | 0.9703<br>0.9717<br>0.9705   |
| L519.9   | 0.2356<br>0.2594<br>0.2624<br>0.2579<br>0.0026<br>0.0057  | 0.8943<br>0.9003<br>0.9085<br>0.9168<br>0.6608<br>0.8122 | 164.92  | 354.65<br>456.03<br>1063.9<br>1114.6<br>1469.2<br>1519.9  | 0.0798<br>0.0896<br>0.5373<br>0.5873<br>0.5839<br>0.5630  | 0.9691<br>0.9693<br>0.6842<br>0.6645<br>0.6780<br>0.7000   |
| 25.91<br>40.99<br>61.06<br>101.28<br>202.70    | 0.0098<br>0.0158<br>0.0233<br>0.0371<br>0.0673  | 0.8775<br>0.9127<br>0.9331<br>0.9474<br>0.9526           |   | 1215.9<br>1317.2<br>1418.6  | 0.5392<br>0.5942<br>0.5910<br>0.5668<br>0.5778  | 0.6836<br>0.6469<br>0.6546<br>0.6948<br>0.6631   |
| 304.08<br>405.39<br>506.70<br>608.00<br>709.31 | 0.0916<br>0.1113<br>0.1252<br>0.1372<br>0.1461  | 0.9500<br>0.9490<br>0.9461<br>0.9449<br>0.9448           | 164.665   | 1246.4<br>1266.6<br>1286.8<br>1317.2<br>810.65  | 0.5817<br>0.5816<br>0.5827<br>0.5762<br>0.4303  | 0.6644<br>0.6637<br>0.6661<br>0.6706<br>0.7424   |
| 810.02<br>013.25<br>5.43<br>8.18               | 0.1519<br>0.1618<br>0.0015<br>0.0026  | 0.9455<br>0.9517<br>0.8217                               |   | 1114.58<br>1215.90<br>1257.3<br>1266.7  | 0.5440<br>0.5710<br>0.5742<br>0.5770  | 0.6825<br>0.6670<br>0.6679<br>0.6892<br>0.6703   |
| 25.88<br>30.89<br>51.06<br>91.43               | 0.0089<br>0.0100<br>0.0162<br>0.0275  | 0.9354<br>0.9432<br>0.9597<br>0.9695                     |   | 1337.5<br>1418.6<br>1519.9<br>1874.5  | 0.5700<br>0.5597<br>0.5393<br>0.4864  | 0.6793<br>0.6980<br>0.7208<br>0.7794   |
|  | <pre>P/bar<br/>506.66<br/>607.97<br/>709.30<br/>810.62<br/>1215.9<br/>1519.9<br/>1519.9<br/>1519.9<br/>1519.9<br/>15.84<br/>25.91<br/>40.99<br/>61.06<br/>101.28<br/>202.70<br/>304.08<br/>405.39<br/>506.70<br/>608.00<br/>709.31<br/>810.02<br/>1013.25<br/>5.43<br/>8.18<br/>15.83<br/>25.88<br/>30.89<br/>51.06</pre> | <pre>P/bar in liquid,</pre>                              | Mole fraction of neon<br>in liquid,in vapor,<br>in vapor,<br>$x_{\rm Ne}$ 506.660.18630.9002607.970.20710.8976709.300.22300.8958810.620.23560.89431215.90.26240.90031519.90.26240.90851874.50.25790.91688.230.00260.660815.840.00570.812225.910.00980.877540.990.01580.912761.060.02330.9331101.280.03710.9474202.700.66730.9526304.080.09160.9500405.390.11130.9490506.700.12520.9461608.000.13720.9449709.310.14610.9448810.020.15190.94551013.250.16180.95175.430.0053-8.180.00260.821715.830.00530.903225.880.0890.935430.890.01000.943251.060.01620.9597 | Mole fraction of neon<br>$P/bar$ T/K $x_{Ne}$ $y_{Ne}$ 506.660.18630.9002123.17607.970.20710.8976123.17607.970.20710.8976123.17607.970.20710.8976123.17506.620.23560.89431215.91215.90.25940.90031215.90.26240.9085164.92164.921874.50.25790.91688.230.00260.660815.840.00570.812225.910.00980.877516.060.02330.9331101.280.03710.9474202.700.06730.9526164.685304.080.09160.9500405.390.11130.9490506.700.125250.310.14610.9448164.665810.020.15190.94551013.250.16180.9015-8.180.00260.821715.830.00530.903225.880.00890.935430.890.01000.943251.060.01620.9597 | Mole fraction of neon<br>$P/bar$ Mole fraction of neon<br>in liquid,<br>$x_{Ne}$ $y_{Ne}$ $x_{Ne}$ $y_{Ne}$ 506.660.18630.9002123.17131.88607.970.20710.8976182.51709.300.22300.8958253.38810.620.23560.8943354.651215.90.25940.9003456.031519.90.26240.9085164.921681114.68.230.00260.66081469.215.840.00570.81221519.925.910.00980.8775164.725101.280.03710.94741418.6202.700.06730.9526164.6851216.90.1130.94901266.6506.700.12520.94611286.8608.000.13720.94491317.2709.310.14610.9448164.665810.020.15190.94551114.581013.250.16180.95171215.905.430.0015-1257.38.180.00260.82171266.715.830.00530.90321297.025.880.00890.93541337.530.890.01000.94321418.651.060.01620.95971519.9 | Mole fraction of neonMole fractiP/barin liquid,in vapor,T/KP/barin liquid, $x_{Ne}$ $y_{Ne}$ $x_{Ne}$ $x_{Ne}$ 506.660.18630.9002123.17131.88-607.970.20710.8976182.510.0497709.300.22300.8958253.380.0629810.620.23560.8943354.650.07981215.90.25940.9003456.030.08961519.90.26240.9085164.921063.91874.50.25790.91681114.60.58731874.50.25790.91681144.60.587318.230.00260.66081469.20.583915.840.00570.81221519.90.563025.910.00980.8775164.7251083.50.539240.990.01580.91271215.90.594261.060.02330.93311317.20.5910101.280.03710.94741418.60.5668202.700.06730.9526164.6851216.00.5778304.080.09160.95001246.40.5817608.000.13720.94491317.20.5762709.310.14610.9448164.665810.650.4303810.020.15190.94551114.580.54401013.250.16180.95171215.900.57105.430.0015-1257.3 <td< td=""></td<> |

COMPONENTS: ORIGINAL MEASUREMENTS: Neon; Ne; 7440-01-9 (1) Miller, R. C., Kidnay, A. J. and Hiza, M. J., J. Chem. Thermodynamics, (2) Krypton; Kr; 7439-90-9 1972, 4, 807. VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: T/K Mole fraction of neon in liquid phase,  $x_{\rm Ne}$ P/bar 120.00 10.31 0.00310 20.09 0.00653 32.53 0.0110 45.29 0.0152 61.5 0.0204 0.0264 81.9 100.3 0.0320 130.00 10.63 0.00341 20.98 0.00798 0.0160 40.02 54.3 0.0215 67.3 0.0264 102.4 0.0399 140.00 13.04 0.00443 23.81 0.0101 39.74 0.0181 0.0283 60.69 81.8 0.0385 0.0472 100.4 150.00 13.22 0.00380 26.24 0.0122 43.22 0.0221 61.3 0.0326 81.3 0.0455 102.3 0.0564 AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: Recirculating vapor-flow apparatus. No details given. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Gas and liquid samples analysed by gas chromatography. Details in source and ref. 1 and 2. ESTIMATED ERROR:  $\delta T/K = \pm 0.01; \quad \delta P/bar = \pm 0.05;$  $\delta x_{\rm Ne} \simeq \delta y_{\rm Ne} = \pm 5\%$ . **REFERENCES:** Kidnay, A. J., Miller, R. C. and Hiza, M. J., Ind. Eng. Chem. Fund. <u>1971</u>, 10, 459. Duncan, A. G. and Hiza, M. J., A.I.Ch.E.J., <u>1970</u>, 16, 733. 1. 2.

| COMPONENTS: |                                      | EVALUATOR:  |  |  |
|-------------|--------------------------------------|---|--|--|
| 1.          | Neon; Ne; 7440-01-9                  | Colin Young,<br>School of Chemistry,                                |  |  |
| 2.          | Nitrogen; N <sub>2</sub> ; 7727-37-9 | University of Melbourne,<br>Parkville, Victoria 3052.<br>AUSTRALIA. |  |  |

CRITICAL EVALUATION:

This system has been studied by three groups. The work of Burch (1) was restricted to two temperatures and relatively low pressures but is in good agreement with data obtained in the more extensive study of Streett (2.3). The early work of Skripka and Dykhno (4) was limited to pressures up to 25 bar and is probably of lower accuracy than the more recent work of Skripka and Lobonova (5). The work of Skripka and Lobonova (5) is in good agreement with the work of Streett (2,3) where the temperature and pressure ranges overlap. The data of Burch (1) and Skripka and Dykhno (4) are classified as restricted data of moderate accuracy whereas that of Streett (2,3) and Skripka and Lobonova (5) are classified as tentative. Because of partly overlapping but different ranges of temperature and pressure studied it is not desirable to classify either of the latter works as recommended at present.

- 1. Burch, R. J., J. Chem. Engng. Data, 1964, 9, 19.
- 2. Streett, W. B., Cryogenics, 1968, 8, 88.
- 3. Streett, W. B., Cryogenics, 1965, 5, 27.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr., 1964, no. 8, 163.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., 1971, no. 13, 90.

| COMPONENTS :  | ORIGINAL MEASUREMENTS:  |  |  |  |  |
|---|---|--|--|--|--|
| <pre>(1) Neon; Ne; 7440-01-9 (2) Nitrogen; N<sub>2</sub>; 7727-37-9</pre>   | Burch, R. J., J. Chem. Eng. Data,<br><u>1964</u> , 9, 19.   |  |  |  |  |
|   |   |  |  |  |  |
| VARIABLES:  | PREPARED BY:  |  |  |  |  |
| Temperature, pressure   | C. L. Young   |  |  |  |  |
| EXPERIMENTAL VALUES:  |   |  |  |  |  |
| T/K P/bar 10 <sup>2</sup> mole fracti   | on of neon in liquid, in vapor,<br>$10^2 x_{Ne}$ $10^2 y_{Ne}$  |  |  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | $\begin{array}{cccccccccccccccccccccccccccccccccccc$  |  |  |  |  |
| AUXILIAR<br>METHOD /APPARATUS/PROCEDURE:  | Y INFORMATION<br>SOURCE AND PURITY OF MATERIALS:  |  |  |  |  |
| Single pass flow method. Vapor<br>passed through magnetically stirred<br>cell. Temperature measured using<br>thermocouple and pressure measured<br>with Bourdon gauge. Liquid and<br>vapor samples analysed using mass<br>spectrometer. | <ol> <li>Airco spectroscopic sample purity<br/>better than 99.985 mole per cent.</li> <li>Airco prepurified sample purity<br/>better than 99.997 mole per cent.<br/>(Details in source.)</li> </ol> |  |  |  |  |
|   | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.2;  \delta P/bar = \pm 0.007 \text{ at } 5.066$<br>bar = $\pm 0.07$ at other pressures;<br>$\delta x_{\text{Ne}} \leq \pm 2$ % (Details in source.)         |  |  |  |  |
|   | REFERENCES:   |  |  |  |  |

| COMPONENT                                      | rs:  |   | ORIGINAL MEASUREMENTS:  |  |  |  |  |
|--|--|---|---|--|--|--|--|
|  |  | 440-01-9<br>2; 7727-37-9  | Skripka, V. G. and Dykhno, N. M.,<br>Trudy Vses. NauchIssled. Inst.<br>Kriog. Mashinstr., <u>1964</u> , 8, 163.                 |  |  |  |  |
|  |  |   |   |  |  |  |  |
| VARIABLE                                       | S:   |   | PREPARED BY:  |  |  |  |  |
| Temper   | ature, pres  | sure  | C. L. Young   |  |  |  |  |
| EXPERIME                                       | NTAL VALUES:   |   | N. 7 Current 1  |  |  |  |  |
| T/K  | P/bar  | P <sup>+</sup> /bar   | Mole fraction of in liquid, x <sub>Ne</sub>   | in vapor, y <sub>Ne</sub>                      |  |  |  |
| 67.4   | 6.03<br>11.08<br>16.10<br>21.22  | 5.77<br>10.82<br>15.84<br>20.95   | 0.0180<br>0.0343<br>0.0503<br>0.0663  | 0.9577<br>0.9733<br>0.9784<br>0.9805           |  |  |  |
| 72.0   | 26.27<br>6.03<br>11.08<br>16.25<br>21.27                                 | 26.01<br>5.49<br>10.55<br>15.72<br>20.73  | 0.0837<br>0.0164<br>0.0315<br>0.0475<br>0.0620  | 0.9824<br>0.9052<br>0.9429<br>0.9570           |  |  |  |
| 78.0   | 26.24<br>5.92<br>11.07<br>16.15  | 20.73<br>25.71<br>4.78<br>9.94<br>15.02   | 0.0772<br>0.0140<br>0.0287<br>0.0445  | 0.9620<br>0.9664<br>0.7933<br>0.8792<br>0.9092 |  |  |  |
| 84.0   | 21.26<br>26.27<br>6.07<br>11.06  | 20.12<br>25.14<br>3.98<br>8.98  | 0.0595<br>0.0740<br>0.0114<br>0.0249  | 0.9242<br>0.9332<br>0.7753                     |  |  |  |
| 90.3   | 16.13<br>21.19<br>26.16<br>6.03<br>11.06                                 | 14.04<br>19.10<br>24.07<br>2.25<br>7.29   | 0.0390<br>0.0530<br>0.0670<br>0.0070<br>0.0219  | 0.8348<br>0.8655<br>0.8819                     |  |  |  |
| ,  | 16.24<br>21.25<br>26.26  | 12.46<br>17.47<br>22.48   | 0.0364<br>0.0521<br>0.0667  | 0.6953<br>0.7593<br>0.7948                     |  |  |  |
| <i>P</i> <sup>+</sup> pa                       | rtial press  | ure of neon   |   |  |  |  |  |
|  |  | AUXILIARY   | INFORMATION   |  |  |  |  |
| METHOD /                                       | APPARATUS/PI   | ROCEDURE :  | SOURCE AND PURITY OF MATER  | IALS:  |  |  |  |
| recirc<br>measur<br>thermo<br>Bourdo<br>liquid | ulating pump<br>ed with pla<br>meter, press<br>n gauge. S<br>analysed by | tus with magnetic<br>p. Temperature<br>tinum resistance<br>sure measured with<br>Samples of gas and<br>y gas phase inter-<br>ils in source. | <ol> <li>High purity sample<br/>mole per cent; in<br/>and nitrogen.</li> <li>Purity 99.5 mole p<br/>main impurity.</li> </ol>   | npurities helium                               |  |  |  |
|  |  |   | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02$ to 0.03;<br>0.2 bar; $\delta x_{Ne} \simeq \delta y_{Ne}$<br>0.0002.<br>REFERENCES: | $\delta P$ less than<br>= ±0.0001 to           |  |  |  |
|  |  |   |   |  |  |  |  |

COMPONENTS: ORIGINAL MEASUREMENTS: (1)Neon; Ne; 7440-01-9 Streett, W. B., Cryogenics, 1968, 8, 88. Nitrogen; N<sub>2</sub>; 7727-37-9 (2) VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: Mole fraction of neon Mole fraction of neon T/K P/bar in liquid, in vapor, T/K P/bar in liquid, in vapor, x<sub>Ne</sub>  $y_{Ne}$  $x_{\rm Ne}$ <sup>y</sup>Ne 79.9 147.1 66.13 86.19 0.5570 0.7209 0.2293 89.6 0.9634 0.7125 0.2546 148.5 0.5862 0.8498 99.9 0.2783 90.65 78.2 0.2316 127.6 0.9447 99.1 0.3061 0.8258 0.3527 111.7 0.8053 134.5 0.3638 160.6 0.4140 0.9061 132.7 0.4826 0.7409 184.7 0.4702 137.5 0.5278 0.8629 216.4 0.7765 0.2832 0.5689 100.78 89.0 0.7111 219.9 0.5946 103.4 0.3579 0.6793 77.35 101.3 0.2988 0.9196 111.0 0.4152 0.6396 135.5 0.4172 0.8691 114.1 0.4578 0.6027 0.5535 158.6 82.1 0.5261 0.7981 108.91 166.1 0.6004 0.7315 87.2 0.3113 0.5325 86.19 98.2 0.2984 0.8723 90.3 0.3404 0.5107 114.8 0.3640 0.8424 92.0 0.4892 114.34 0.2617 132.3 0.4438 0.8050 74.2 0.4029 141.7 0.5019 0.7669 AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: Recirculating vapor flow with magnetic No details given. Samples of phases analysed by pump. thermal conductivity. Temperature measured with platinum resistance thermometer and pressure measured with Bourdon gauge. Details in ref. 1. ESTIMATED ERROR:  $\delta T/K = \pm 0.02;$  $\delta P/\text{bar} = \pm 0.1;$ δx<sub>Ne</sub> ≃  $\delta y_{\rm Ne} = \pm 0.0005$  (estimated by compiler) **REFERENCES**: 1. Streett, W. B., Cryogenics, 1965, 5, 27.

| COMPONENTS:  |                |  |   | ORIGINAL MEASUREMENTS:   |   |  |                |  |
|--|----------------|--|---|--|---|--|----------------|--|
| (1) Neon; Ne; 7440-01-9  |                |  |   | Skripka, V. G. and Lobonova, N. N.,                                    |   |  |                |  |
| (2) Nitrogen; N <sub>2</sub> ; 7727-37-9                                 |                |  |   | Trudy Vses. NauchIssled. Inst.   |   |  |                |  |
|  | -              |  |   | Kriog. Mashinostr., <u>1971</u> , 13, 90.                              |   |  |                |  |
| VARIABLES:   |                |  |   | DEDADED DV.  |   |  |                |  |
|  |                |  |   | PREPARED BY:   |   |  |                |  |
| Temperature, pressure  |                |  |   | C. L. Young  |   |  |                |  |
| EXPERIME   | NTAL VALU      |  |   |  |   | · · · · · · · · · · · · · · · · · · ·        |                |  |
| т/к  | P/bar          | Mole fract:<br>in liquid,<br><sup>x</sup> Ne | ion of neon<br>in vapor,<br><sup>Y</sup> Ne | т/к  | P/bar   | Mole fracti<br>in liquid,<br><sup>x</sup> Ne |                |  |
| 65.97  | 9.8            | 0.0029                                       | 0.977                                       | 89.68  |   | 0.0018                                       |                |  |
|  | 19.6<br>29.4   | 0.0058<br>0.0086                             | 0.981<br>0.983                              |  | 19.6<br>29.4  | 0.0042<br>0.0075                             | 0.775<br>0.823 |  |
|  | 39.2           | 0.0114                                       | 0.983                                       |  | 39.2  | 0.0104                                       | 0.849          |  |
|  | 49.0<br>58.8   | 0.0143<br>0.0169                             | 0.982<br>0.980                              |  | 49.0<br>58.8  | 0.0135<br>0.0166                             | 0.857<br>0.858 |  |
|  | 68.6           | 0.0195                                       | 0.978                                       |  | 68.6  | 0.0198                                       | 0.858          |  |
|  | 78.5<br>88.3   | 0.0219<br>0.0241                             | 0.973<br>0.968                              |  | 78.5<br>88.3  | 0.0231<br>0.0268                             | 0.856<br>0.854 |  |
|  | 98.1           | 0.0261                                       | 0.962                                       |  | 98.1  | 0.0306                                       | 0.847          |  |
|  | 107.9<br>117.7 | 0.0278<br>0.0294                             | 0.955<br>0.849                              |  | 107.9<br>117.7  | 0.0344<br>0.0381                             | 0.837<br>0.823 |  |
| 77.69  | 9.8            | 0.0024                                       | -   | 101.31   | 9.8   | 0.0004                                       | -              |  |
|  | 19.6<br>29.4   | 0.0051<br>0.0079                             | 0.925<br>0.942                              |  | 19.6<br>29.4  | 0.0032<br>0.0061                             | 0.606          |  |
|  | 39.2           | 0.0107                                       | 0.949                                       |  | 39.2  | 0.0091                                       | 0.663          |  |
|  | 49.0<br>58.8   | 0.0136<br>0.0168                             | 0.950<br>0.948                              |  | 49.0<br>58.8  | 0.0122<br>0.0156                             | 0.698<br>0.715 |  |
|  | 68.6           | 0.0198                                       | 0.947                                       |  | 68.6  | 0.0191                                       | 0.725          |  |
|  | 78.5<br>88.3   | 0.0227<br>0.0257                             | 0.944<br>0.939                              |  | 78.5<br>88.3  | 0.0228<br>0.0271                             | 0.729<br>0.724 |  |
|  | 89.1           | 0.0286                                       | 0.931                                       |  | 98.1  | 0.0319                                       | 0.704          |  |
|  | 107.9<br>117.7 | 0.0316<br>0.0347                             | 0.921<br>0.910                              |  | 107.9   | 0.0374                                       | 0.665          |  |
|  |                |  | AUXILIARY                                   | INFORMATI  | ON  |  |                |  |
| METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS:              |                |  |   |  |   |  |                |  |
| Rocking autoclave partially filled 1. High purity same                   |                |  |   |  |   |  | rity 99.7      |  |
| with liquid and then pressurized with gas. Samples of phases analysed by |                |  |   | mole per cent.   |   |  |                |  |
| interferometry. Temperature measured                                     |                |  |   | <ol> <li>High purity sample, purity 99.9<br/>mole per cent.</li> </ol> |   |  |                |  |
| with pl  | latinum        | resistance t<br>easured with                 | hermometer<br>Bourdon                       | 1101   | re her c  | ent.   |                |  |
| gauge.   | Detai          | ls in source                                 | •   |  |   |  |                |  |
|  |                |  |   |  |   |  |                |  |
|  |                |  |   |  |   |  |                |  |
|  |                |  |   |  |   |  |                |  |
|  |                |  |   | ESTIMATE   | ESTIMATED ERROR:                                      |  |                |  |
|  |                |  |   |  |   | $\delta P/\text{bar} = \pm 0$                | .4;            |  |
|  |                |  |   | $\delta x_{\rm Ne} =$  | $\delta x_{\rm Ne} = \delta y_{\rm Ne} = \pm 0.0002.$ |  |                |  |
|  |                |  |   | REFERENCES:  |   |  |                |  |
|  |                |  |   |  |   |  |                |  |
|  |                |  |   |  |   |  |                |  |
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|  |                |  |   | 1  |   |  |                |  |

COMPONENTS: ORIGINAL MEASUREMENTS: (1)Neon; Ne; 7440-01-9 Streett, W. B., Cryogenics, 1965, 5, (2)Nitrogen; N<sub>2</sub>; 7727-37-9 27. VARIABLES: PREPARED BY: Temperature, pressure C. L. Young EXPERIMENTAL VALUES: Mole fraction of neon Mole fraction of neon T/K P/bar т/к P/bar in liquid, in vapor, in liquid, in vapor,  $x_{\rm Ne}$  $y_{Ne}$ <sup>y</sup>Ne x<sub>Ne</sub> 66.13 3,90 0.9362 86.19 6.55 0.0116 0.5733 0.0198 6.93 0.9634 10.72 0.0242 0.7205 13.89 13.24 0.0387 0.9769 0.0334 20,82 0.0614 0.9810 14.27 0.0337 0.7810 20.44 0.8319 27.37 0.0828 0.9828 0.0512 34,58 0.1031 0.9820 28.34 0.0746 0.8628 34.47 41.33 0.1236 0.9825 0.0937 0.8753 48.16 0.1428 0.9816 41.51 0.1142 0.8852 0.1617 55,26 0.9804 48.06 0.1338 0.8897 62.40 0.1811 0.9780 55.57 0.1559 0.8928 0.2011 0.9749 69,98 62.40 0.1776 0.8930 77.50 5.48 0.0125 0.7738 71.02 0.2027 0.8912 0.0213 8.41 0.8592 90.65 9.31 0.0155 0.5431 15.17 12.34 0.0325 0.8951 0.0326 0.6929 12,65 0.0333 0.8978 21.13 0.0503 0.7597 16,55 0.0444 0.9142 28.54 0.0722 0.8017 20.68 0.0576 0.9271 35.09 0.0921 0.8231 27,85 0.0782 0.9386 41.37 0.1112 0.8358 34.44 0.0978 0.9428 48.61 0.1330 0.8450 41.58 0.1187 0.9460 55.40 0.1548 0.8502 48.33 0.1288 0.9464 62.50 0.1772 0.8514 0.1591 55,40 0.9456 69.46 0.2000 0.8512 62.05 0.1793 0.9444 100.78 21.93 0.0406 0.5291 69,22 0.1991 0.9418 30.58 0.6186 0.0674 86.19 4,48 0.0055 0.3957 43.78 0.1110 0.6878 AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: Recirculating vapor flow apparatus No details given. with magnetic pump at ambient temperature. Samples analysed by thermal conductivity. Temperature measured with platinum resistance thermometer. Pressure measured using Bourdon gauge. Details in source. ESTIMATED ERROR:  $\delta T/K = \pm 0.01$  except at 66.13K;  $\delta T/K =$  $\pm 0.02$  at 66.13K;  $\delta P/bar = \pm 0.01$ ;  $\delta x_{\rm Ne} = \pm 0.0002$  to 0.0004; <sup>δy</sup>Ne <sup>−</sup> ±0.002. **REFERENCES:** 

| COMPONI | ENTS:  |  |  | ORIGIN           | IAL MEA   | SUREMENTS:   |  |
|---------|--|--|--|------------------|---|--|--|
|         |  | : 7440-01-9<br>: N <sub>2</sub> ; 7727-37                                    | 7-9  | Street<br>27.    | zt, W.  | B., Cryogeni   | cs, <u>1965</u> , 5,                                     |
| EXPERIM | ENTAL V  | ALUES:   | <u> </u>   |                  |   |  |  |
| с/к     | P/bar  | Mole fractio<br>in liquid,<br><sup>x</sup> Ne                                |  | т/к              | P/bar   | Mole fracti<br>in liquid,<br><sup>x</sup> Ne                       |  |
| .00.78  | 53.71<br>63.30<br>68.71<br>24.13<br>32.96<br>40.33                   | 0.1439<br>0.1768<br>0.1975<br>0.0330<br>0.0619<br>0.0884                     | 0.7100<br>0.7217<br>0.7207<br>0.3153<br>0.4338<br>0.4892           | 114.34<br>117.61 | 28.27<br>35.06<br>41.99<br>48.13<br>58.47                   | 0.2055<br>0.0218<br>0.0483<br>0.0776<br>0.1055<br>0.1622           | 0.4227<br>0.1242<br>0.2156<br>0.2766<br>0.3086<br>0.3294 |
| .14.34  | 47.44<br>52.92<br>69.57<br>22.58<br>28.96<br>33.75<br>43.60<br>54.95 | 0.1105<br>0.1512<br>0.2033<br>0.0134<br>0.0354<br>0.0528<br>0.0914<br>0.1394 | 0.5242<br>0.5538<br>0.5630<br>0.1123<br>0.2313<br>0.2930<br>0.3747 | 120.64           | 61.02<br>63.09<br>66.88<br>32.44<br>39.68<br>46.54<br>53.30 | 0.1755<br>0.1962<br>0.2655<br>0.0257<br>0.0578<br>0.0987<br>0.1448 | 0.3269<br>0.2703<br>0.1016<br>0.1748<br>0.2073<br>0.2138 |
|         |  |  |  | <u> </u>         |   |  |  |
|         |  |  |  |                  |   |  |  |
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|         |  |  |  |                  |   |  |  |
|         |  |  |  |                  |   |  |  |

| COMPONI | ENTS:                              | EVALUATOR:                |
|---------|------------------------------------|---------------------------|
| 1.      | Neon; Ne; 7440-01-9                | Colin Young,              |
|         |                                    | School of Chemistry,      |
| 2.      | Oxygen; O <sub>2</sub> ; 7782-44-7 | University of Melbourne,  |
|         |                                    | Parkville, Victoria 3052, |
|         |                                    | AUSTRALIA.                |

## CRITICAL EVALUATION:

This system has been studied by Streett and Jones (1) and Skripka and coworkers (2,3). The study by Skripka and Dykhno (2) was over a limited range of pressure (up to 25 bar) and is probably of lower accuracy than the more recent work by Skripka and Lobonova (3). The data of Skripka and Lobonova (3) are only in fair agreement with the data of Streett and Jones (1). The solubility of neon reported by Skripka and Lobonova is generally greater than that reported by Jones and Streett (1) except at pressures below 50 bar where the opposite is usually true. Therefore the data of both Streett and Jones (1) and Skripka and Lobonova (3) are classified as tentative and that of Skripka and Dykhno (2) as doubtful.

## References

- 1. Streett, W. B. and Jones, C. H., Adv. Cryog. Engng., <u>1965</u>, 11, 356.
- Skripka, V. G. and Dykhno, N. M., Trudy Vses. Nauch.-Issled. Inst. Kislorodn. Mashinostr., <u>1964</u>, no. 8, 163.
- Skripka, V. G. and Lobonova, N. N., Trudy Vses. Nauch.-Issled. Inst. Kriog. Mashinostr., <u>1971</u>, no. 13, 90.

| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |
|--|---|--|--|
| COMPONENTS:  | ORIGINAL MEASUREMENTS:  |  |  |
| (1) Neon; Ne; 7440-01-9<br>(2) Oxygen; $O_2$ ; 7782-44-7   | Skripka, V. G. and Dykhno, N. M.,<br>Trudy Vses. NauchIssled. Inst.<br>Kriog. Mashinostr., 1964, 8, 163.  |  |  |
|  |   |  |  |
| VARIABLES:   | PREPARED BY:  |  |  |
| Temperature, pressure  | C. L. Young   |  |  |
| EXPERIMENTAL VALUES:   | Mole fraction of neon   |  |  |
| T/K P/bar P <sup>+</sup> /bar  | in liquid, x <sub>Ne</sub> in vapor, y <sub>Ne</sub>  |  |  |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$  | 0.00398 0.9940<br>0.00744 0.9961<br>0.01088 0.9966<br>0.01403 0.9967<br>0.01741 0.9968  |  |  |
| 72.0 6.06 5.88<br>11.12 11.03<br>16.18 16.10<br>21.25 21.17  | 0.0041 0.9837<br>0.0078 0.9898<br>0.0112 0.9919<br>0.0146 0.9927  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | 0.0183       0.9932         0.0042       0.9606         0.0080       0.9755         0.0115       0.9814         0.0153       0.9858         0.0194       0.9872   |  |  |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$  | 0.0044<br>0.0086<br>0.9477<br>0.0128<br>0.9611<br>0.0169<br>0.9685<br>0.0207<br>0.9724  |  |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | 0.0046<br>0.8045<br>0.0092<br>0.8881<br>0.0140<br>0.9198<br>0.0183<br>0.9348<br>0.0226<br>0.9431  |  |  |
| P <sup>+</sup> partial pressure of neon  |   |  |  |
| AUXILIARY  | INFORMATION   |  |  |
| METHOD/APPARATUS/PROCEDURE:  | SOURCE AND PURITY OF MATERIALS:   |  |  |
| Vapor flow apparatus with magnetic<br>recirculating pump. Temperature<br>measured with platinum resistance<br>thermometer, pressure measured with<br>Bourdon gauge. Samples of gas and<br>liquid analysed by gas phase inter-<br>ferometry. Details in source. | <ol> <li>High purity sample, purity<br/>99.69 mole per cent;<br/>impurities helium and nitrogen.</li> <li>Purity 99.5 mole per cent or<br/>better; major impurities<br/>argon and water vapor.</li> </ol>           |  |  |
|  | ESTIMATED ERROR:<br>$\delta T/K = \pm 0.02 \text{ to } 0.03;  \delta P \text{ less than}$<br>$0.2 \text{ bar;}  \delta x_{\text{Ne}} \simeq \delta y_{\text{Ne}} = \pm 0.0001 \text{ to}$<br>0.0002.<br>REFERENCES: |  |  |
|  |   |  |  |

| COMPONEN   | NTS:   | ······   | <u></u>  | ORIGINAL                     | MEASUREME  | NTS:  |  |  |
|--|--|--|--|------------------------------|--|---|--|--|
| (1) Neon; Ne; 7440-01-9                                  |  |  |  |                              | Streett, W. B. and Jones, C. H.,   |   |  |  |
| (2) Oxygen; O <sub>2</sub> ; 7782-44-7                   |  |  |  | Adv. C                       | ryog. Eng  | ng., <u>1965</u> ,  | 11, 356.   |  |
| VARIABL  | ES:  |  | <u></u>  | PREPAREI                     | ) BY:  |   |  |  |
| Temper   | ature, p   | ressure  |  | С. L.                        | Young  |   |  |  |
| EXPERIM  | ENTAL VALUE  | S:   |  | _!                           |  |   | <u></u>  |  |
| т/к  |  | Mole fractic<br>in liquid,<br><sup>x</sup> Ne  | on of neon<br>in vapor,<br><sup>Y</sup> Ne   | Т/К                          |  | lole fractio<br>n liquid,<br><sup>x</sup> Ne  | on of neon<br>in vapor,<br><sup>y</sup> Ne   |  |
| 63.35  | 2.76<br>6.86<br>13.76<br>20.82<br>27.30<br>34.44<br>39.78<br>47.61<br>62.95<br>3.45<br>6.96<br>13.72<br>20.68<br>27.51<br>34.06<br>34.37<br>42.89<br>54.88<br>69.50<br>103.1<br>138.9<br>206.5<br>278.5<br>343.7 | 0.0016<br>0.0041<br>0.0078<br>0.0137<br>0.0154<br>0.0212<br>0.0232<br>0.0278<br>0.0295<br>0.0334<br>0.0029<br>0.0056<br>0.0109<br>0.0160<br>0.0216<br>0.0216<br>0.0257<br>0.0321<br>0.0491<br>0.0668<br>0.0822<br>0.1046<br>0.1228<br>0.1359<br>0.1359 | 0.9947<br>0.9977<br>0.9987<br>0.9987<br>0.9988<br>0.9990<br>0.9988<br>0.9985<br>0.9985<br>0.9984<br>0.9977<br>0.9345<br>0.9652<br>0.9802<br>0.9843<br>0.9865<br>0.9873<br>0.9864<br>0.9878<br>0.9866<br>0.9878<br>0.9878<br>0.9866<br>0.9878<br>0.9888<br>0.9878<br>0.9886<br>0.9878<br>0.9885<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9866<br>0.9852<br>0.9878<br>0.9865<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9852<br>0.9878<br>0.9866<br>0.9878<br>0.9866<br>0.9878<br>0.9866<br>0.9878<br>0.9866<br>0.9878<br>0.9866<br>0.9878<br>0.9866<br>0.9878<br>0.98778<br>0.9865<br>0.98778<br>0.9866<br>0.98778<br>0.98778<br>0.9878<br>0.9866<br>0.98778<br>0.98778<br>0.9866<br>0.98778<br>0.9866<br>0.98778<br>0.98778<br>0.98778<br>0.9866<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.98778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.99778<br>0.997788<br>0.997788<br>0.99778<br>0.99778<br>0.99778<br>0.997788<br>0.997788<br>0.99778 | 89.44<br>89.17<br>101.46     | $\begin{array}{c} 2.76\\ 7.10\\ 13.98\\ 20.79\\ 27.68\\ 34.34\\ 45.02\\ 61.36\\ 107.2\\ 140.0\\ 171.2\\ 207.8\\ 243.4\\ 274.1\\ 307.9\\ 345.1\\ 2.92\\ 4.34\\ 7.76\\ 13.27\\ 21.30\\ 27.75\\ 34.78\\ 41.71\\ 48.37\end{array}$ | 0.0015<br>0.0058<br>0.0119<br>0.0178<br>0.0241<br>0.0298<br>0.0381<br>0.0501<br>0.0877<br>0.1096<br>0.1291<br>0.1499<br>0.1686<br>0.1841<br>0.1998<br>0.2151<br>0.0000<br>0.015<br>0.0050<br>0.0190<br>0.0190<br>0.0256<br>0.0322<br>0.0386<br>0.0468 | 0.6404<br>0.8550<br>0.9183<br>0.9391<br>0.9494<br>0.9547<br>0.9596<br>0.9634<br>0.9601<br>0.9540<br>0.9461<br>0.9361<br>0.9262<br>0.9177<br>0.9083<br>0.8987<br>0.0000<br>0.3098<br>0.6010<br>0.7493<br>0.8293<br>0.8293<br>0.8789<br>0.8994 |  |
|  |  |  | AUXILIARY  | INFORMAT                     | ION  |   |  |  |
| Recirc<br>with m<br>peratu<br>therma<br>measur<br>thermo | ulating v<br>agnetic p<br>re. Sam<br>l conduct<br>ed with p<br>meter.<br>Bourdon o   | S/PROCEDURE:<br>yapor flow a<br>pump at ambi<br>uples analys<br>ivity. T<br>platinum res<br>Pressure me<br>gauge. Det  | pparatus<br>ent tem-<br>ed by<br>'emperature<br>istance<br>asured  | ESTIMATH<br>δT/K =<br>100 ba | No deta<br>ED ERROR:<br>±0.01;<br>r) = ±0.7  | DF MATERIALS:<br>ils given.<br>$\delta P/bar = \pm 0$<br>(above 100<br>$\phi = 0.002$ :   | 0.1 (up to<br>bar);  |  |
|  |  |  |  | ±0.001<br>REFERENO           | <u>to ±0.00</u><br>CES:  |   | <sup>8y</sup> Ne =   |  |

| COMPONENTS: |                |                               |                              | ORIGINAL MEASUREMENTS: |                 |                               |                              |
|-------------|----------------|-------------------------------|------------------------------|------------------------|-----------------|-------------------------------|------------------------------|
| (1) No      | eon; Ne;       | 7440-01-9                     |                              |                        |                 | and Jones,<br>Engng., 1965,   |                              |
| (2) 0:      | xygen; C       | ) <sub>2</sub> ; 7782-44-7    |                              | Aav. C                 | <i>ryoy</i> . r | <i>ngng.</i> , <u>1965</u> ,  | 11, 330.                     |
|             |                |                               |                              |                        |                 |                               |                              |
| EXPERIM     | ENTAL V        | ALUES:                        |                              | <u>)</u>               |                 |                               |                              |
| m /17       | T) /h a va     | Mole fractio                  |                              | m /12                  | D /h a ra       | Mole fractio                  |                              |
| т/К         | P/bar          | in liquid,<br><sup>x</sup> Ne | in vapor,<br><sup>Y</sup> Ne | т/К                    | P/bar           | in liquid,<br><sup>x</sup> Ne | in vapor,<br><sup>y</sup> Ne |
| 101.46      | 55.43          |                               | 0.9050<br>0.9103             | 102.03                 | 28.75<br>35.37  |                               | 0.5531<br>0.6127             |
|             | 68.81<br>104.8 |                               | 0.9106<br>0.9133             |                        | 42.37           | 0.0415                        | 0.6549                       |
|             | 142.7          | 0.1398                        | 0.9060                       |                        | 56.85           | 0.0608                        | 0.7074                       |
| l           | 183.4<br>207.9 | 0.1801<br>0.2037              | 0.8916<br>0.8793             |                        | 64.19<br>69.50  |                               | 0.7249<br>0.7338             |
|             | 241.3          | 0.2359                        | 0.8620                       |                        | 90.87           | 0.1087                        | 0.7554                       |
|             | 282.0<br>312.3 | 0.2756<br>0.3095              | 0.8374<br>0.8158             |                        | 108.9<br>140.3  | 0.1359<br>0.1850              | 0.7611<br>0.7552             |
| 110.39      | 351.2<br>5.76  | 0.3540                        | 0.7837<br>0.0000             |                        | 176.9<br>209.6  | 0.2533<br>0.3358              | 0.7263                       |
| 110.39      | 6.65           |                               | 0.1447                       |                        | 227.9           | 0.4099                        | 0.6624                       |
|             | 14.10<br>19.88 | 0.0095<br>0.0163              | 0.5525<br>0.6619             | 130.00                 | 19.58<br>32.58  |                               | 0.0757<br>0.3520             |
|             | 27.03          | 0.0240                        | 0.7334                       |                        | 37.82           | 0.0288                        | 0.4128                       |
|             | 35.44<br>41.92 | 0.0324<br>0.0420              | 0.7801<br>0.8022             |                        | 44.47<br>52.37  |                               | 0.4692<br>0.5159             |
|             | 55.74          | 0.0558                        | 0.8296                       |                        | 57.00           | 0.0539                        | 0.5376                       |
|             | 65.83<br>69.64 |                               | 0.8404<br>0.8432             |                        | 64.74<br>83.29  |                               | 0.5648<br>0.6050             |
|             | 108.8<br>140.0 | 0.1210<br>0.1594              | 0.8544<br>0.8484             |                        | 107.6           | 0.1502                        | 0.6227                       |
|             | 172.4          | 0.2008                        | 0.8337                       |                        | 140.4<br>158.9  | 0.2269<br>0.2805              | 0.6064<br>0.5720             |
|             | 209.5<br>245.0 | 0.2522<br>0.3088              | 0.8084<br>0.7730             | 146.36                 | 170.3<br>44.33  |                               | 0.5165<br>0.1190             |
|             | 279.0          | 0.3765                        | 0.7230                       | 140.30                 | 69.36           | 0.0767                        | 0.2697                       |
| 120.03      | 307.5<br>10.31 | 0.4931<br>0.0000              | 0.6420<br>0.0000             |                        | 89.49<br>93.08  |                               | 0,2949<br>0,2830             |
| 120.05      | 12.10          | 0.0023                        | 0.1252                       | 152.29                 | 50.88           | 0.0147                        | 0.0434                       |
|             | 16.31<br>21.48 | 0.0074<br>0.0144              | 0.3106<br>0.4454             |                        | 55.50           | 0.0302                        | 0.0752                       |
|             |                |                               |                              |                        |                 |                               |                              |
|             |                |                               |                              |                        |                 |                               |                              |
|             |                |                               |                              |                        |                 |                               |                              |
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|             |                |                               |                              |                        |                 |                               |                              |
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|             |                |                               |                              |                        |                 |                               |                              |

| COMPONEN                               | TS:   |   |  | ORIGINAL                            | MEASUREME  | ENTS:  |   |
|--|---|---|--|-------------------------------------|--|--|---|
| (1) Neon; Ne; 7440-01-9                |   |   |  | Skripka, V. G. and Lobonova, N. N., |  |  |   |
| (2) Oxygen; O <sub>2</sub> ; 7782-44-7 |   |   |  | Trudy Vses. NauchIssled. Inst.      |  |  |   |
|  |   |   |  |                                     |  | str., 1971,  |   |
|  |   |   |  |                                     |  | ····, <u></u> ,  |   |
| VARIABLE                               | :5 :  | <u> </u>  |  | PREPARED                            | BY:  |  |   |
| Tempera                                | ature, pr   | essure  |  | с. г.                               | Young  |  |   |
| EXPERIME                               | NTAL VALUES   | 3:  |  | l <u></u>                           |  |  | <u></u>   |
| т/к                                    |   | Mole fracti<br>in liquid,<br><sup>x</sup> Ne  |  | т/к                                 | P/bar  | Mole fracti<br>in liquid,<br><sup>x</sup> Ne   | on of neon<br>in vapor,<br><sup>y</sup> Ne  |
| 64.14<br>77.81                         | 9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>98.1<br>107.9<br>117.7<br>127.5<br>137.3<br>147.1<br>156.9<br>166.7<br>176.5<br>186.3<br>196.1<br>205.9<br>9.8<br>19.6<br>29.4<br>39.2 | 0.0035<br>0.0072<br>0.0120<br>0.0220<br>0.0280<br>0.0335<br>0.0390<br>0.0440<br>0.0470<br>0.0500<br>0.0555<br>0.0590<br>0.0620<br>0.0660<br>0.0690<br>0.0720<br>0.0750<br>0.0750<br>0.0790<br>0.0825<br>0.00825<br>0.0130<br>0.0200<br>0.0270 |  | 90.73                               | 49.0<br>58.8<br>68.6<br>78.5<br>88.3<br>98.1<br>107.9<br>117.7<br>129.5<br>137.3<br>147.1<br>156.9<br>166.7<br>176.5<br>186.3<br>196.1<br>205.9<br>9.8<br>19.6<br>29.4<br>39.2<br>49.0<br>58.8<br>68.6<br>78.5 | 0.0340<br>0.0410<br>0.0485<br>0.0570<br>0.0640<br>0.0710<br>0.0770<br>0.0820<br>0.0880<br>0.0940<br>0.0985<br>0.1030<br>0.1125<br>0.1170<br>0.1210<br>0.1240<br>0.0240<br>0.0240<br>0.0330<br>0.0440<br>0.0550<br>0.0665<br>0.0780 | 0.9815<br>0.9815<br>0.9810<br>0.9790<br>0.9770<br>0.9770<br>0.9750<br>0.9730<br>0.9610<br>0.9610<br>0.9610<br>0.9570<br>0.9570<br>0.9550<br>-<br>-<br>-<br>0.9295<br>0.9305<br>0.9375<br>0.9380<br>0.9380 |
|  |   | **************************************  | AUXILIARY  | INFORMAT                            | ION  |  |   |
| METHOD/A                               | PPARATUS,   | PROCEDURE:  | <u></u>  | SOURCE A                            | ND PURITY  | OF MATERIALS:  |   |
| with li<br>gas.<br>interfe<br>with pl  | quid and<br>Samples o<br>rometry.<br>atinum re<br>ssure mea   | of phases a   | urized with<br>nalysed by<br>ure measured<br>nermometer<br>Bourdon | mo.<br>2. Hig                       | le per ce  | y sample; p  | -   |
|  |   |   |  | δт/К =                              | $\delta y_{\rm Ne} = \pm 0$  | $\delta P/\text{bar} = \pm 0$<br>0.002.  | . 4 ;   |

| <pre>(1) Neon; Ne; 7440-01-9 (2) Oxygen; O<sub>2</sub>; 7782-44-7 EXPERIMENTAL VALUES:  T/K P/bar in liquid, in va</pre>  |  |
|---|--|
| Mole fraction of nT/KP/barin liquid, in va $x_{Ne}$ $y_N$ 90.7388.30.08950.93795.10.09950.935107.90.11000.933117.70.12000.931129.50.13000.929137.30.14000.926147.10.15100.922156.90.16250.918   |  |
| T/K P/bar in liquid, in va<br><sup>x</sup> Ne <sup>y</sup> N<br>90.73 88.3 0.0895 0.937<br>95.1 0.0995 0.935<br>107.9 0.1100 0.933<br>117.7 0.1200 0.931<br>129.5 0.1300 0.929<br>137.3 0.1400 0.926<br>147.1 0.1510 0.922<br>156.9 0.1625 0.918  |  |
| 99.1         0.0995         0.935           107.9         0.1100         0.933           117.7         0.1200         0.931           129.5         0.1300         0.929           137.3         0.1400         0.926           147.1         0.1510         0.922           156.9         0.1625         0.918 |  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ |

## SYSTEM INDEX

Underlined page numbers refer to the start of the evaluation text and those not underlined to the start of the compiled tables for that system. The compounds are listed in the order as in the Chemical Abstract indexes, for example toluene is listed as benzene, methyl- and dimethylsulfoxide is listed as methane, sulfinylbis-.

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