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SOLUBILITY DATA SERIES

Volume 61

ALKALI METAL AND AMMONIUM PERCHLORATES PART I: LITHIUM AND SODIUM PERCHLORATES

SOLUBILITY DATA SERIES

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ALKALI METAL AND AMMONIUM PERCHLORATES PART I: LITHIUM AND SODIUM PERCHLORATES

Volume Editors

Chee-Yan Chan University of Malaya Kuala Lumpur, Malaysia

Elena S. Gryzlova Kurnakov Institute of General & Inorganic Chemistry Moscow, Russia Kean H. Khoo University of Brunei Brunei Darussalam

Marie-Thérèse Saugier-Cohen Adad Université Claude Bernard-Lyon I Villeurbanne, France

Contributors (*Evaluators)

I. S. Bodnya Kurnakov Institute of General & Inorganic Chemistry, Moscow, Russia

Elena S. Gryzlova* Kurnakov Institute of General & Inorganic Chemistry, Moscow, Russia

N. A. Kozyreva (N. A. Vasina) Kurnakov Institute of General & Inorganic Chemistry, Moscow, Russia Chee-Yan Chan* University of Malaya Kuala Lumpur, Malaysia

Chee-Cheong Ho University of Malaya Kuala Lumpur, Malaysia

Ivan N. Lepeshkov† Kurnakov Institute of General & Inorganic Chemistry, Moscow, Russia Roger Cohen-Adad* Université Claude Bernard-Lyon I Villeurbanne, France

> Kean H. Khoo University of Brunei Brunei Darussalam

Wee-Lam Ng University of Malaya Kuala Lumpur, Malaysia

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OBITUARY: IVAN NIKONOVICH LEPESHKOV

Ivan Nikonovich Lepeshkov, Professor of Inorganic Chemistry in the Kurnakov Institute of General and Inorganic Chemistry, Russian Academy of Sciences, died on January 30, 1993 in Moscow. His sudden passing after a brief illness came as a great shock to his friends and colleagues.

Prof. Lepeshkov was born into a peasant family on January 15, 1907 in a small village near Smolensk. His early education began in a village school and continued into secondary school in Smolensk. In 1930 he was graduated from the University of Smolensk with a degree in chemistry. The following year he pursued post-graduate studies under the tutelage of Academician N.S. Kurnakov in the Laboratory of General Chemistry in Leningrad (St Petersburg). His thesis for a Candidate's Degree was on the crystallization of natural salts found in the Inder Lake (Kazakhstan) and was completed in 1935 and submitted to the faculty of the Institute of General and Inorganic Chemistry in Moscow (the Chemical Laboratories of the Academy of Sciences in Leningrad was moved to Moscow in 1934). Prof. Kurnakov became the director of this new institute and Prof. Lepeshkov was appointed Professor of Inorganic Chemistry at this same institute in 1943.

Prof. Lepeshkov spent the whole of his active life at the Institute of General and Inorganic Chemistry. He was Head of the Laboratory of Chemistry and Technology of Natural Salts for more than 40 years, and at the time of the Second World War was promoted to Vice-Director of the institute. At this time he also served as chief of the Division of Physico-Chemical Analysis. He participated in numerous scientific expeditions in the Central Asian Republics, Volga-Ural regions and Siberia. Prof. Lepeshkov and his colleagues discovered industrial deposits of bishoffite in the Volvograd Region, and he was active in the solution of the problems connected with Lake Kara-Bugas, and his solutions are presently accepted as the most practical.

Prof. Lepeshkov is best known for his extensive and numerous studies on water-salt equilibria which found important applications in geochemical and chemical engineering aspects of prospecting and processing of salt deposits. He contributed to chemical technology and production of fertilizers, antifreeze formulations and electronic materials. The results of these studies were published in more than 400 papers and several books. He exerted strong influence on the formation and development of inorganic chemistry in Kazakhstan, Kirgizia, Turkmenistan and Kabardino-Balkaria where he helped organize the research groups and Laboratories on Natural Salt Chemistry. Prof Lepeshkov continually stressed the fundamental ideas of his teacher, Prof. Kurnakov, on the principles of physico-chemical analysis, and from amongst his more than fifty students, a number have become professors and members of the Academy of Sciences of the Central Asia Republics.

Prof. Lepeshkov's international activities began in the 1950s when he established contacts with German chemists in the former DDR. He visited China, Bulgaria, Spain and other countries. His most fruitfull cooperation was between his laboratory and the Chemical Division of the Freiberg Bergakademie in Germany and the Laboratory of Inorganic Salts of the Bulgarian Academy of Sciences in Sofia. During the last years of his life Prof. Lepeshkov participated in the IUPAC Solubility Data Project and became a close colleague of many members of IUPAC Commission V.8. At he invitation of Prof. A.S. Kertes (founder of the Solubility Data Project and Chairman of Commission V.8 until shortly before his untimely death in 1988), Prof. Lepeshkov became the first Russian chemist to participate in this international project. His first volume on Alkaline Earth Metal Perchlorates, co-edited with Profs C.-Y. Chan and K.H. Khoo from the University of Malaysia, was published as volume 41 in 1989, and this second volume on the solubilities of perchlorates is dedicated to his memory.

Prof. Lepeshkov will be missed by all who knew him. His work and science lives on and we are indeed richer for his contributions and for his friendship.

V.L. Valyashko and V. Danilov

INTRODUCTION TO THE SOLUBILITY DATA SERIES

SOLUBILITY OF SOLIDS IN LIQUIDS

NATURE OF THE PROJECT

The Solubility Data project (SDP) has as its aim a comprehensive review of published data for solubilities of gases, liquids and solids in liquids or solids. Data of suitable precision are compiled for each publication on data sheets in a uniform format. The data for each system are evaluated and, where data from independent sources agree sufficiently, recommended values are proposed. The evaluation sheets, recommended values, and compiled data sheets are published on consecutive pages.

COMPILATIONS AND EVALUATIONS

The formats for the compilations and critical evaluations have been standardized for all volumes. A description of these formats follows.

Compilations

The format used for the compilations is, for the most part, self-explanatory. Normally, a compilation sheet is divided into boxes, with detailed contents described below.

Components: Each component is listed according to IUPAC name, formula, and Chemical Abstracts (CA) Registry Number. The Chemical Abstracts name is also included if this differs from the IUPAC name, as are trivial names if appropriate. IUPAC and common names are cross-referenced to Chemical Abstracts names in the System Index.

The formula is given either in terms of the IUPAC or Hill (1) system and the choice of formula is governed by what is usual for most current users: i.e., IUPAC for inorganic compounds, and Hill system for organic compounds. Components are ordered on a given compilation sheet according to:

- (a) saturating components:
- (b) non-saturating components;
- (c) solvents.

In each of (a), (b) or (c), the components are arranged in order according to the IUPAC 18column periodic table with two additional rows:

Columns 1 and 2:	H, alkali elements, ammonium, alkaline earth elements
Columns 3 to 12:	transition elements
Columns 13 to 17:	boron, carbon, nitrogen groups; chalcogenides, halogens
Column 18:	noble gases
Row 1:	Ce to Lu
Row 2:	Th to the end of the known elements, in order of atomic nu

Row 2: Th to the end of the known elements, in order of atomic number. The same order is followed in arranging the compilation sheets within a given volume.

Original Measurements: References are abbreviated in the forms given by Chemical Abstracts Service Source Index (CASSI). Names originally in other than Roman alphabets are given as transliterated by Chemical Abstracts. In the case of multiple entries (for example, translations) an asterisk indicates the publication used for compilation of the data.

Variables: Ranges of temperature, pressure, etc. are indicated here.

Prepared by: The names of all compilers are given here.

Experimental Values: Components are described as (1), (2), etc., as defined in the "Components" box. Data are reported in the units used in the original publication, with the exception that modern names for units and quantities are used; e.g., mass per cent for weight per cent; mol dm³ for molar; etc. Usually, only one type of value (e.g., mass per cent) is found in the original paper, and the compiler has added the other type of value (e.g., mole per cent) from computer calculations based on 1989 atomic weights (2). Temperatures are expressed as $t/^{\circ}C$, $t/^{\circ}F$ or T/K as in the original; if necessary, conversions to T/K are made, sometimes in the compilations and always in the critical evaluation. However, the author's units are expressed according to IUPAC recommendations (3) as far as possible.

Errors in calculations, fitting equations, etc. are noted, and where possible corrected. Material inserted by the compiler is identified by the word "compiler" or by the compiler's name in parentheses or in a footnote. In addition, compiler-calculated values of mole or mass fractions are included if the original data do not use these units. If densities are reported in the original paper,

conversions from concentrations to mole fractions are included, but otherwise this is done in the evaluation, with the values and sources of the densities being quoted and referenced.

Details of smoothing equations (with limits) are included if they are present in the original publication and if the temperature or pressure ranges are wide enough to justify this procedure and if the compiler finds that the equations are consistent with the data.

The precision of the original data is preserved when derived quantities are calculated, if necessary by the inclusion of one additional significant figure. In some cases, compilers note that numerical data have been obtained from published graphs using digitizing techniques. In these cases, the precision of the data can be determined by the quality of the original graph and the limitations of the digitizing technique. In some cases graphs have been included, either to illustrate data more clearly, or if this is the only information in the original. Full grids are not usually inserted as it is not intended that users should read data from the graphs.

Method: The apparatus and procedure are mentioned briefly. Abbreviations used in Chemical Abstracts are often used here to save space, reference being made to sources of further detail if these are cited in the original paper.

Source and Purity of Materials: For each component, referred to as (1), (2), etc., the following information (in this order and in abbreviated form) is provided if available in the original paper: source and specified method of preparation; properties; degree of purity.

Estimated Error: If estimated errors were omitted by the original authors, and if relevant information is available, the compilers have attempted to estimate errors (identified by "compiler" or the compiler's name in parentheses or in a footnote) from the internal consistency of data and type of apparatus used. Methods used by the compilers for estimating and reporting errors are based on Ku and Eisenhart (4).

Comments and/or Additional Data: Many compilations include this section which provides short comments relevant to the general nature of the work or additional experimental and thermodynamic data which are judged by the compiler to be of value to the reader.

References: The format for these follows the format for the Original Measurements box, except that final page numbers are omitted. References (usually cited in the original paper) are given where relevant to interpretation of the compiled data, or where cross-reference can be made to other compilations.

Evaluations

The evaluator's task is to assess the reliability and quality of the data, to estimate errors where necessary, and to recommend "best" values. The evaluation takes the form of a summary in which all the data supplied by the compiler have been critically reviewed. There are only three boxes on a typical evaluation sheet, and these are described below.

Components: The format is the same as on the Compilation sheets.

Evaluator: The name and affiliation of the evaluator(s) and date up to which the literature was checked.

Critical Evaluation:

(a) Critical text. The evaluator checks that the compiled data are correct, assesses their reliability and quality, estimates errors where necessary, and recommends numerical values based on all the published data (including theses, patents and reports) for each given system. Thus, the evaluator reviews the merits or shortcomings of the various data. Only published data are considered. Documented rejection of some published data may occur at this stage, and the corresponding compilations may be removed.

The solubility of comparatively few systems is known with sufficient accuracy to enable a set of recommended values to be presented. Although many systems have been studied by at least two workers, the range of temperatures is often sufficiently different to make meaningful comparison impossible.

Occasionally, it is not clear why two groups of workers obtained very different but internally consistent sets of results at the same temperature, although both sets of results were obtained by reliable methods. In such cases, a definitive assessment may not be possible. In some cases, two or more sets of data have been classified as tentative even though the sets are mutually inconsistent.

(b) Fitting equations. If the use of a smoothing equation is justifiable the evaluator may provide an equation representing the solubility as a function of the variables reported on all the compilation sheets, stating the limits within which it should be used.

- (c) Graphical summary. In addition to (b) above, graphical summaries are often given.
- (d) Recommended values. Data are recommended if the results of at least two independent

groups are available and they are in good agreement, and if the evaluator has no doubt as to the adequacy and reliability of the applied experimental and computational procedures. Data are reported as tentative if only one set of measurements is available, or if the evaluator considers some aspect of the computational or experimental method as mildly undesirable but estimates that it should cause only minor errors. Data are considered as doubtful if the evaluator considers some aspect of the computational or experimental method as undesirable but still considers the data to have some value where the order of magnitude of the solubility is needed. Data determined by an inadequate method or under ill-defined conditions are rejected. However, references to these data are included in the evaluation together with a comment by the evaluator as to the reason for their rejection.

(e) References. All pertinent references are given here, including all those publications appearing in the accompanying compilation sheets and those which, by virtue of their poor precision, have been rejected and not compiled.

(f) Units. While the original data may be reported in the units used by the investigators, the final recommended values are reported in SI units (3) when the data can be converted accurately.

QUANTITIES AND UNITS USED IN COMPILATION AND EVALUATION OF SOLUBILITY DATA

Mixtures, Solutions and Solubilities

A mixture (5) describes a gaseous, liquid or solid phase containing more than one substance, where the substances are all treated in the same way.

A solution (5) describes a liquid or solid phase containing more than one substance, when for convenience one of the substances, which is called the *solvent*, and may itself be a mixture, is treated differently than the other substances, which are called *solutes*. If the sum of the mole fractions of the solutes is small compared to unity, the solution is called a *dilute solution*.

The solubility of a solute 1 (solid, liquid or gas) is the analytical composition of a saturated solution, expressed in terms of the proportion of the designated solute in a designated solvent (6).

"Saturated" implies equilibrium with respect to the processes of dissolution and precipitation; the equilibrium may be stable or metastable. The solubility of a substance in metastable equilibrium is usually greater than that of the same substance in stable equilibrium. (Strictly speaking, it is the activity of the substance in metastable equilibrium that is greater.) Care must be taken to distinguish true metastability from supersaturation, where equilibrium does not exist.

Either point of view, mixture or solution, may be taken in describing solubility. The two points of view find their expression in the reference states used for definition of activities, activity coefficients and osmotic coefficients.

Note that the composition of a saturated mixture (or solution) can be described in terms of any suitable set of thermodynamic components. Thus, the solubility of a salt hydrate in water is usually given as the relative proportions of anhydrous salt in solution, rather then the relative proportions of hydrated salt and water.

Physicochemical Quantities and Units

Solubilities of solids have been the subject of research for a long time, and have been expressed in a great many ways, as described below. In each case, specification of the temperature and either partial or total pressure of the saturating gaseous component is necessary. The nomenclature and units follow, where possible, ref. (3)

A note on nomenclature. The nomenclature of the IUPAC Green Book (3) calls the solute component B and the solvent component A. In compilations and evaluations, the first-named component (component 1) is the solute, and the second (component 2 for a two-component system) is the solvent. The reader should bear these distinctions in nomenclature in mind when comparing equations given here with those in the Green Book.

1. Mole fraction of substance 1, x_1 or x(1) for condensed phases, y_1 for gaseous phases:

$$x_1 = n_1 / \sum_{s=1}^{c} n_s$$
 [1]

where n_s is the amount of substance of s, and c is the number of distinct substances present (often

the number of thermodynamic components in the system). Mole per cent of substance 1 is 100 x_1 .

2. Ionic mole fractions of salt i, x_{i+} , x_{i-} :

For a mixture of s binary salts i, each of which ionizes completely into v_{i+} cations and v_{i-} anions, with $v_i = v_{+i} + v_{-i}$ and a mixture of p non-electrolytes k, of which some may be considered as solvent components, a generalization of the definition in (7) gives:

$$x_{+i} = \frac{v_{+i}x_i}{1 + \sum_{j=1}^{s} (v_j - 1)x_j}, \quad x_{-i} = \frac{v_{-i}x_{+i}}{v_{+i}} \quad i = 1...s$$
[2]

$$x_{k}^{\prime} = \frac{x_{k}}{1 + \sum_{j=1}^{s} (v_{j} - 1) x_{j}}, \quad k = (s+1), \dots, (s+p)$$
[3]

The sum of these mole fractions is unity, so that, with c = s + p,

$$\sum_{i=1}^{s} (x_{*i} + x_{-i}) + \sum_{i=s+1}^{c} x_{i}^{\prime} = 1$$
 [4]

General conversions to other units in multicomponent systems are complicated. For a threecomponent system containing non-electrolyte 1, electrolyte 2 and solvent 3,

$$x_{1} = \frac{v_{\star 2} x_{1}'}{v_{\star 2} - (v_{2} - 1) x_{\star 2}} \qquad x_{2} = \frac{x_{\star 2}}{v_{\star 2} - (v_{2} - 1) x_{\star 2}}$$
[5]

These relations are used in solubility equations for salts, and for tabulation of salt effects on solubilities of gases.

3. Mass fraction of substance 1, w_1 or w(1):

$$w_1 = g_1 / \sum_{s=1}^{c} g_s$$
 [6]

where g_s is the mass of substance s. Mass per cent of substance 1 is 100 w_1 . The equivalent terms weight fraction, weight per cent and g (1)/100 g solution are no longer used.

4. Solute mole fraction of substance 1, $x_{s,1}$:

$$x_{s,1} = m_1 / \sum_{i=1}^{s} m_i = x_1 / \sum_{i=1}^{s} x_i$$
^[7]

where c is the number of solutes in the mixture. These quantities are sometimes called Jänecke mole (mass) fractions (8, 9). Solute mass fraction of substance 1, $w_{s,1}$, is defined analogously.

5. Solvent mole fraction of substance 1, $x_{v,1}$:

$$x_{\nu,1} = x_1 / \sum_{i=s+1}^{c} x_i$$
 [8]

Here, p is the number of solvent components in the mixture. Solvent mass fraction of substance 1, $w_{v,1}$, is defined analogously.

6. Molality of solute 1 in a solvent 2, m_1 :

$$m_1 = n_1/n_2 M_2$$
 [9]

SI base units: mol kg⁻¹. Here, M_2 is the molar mass of the solvent.

7. Aquamolality, Solvomolality of substance 1 in a mixed solvent with components 2, 3 (10), $m_1^{(3)}$:

$$m_1^{(3)} = m_1 \overline{M}/M_3$$
^[10]

SI base units: mol kg⁻¹. Here, the average molar mass of the solvent is

$$\overline{M} = x_{\nu,2}M_2 + (1 - x_{\nu,2})M_3$$
[11]

and $x_{v,2}$ is the solvent mole fraction of component 2. This term is used most frequently in discussing comparative solubilities in water (component 2) and heavy water (component 3) and in their mixtures.

8. Amount concentration of solute 1 in a solution of volume V, c_1 :

 $c_1 = [\text{formula of solute 1}] = n_1/V$ [12]

SI base units: mol m⁻³. The symbol c_1 is preferred to [formula of solute 1], but both are used. The old terms molarity, molar and moles per unit volume are no longer used.

9. Mass concentration of solute 1 in a solution of volume V, ρ_1 :

$$\rho_1 = g_1 / V = c_1 M_1 / V$$
 [13]

SI base units: kg m⁻³.

10. Mole ratio, $r_{1,2}$ (dimensionless) (11):

 $r_{1,2} = n_1 / n_2$ [14]

Mass ratio, symbol $\zeta_{1,2}$, may be defined analogously (11).

11. Partial pressure, $p_1 = y_1 p$ for substance 1, where y_1 is the mole fraction of 1 in the vapor phase and p is the total pressure. SI units: Pa; common units: mmHg, Torr. 1 mmHg and 1 Torr differ slightly in definition (3), but are identical numaerically to better than 2×10^{-7} Torr.

12. Ionic strength, I_m (molality basis), or I_c (concentration basis):

$$I_{m} = \frac{1}{2} \sum_{i} m_{i} z_{i}^{2}, \quad I_{c} = \frac{1}{2} \sum_{i} c_{i} z_{i}^{2}$$
[15]

where z_i is the charge number of ion i. While these quantities are not used generally to express solubilities, they are used to express the compositions of non-saturating components. For a single salt i with ions of charge numbers z_+ , z_- ,

$$I_{m} = |z_{z}| vm_{i}, \quad I_{c} = |z_{z}| vc_{i}$$
[16]

Mole and mass fractions and mole ratios are appropriate to either the mixture or the solution point of view. The other quantities are appropriate to the solution point of view only. Conversions between pairs of these quantities can be carried out using the equations given in Table 1 at the end of this Introduction. Other useful quantities will be defined in the prefaces to individual volumes or on specific data sheets. Salt hydrates are generally not considered to be saturating components since most solubilities are expressed in terms of the anhydrous salt. The existence of hydrates or solvates is noted carefully the critical evaluation.

Mineralogical names are also quoted, along with their CA Registry Numbers, again usually in in the text, and CA Registry Numbers (where available) are given usually in the critical evaluation.

In addition to the quantities defined above, the following are useful in conversions between concentrations and other quantities.

13. Density, ρ:

$$\rho = g/V = \sum_{i=1}^{c} \rho_i$$
[17]

SI base units: kg m⁻³. Here g is the total mass of the system.

14. Relative density, $d = \rho/\rho^{\circ}$: the ratio of the density of a mixture at temperature *t*, pressure *p* to the density of a reference substance at temperature *t'*, pressure *p'*. For liquid solutions, the reference substance is often water at 4°C, 1 bar. (In some cases 1 atm is used instead of 1 bar.) The term specific gravity is no longer used.

Thermodynamics of Solubility

Thermodynamic analysis of solubility phenomena provides a rational basis for the construction of functions to represent solubility data, and thus aids in evaluation, and sometimes enables thermodynamic quantities to be extracted. Both these aims are often difficult to achieve because of a lack of experimental or theoretical activity coefficients. Where thermodynamic quantities can be found, they are not evaluated critically, since this task would involve examination of a large body of data that is not directly relevant to solubility. Where possible, procedures for evaluation are based on established thermodynamic methods. Specific procedures used in a particular volume will be described in the Preface to that volume.

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R. Cohen-Adad Villeurbanne, France J.W. Lorimer London, Ont., Canada

M. Salomon Sea Bright, NJ, USA M.-T. Saugier-Cohen Adad Villeurbanne, France

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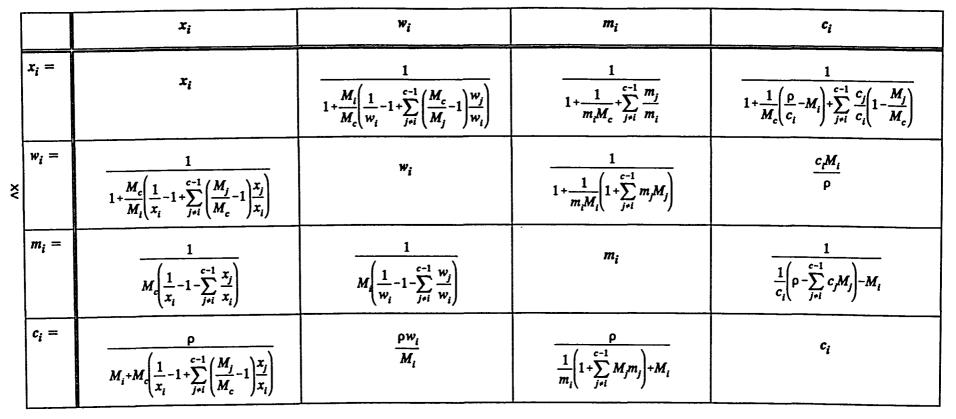


Table 1. Interconversions between Quantities Used as Measures of Solubility c-component Systems Containing c - 1 Solutes i and Single Solvent c

 ρ - density of solution; M_i - molar masses of i. For relations for 2-component systems, set summations to 0.

PREFACE

The compilation and evaluation work on solubility data for alkali metal and ammonium perchlorates in aqueous, non-aqueous and mixed solvents resulted in two volumes which have been prepared in accordance with the objectives and format guidelines of the IUPAC Solubility Data Series. The first of these volumes, Part I, covers solubility data for lithium and sodium perchlorates and Part II, the second volume, covers those for potassium, rubidium, cesium and ammonium perchlorates.

The first comprehensive review, and probably the only one of its kind available, on the manufacture, properties, uses and analytical chemistry of perchloric acid, its salts and derivative compounds appeared as an excellent monograph edited by Schumacher (6) in 1960. It also included a brief account of the history and manufacture of perchloric acid and its salts. Potassium perchlorate was the first salt of perchloric acid to be prepared. Its discovery, together with the preparation of perchloric acid, was reported by von Stadion (1) as early as 1816. During the period between 1816 and 1831 the term "oxychlorate" was used to describe salts of perchloric acid. Serullas (2), who reported in 1830 another method of perchloric acid preparation and also the preparation of ammonium perchlorate and most of the more common inorganic metal perchlorates, helped to popularise the use of the term "perchlorate", which has been the preferred term since then. The main industrial and patent interests in the alkali metal and ammonium perchlorates appear to lie in the use of both potassium perchlorate and ammonium perchlorate in the manufacture of explosives and solid rocket propellants, in the use of lithium perchlorate as battery electrolyte, and in the use of sodium perchlorate as starting material in the manufacture of ammonium perchlorate and other perchlorates. Rubidium and cesium perchlorate attract relatively little commercial interest.

The unusual stability of the perchlorate ion is well-known but so is its ability to act as a powerful oxidant which can react explosively with organic materials (6). The alkali metal perchlorates together with ammonium perchlorate form an interesting group in that the lithium and sodium salts are very soluble in water and are hydrated while the potassium, rubidium, cesium and ammonium salts are unhydrated and have low solubilities. Lithium and sodium perchlorates are also much more soluble in alcohols and other non-aqueous solventshan the potassium, rubidium, cesium and ammonium, cesium and ammonium salts. All of them exist as colourless crystalline solids. Reliable solubility data for these perchlorates in water, alcohols (continued)

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and other solvents were first published in 1923 by Willard and Smith (4). After that, up until the 1960's, more interest appeared to be focused on the solubility systems of potassium perchlorate in both aqueous and non-aqueous solvents than those of other perchlorates. The period between 1960 and 1980 saw prolific publication of solubility data on ammonium, alkali metal and alkaline earth metal perchlorates in binary and multi-component systems in aqueous, non-aqueous and mixed solvents. The majority of such work was carried out in the Commonwealth of Independent States (formerly USSR) and found only in Russian publications. After 1980 much fewer reports of solubility data for these perchlorates were found.

The primary sources used in the literature survey for relevant information were *Chemical Abstracts* from 1907 to 1990 and the volumes on *Solubilities of Inorganic and Metal Organic Compounds* by Linke (5). Other sources include the monographs by Schumacher (6) and Schilt (8), the article by Carlson (3), and the comprehensive treatise by Mellor (7). While the compilers have made their best effort to compile on all relevant and available data published up to 1990, it is possible that certain pertinent articles published in obscure journals have missed their attention. No compilations have been prepared for data presented only in graphic forms and they involved only a few articles, published in Russian. It is practically impossible to communicate with the authors of the original measurements to obtain the numerical data.

This work is the result of many years of collaboration between the Russian and Malaysian scientists involved in the Solubility Data Project, which has already resulted in volume 41 in the Series (on alcaline earth metal perchlorates, published in 1990). It is worth noting that much of the compilations in the present two Volumes, just as in Volume 41, are on data published in Russian Journals which are not readily available outside the C.I.S. The editors thank the University of Malaya and the Kurnakov Institute of General and Inorganic Chemistry, Moscow, for providing facilities used in the preparation of these volumes. They also wish to acknowledge the much appreciated help and advice from Dr. M. Salomon (U.S.A.), Prof. J.W. Lorimer (Canada), the late Prof. A.S. Kertes (Israel) and Prof. Yagodin (Russia), given in various ways, including liaison and literature search. They also thank all those colleagues in IUPAC Commission V.8 who have given help in one way or another.

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C. Y. Chan K. H. Khoo I.N. Lepeshkov

COMPONENTS	EVALUATORS
(1) Lithium Perchlorate; LiClO ₄ ;	S. Gryzlova;
[7791-03-9]	*Kurnakov Institute of General and Inorganic Chemistry, Russian Academy of Sciences,
2) Water ; H ₂ O ; [7732-18-5]	Moscow, Russia Cohen-Adad; Université Clauda Ramard Luca I
(3) Other Solvents	Université Claude Bernard Lyon I Villeurbanne, France

CRITICAL EVALUATION

Solubility data for fifty-eight binary systems $LiClO_4$ - solvents are presented in eleven publications (5, 7, 12, 14, 15, 20, 25, 32, 39, 46, 57). There are also data for twenty-four ternary (5, 17, 21-26, 28-30, 36, 38, 42-45, 47, 48, 50, 51, 54, 55, 58) and seven quaternary systems (6, 22, 31, 34, 37, 50, 52).

EXPERIMENTAL METHODS

The solubility of lithium perchlorate has been measured in most cases by the isothermal method. Simmons and Ropp (7) used a visual heating method in sealed tubes; a cooling method is also mentioned in ref. (46).

The solid phase was characterized by evaporation to dryness and, for ternary or quaternary systems, by the Schreinemakers' wet residues method (1). Thermographic and X-ray powder analysis were also employed (38).

ANALYSIS OF SOLUTIONS

Lithium perchlorate in saturated solution was determined by evaporation to dryness or by chemical analysis : Li^+ was titrated gravimetrically by precipitation as sulfate (17) or lithium zinc uranyl acetate (22, 30, 31, 37) or in solution, using the periodate method (21, 30), atomic absorption spectrophotometry (25) or flame photometry (12).

Perchlorate ion was determined gravimetrically as nitron perchlorate (14, 20, 21, 23, 29, 43, 47, 54) or by conversion to chloride and titration as AgCl (14).

SOURCE AND PURITY OF MATERIALS

In most cases lithium perchlorate was prepared by the methods described in references (2, 3, 4) and analysed as nitron perchlorate. It was also obtained by reacting 70 % HClO4 (aq.) with Li₂CO₃, recrystallized twice (20). Keller and Foster used a commercial product

(Atomergic Chemicals Co) dried at 90-120 °C under vacuum. Lithium perchlorate was also dried at 200-250 °C under vacuum (20) or at 150-160 °C for 20-25 hours (15).

The solvents were "Reagent grade products" (14, 25) purified by fractional distillation after drying over anhydrous calcium sulfate (14), metallic lithium (15), zeolites of type NaA (58) or by recrystallization (12). Alcohols were purified by refluxing with calcium and fractional distillation (5). Acetonitrile, ethyl acetate, ether were redistilled from their mixture with P₂O₅ (25). Acetone was refluxed with powdered KOH and purified by the bisulfite process (5). Propylene carbonate (Matheson, Coleman & Bell) spectropure grade was fractionally distilled in the presence of CaH₂ and dry N₂ (25).

Anhydrous perchloric acid was distilled from a mixture of oleum and perchloric acid dihydrate at 100 °C under vacuum (20). Nickel perchlorate was synthetized from nickel carbonate and perchloric acid, followed by recrystallization (29).

Terbium perchlorate was prepared by heating terbium nitrate and dissolving the resulting terbium oxide in 56 % perchloric acid. The salt was recrystallized from aqueous solution and washed with chloroform (42).

I BINARY SYSTEMS

When possible a statistical treatment of data was performed in order to make a critical evaluation or to check the coherence of data

System LiClO4 -H2O

The solubility of lithium perchlorate in aqueous solutions has been studied over a wide temperature range, from 273 K to 445 K and is presented in twenty-three publications Within the accuracy of the analyses, the solid phases in equilibrium with saturated solutions are stoichiometric. Three solubility curves can be identified, involving anhydrous salt and two congruent melting hydrates LiClO₄ \cdot H₂O, LiClO₄ \cdot 3H₂O.

Fitting equations

 $Y = f(T) = A/T + B \ln T + CT + D + ...$

The data of compilation sheets have been analyzed following the procedure described in the preface of volume 47 (59). The curves are represented by equation :

where T is the temperature (K) and Y is the natural logarithm of solubility for the liquidus curve of ice, and is related to the solubility constant for the salts (table 1).

(continued)

[1]

Table 1	LiClO4-H2O
Exp	ression of Y
LiClO4	$Y = \ln(4x^2/(1+x)^2)$
LiClO4·H2O	$Y = \ln(27x^2(1-x)/(1+x)^3)$
LiClO ₄ ·3H2O	$Y = \ln(5^5 x^2 (1-x)^3 / (27(1+x)^5))$

Four coefficients, deduced from experimental data by linear regression, were necessary to represent the data. Their values are given in table 2.

Table 2System LiClO4-H2OCoefficients of fitting equations

Solid Phase	Α	В	С	D
LiClO ₄	-226579.46	-1022.4424	1.1542909	6229.9317
LiClO ₄ ·H ₂ O	87977.65	446.3249	0.5600779	-2670.172
LiClO ₄ ·3H ₂ O	-1943.37	0.503708	-8.49846E-3	5.4328

Solubility of anhydrous LiClO₄

Only four data are available so that the coefficients A, B, C, D have been calculated by simple resolution of a system of 4 linear equations and the data above 172 °C must be considered as tentative data. The value 509 K (236 °C) given by Richards and Willard (2) for the melting point of lithium perchlorate has been adopted. The comparison between experimental and calculated values of solubility is presented in table 3.

	Table 3System LiClO4-H2OLiquidus of anhydrous LiClO4							
t °C	exp100w	y calc	exp 100	xl calc	ref			
144.2	90.0	90.04	60.4	60.5	7			
167.5	91.04	91.06	63.24	63.3	7			
172.0	91.11	91.13	63.44	63.5	7			
236	100	100	100	100	2			

The solid phase in equilibrium with liquid at 144.2 °C is probably anhydrous lithium perchlorate instead of the monohydrate claimed by the authors

Solubility Curve of LiClO₄ H₂O

The solubility Curve of LiClO₄·H₂O has been determined only by Simmons and Ropp (7). The coherence of experimental results is good except for the data close to the melting point. The congruent melting point is given by solution of the equation :

$$D = -A/T_m - B\ln(T_m) - CT_m$$

[2]

The calculated value is 152.2 °C, the experimental value is 149 °C (5).

t°C	exp10	0w1calc	exp10	Oxicalc	deviat.x1000	ev.	ref
93.2	70.5	70.53	28.8	28.84	0	R	7
97.3	71.0	70.95	29.3	29.26	0	R	7
108.9	72.8	72.74	31.2	31.12	3.2	R	7
120.7	75.0	75.23	33.7	33.96	- 8.8	R	7
136.9	80.0	79.38	40.4	39.46	22.7	Т	7
144.0	82.5	81.47	44.4	42.68	39.8	Т	7
144.2	81.53		42.78				**
148.5	85.0	83.02	49.0	45.29	81.7	Α	7
149.3	87.5	83.34		45.87			**
149.3		87.48	54.2	54.2	0	R	7
148.5		87.74		54.8			**
144.2	90.0	88.85	60.4	57.45	50.5	Α	7*
136.9		89.87		60.03			**
120.7		92.37		67.2			**
108.9		93.38		70.48			**
97.3		94.01		72.66			**
93.2		94.15		73.15			**

Table 4	Liquidus	of monoh	ydrate 1	LiClO ₄ ·H ₂ O
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* belongs probably to the liquidus of anhydrous LiClO₄ ** calculated by evaluator R = recommended, T = tentative, A = aberrant value

A comparison between experimental and calculated values of solubility is presented in table 4. The deviation is the quantity $100(x_{exp}-x_{calc})/x_{calc}$. The data have been recommended when dev < 2 %, considered as tentative when 2 % < dev < 5 % and aberrant above 5 %

Solubility Curve of LiClO4 3H2O

The range of solubility of trihydrate has been determined in totality by Simmons and Ropp above 0 °C, but in most papers the data are reported at 25 °C. Lithium perchlorate trihydrate crystallizes from aqueous solutions as short prismatic or needle-like crystals of the hexagonal form. The critical evaluation is given in table 5. The coherence of experimental results is good except for the data close to the melting point. The calculated congruent melting point is 95 °C.

t°C

ev.

ref

Table 5	Liquidus of trihydrate LiClO4·3H2O					
exp 100w1 calc	exp	100x1	calc	devx1000		

. e	cxp re	ion f calc	cxp 1	oon cale	00001000	٥٧.	101
0.0	29.90	29.91	6.736	6.740	- 0.59	R	7
10.0	32.88	32.90	7.660	7.665	- 0.65	R	7
20.0	35.95	35.91	8.679	8.665	1.62	R	7
25	37.30	37.44	9.170	9.152	- 3.26	R	23
25	37.34	37.44	9.166	9.200	- 3.70	R	30
25	37.34	37.44	9.166	9.200	- 3.70	R	28
25	37.34	37.44	9.166	9.200	- 3.70	R	26
25	37.34	37.44	9.166	9.200	- 3.70	R	51
25	37.34	37.44	9.166	9.200	- 3.70	R	48
25	37.34	37.44	9.166	9.200	- 3.70	R	54
25	37.34	37.44	9.166	9.200	- 3.70	R	47
25	37.38	37.44	9.188	9.200	- 1.30	R	5
25	37.46	37.44	9.209	9.200	0.98	R	55
25.0	37.48	37.44	9.216	9.200	1.74	R	7
25	37.50	37.44	9.223	9.200	2.50	R	45
25	37.52	37.44	9.230	9.200	3.26	R	36
25	37.53	37.44	9.231	9.200	3.26	R	29
25	37.55	37.44	9.241	9.200	4.49	R	44
25	37.58	37.44	9.252	9.200	5.65	R	43
25	37.58	37.44	9.252	9.200	5.65	R	29
25	37.62	37.44	9.266	9.200	7.27	R	21
25	37.66	37.44	9.280	9.200	8.70	R	42
25	37.70	37.44	9.295	9.200	10.33	Т	24
25	37.78	37.44	9.323	9.200	13.37	Т	38
30.0	38.87	38.96	9.721	9.755	- 3.49	R	17
35	41.09	40.49	10.56	10.330	22.27	Α	22
40.0	41.97	42.04	10.91	10.940	- 2.65	R	7
50	45.28	45.18	12.29	12.249	3.67	R	40
64.6	50.0	49.96	14.48	14.460	1.38	R	7
77.9	55.0	54.79	17.15	17.03	7.05	R	7
89.2	60.0	60.02	20.26	20.27	- 0.49	R	7
92.3	62.5	62.12	22.01	21.735	12.65	Τ	7
94.3	65.0	64.21	23.92	23.30	26.61	Α	7
95.1*	66.32		25.01				7
94.8	66.67	67.41	25.30	25.94	- 24.67	A	7
93.2	70.0	69.53	28.3	27.87	15.43	T	7
92.7 02.5	70.3	69.93	28.6	28.25	- 58.41	A	7
92.5	70.33	70.08	28.64	28.40	8.45	R	7

R = recommended, T = tentative, A = aberrant value * The calculated melting point is 95.0 $^{\circ}$ C

Double saturation points

Two eutectic points can be observed above 0 °C :

liq. \Leftrightarrow LiClO₄·3H₂O + LiClO₄ · H₂O T = 92.4 °C , x₁ = 0.284

liq. \Rightarrow LiClO₄·H₂O + LiClO₄ T = 140 °C, $x_1 = 0.592$

Phase diagram

The phase diagram LiClO₄ - H_2O between 0 °C and the melting point is presented in figure 1. The calculated solubility of mono and trihydrate are in good agreement with experimental data, the liquidus curve of anhydrous salt must be considered as tentative due to the small number of experimental data.

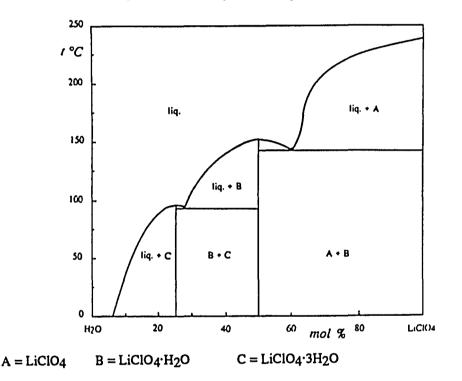


Figure 1 Solubility of lithium perchlorate in water

Solubility of Lithium Perchlorate in other solvents

Due to the small number of papers it was not possible to perform a critical evaluation, so that all data must be considered as tentative.

The solubility of lithium perchlorate in tetrahydrofuran was 2.2 mol dm⁻³ [35] at 298.2 K and could not be converted in mass units.

In most cases the solubility was measured at 298 K and the data at this temperature are collected in table 6.

6

		Solvent		g % solvent	x1	ref
CH3NO	[75-12-7]		formamide	142.1±0.2	37.6	14
CH4O	[67-56-1]	methanol	methyl alcohol	182.25	35.44	5
C ₂ HF ₃ O ₂	[76-05-1]	2-trifluoroethanoic acid	trifluoroacetic acid	11.7	11.1	14
C ₂ H ₃ N	[75-05-8]	acetonitrile		12.99	5.44	25
				14.46	6.12	46
				13.6±0,1	6.98	14
C2H4O2	[64-19-7]	ethanoic acid	acetic acid	108.7±0.1	38.0	14
C2H6O	[64-17-5]	ethanol	ethyl alcohol	151.76	39.66	5
$C_2H_6O_2$	[107-21-1]	1-2-ethanediol	ethyleneglycol	96.7±0.4	36.1	14
C ₂ H ₆ OS	[67-68-5]	sulfinylbis-methane	dimethylsulphoxide	21.1*	17.4*	12
C ₂ H ₇ NO	[141-43-5]	2-aminoethanol		78.9±0.9	31.2	14
$C_2H_8N_2$	[107-15-3]	1,2-ethanediamine	ethylenediamine	48.0±0.3	21.3	14
C3H60	[123-38-6]	propionaldehyde	propanal	110.5±0.7	37.6	14
C3H60	[75-56-9]	methyloxirane	propylene oxide	91.4±0.6	33.3	14
C3H60	[67-64-1]	•	acetone	136.52	42.70	5
C ₃ H ₇ NO	[68-12-2]	N,N-dimethyl-form amide		7.5±0.2	34.0	14
C ₃ H ₈ O	[71-23-8]	1-propanol	n-propyl alcohol	105.0	37.23	5
C ₃ H ₈ O	[67-63-0]	2-propanol	isopropyl alcohol	112.1±0.1	38.8	14
C ₃ H ₉ N	[107-10-8]	1-propanamine	n-propylamine	59.1±0.3	24.7	14
C4H6O3	[108-24-7]	1.1.1	acetic anhydride	8.1	7.2	14
C4H8O	[109-99-9]		tetrahydrofurane	27.1±0.2	15.5	14
C ₄ H ₈ O ₂	[141-78-6]		ethyl acetate	95.12	44.1	5
· +- · 0 2			-	95.1	44.1	14
$C_4H_8O_2$	[107-92-6]	butanoic acid	butyric acid	60.0±0.3	33.2	14
C4H9NO2	[544-16-1]	1-butyl nitrite	n-butyl nitrite	3.4	3.2	14
C4H10O	[60-29-7]	1,1'-oxybis-ethane	diethylether	113.72	44.21	5
C4H10O	[71-36-3]	1-butanol	n-butyl alcohol	79.31	35.59	5
$C_4H_{10}O$	[78-92-2]	2-butanol	sec-butyl alcohol	77.1±0.1	34.9	14
C4H10O	[78-83-1]	2-methyl-1-propanol	isobutylalcohol	58.05	28.8	5
C4H10O	[75-65-0]	2-methyl-2-propanol		0.6	0.4	14
	[110-80-5]	2-ethoxyethanol	-	136.6±0.4	53.6	14
$C_{4H_{11}N}$	[109-73-9]	1-butanamine	n-butylamine	45.7±0.3	23.9	14
$C_4H_{11}N$		2-butanamine	sec-butylamine	45.7±0.2	23.9	14
	[75-64-9]	2-methyl-2-	t-butylamine	10.7 ± 0.3	6.8	14
	- •	propananamine	-			
C5H5N	[110-86-1]		pyridine	8.7±0.1	6.1	14
C5H8O	[120-92-3]		cyclopentanone	63.8±0.2	33.5	14
	[105-58-9]		diethyl carbonate	52.6±0.1	36.9	14
C6H7N	[62-53-3]	benzenamine	aniline	6.1±0.2	5.1	14
C6H10O	[108-94-1]	cyclohexanone		54.0±0.3	33.2	14
C6H10O3	[141-97-9]	ethyl-3-oxobuta noate	ethyl acetoacetate	76.7±0.1	48.4	14

Table 6 Solubility of LiClO4 in various solvents

7

Table 6 (continued)

Solubility of LiClO4 in various solvents at 298 K

		Solvent		mass % solvent	xı	ref
C ₆ H ₁₂ O	[108-93-0]	cyclohexanol		5.9±0.1	5.3	14
C6H12N	[108-91-8]	cyclohexanamine	cyclohexylamine	16.9	13.6	14
C7H5N	[100-47-0]	benzonitrile		21.9±0.2	17.5	14
C7H6O	[100-52-7]	benzaldehyde		51.5±0.3	33.9	14
C7H8O	[100-51-6]	benzenemethanol	benzyl alcohol	49.8±0.3	33.6	14
C7H8O	[108-39-4]	3-methylphenol	-	142.1±0.2	37.6	14
C7H9N	[100-61-8]	n-methyl benzenamine	n-methylaniline	1.4±0.1	1.4	14
C8H16O2	[124-07-2]	1-octanoic acid	n-octanoic acid	32.1±0.3	30.3	14
C8H18O	[111-87-5]	1-octanol		43.8±0.3	34.9	14
C8H18O	[123-96-6]	2-octanol		44.7±0.3	35.4	14
C8H18O	[142-96-1]	1-1'-oxybis- butane	n-butylether	13.6±0.2	14.3	14
C8H19N	[111-92-2]	n-butyl-1-buta namine	dibutylamine	45.6±0.4	35.6	14
C9H10O2	[93-89-0]		ethyl benzoate	29.2±0.2	29.2	14
C9H10O2	[140-11-4]		benzyl acetate	50.1±0.4	41.4	14
C ₁₂ H ₁₄ O ₄	[84-66-2]	diethyl-1,2-benz ene dicarboxylate	diethylphtalate	5.5	1.2	14
C ₁₄ H ₂₆ O ₄	[110-40-7]	diethyldecanedi oate	diethylsebacate	21.3±0.1	34.0	14
N ₂ H ₄	[302-01-2]		hydrazine	54.4	14.1	39

* the solid phase is the solvate 2LiClO4.7(CH3)2SO

Some solubilities have been measured at 273 K (table 7)

	Sc	blvent	mol% solvent	xj	ref
HClO ₄	[7601-90-3]	perchloric acid	0.107	0.1	20
H_2O_2	[7722-84-1]	hydrogen peroxide	62.3	16.61	57
N2H4*	[302-01-2]	hydrazine	47.1	12.4	32

* The solid phase was LiClO₄·2N₂H₄

Sometimes the measurements have been performed at several temperatures, so that a fitting equation has been derived in order to allow interpolation.

System LiClO4-Acetonitrile [75-05-8]

Tomkins and Turner [46] have measured the solubility of lithium perchlorate in acetonitrile at temperatures between 24.20 and 50.17 °C. A congruent melting point is observed for $x_1=0.20$. The solid phase is LiClO4·4CH₃CN and the data are fitted by the equation :

 $\ln(x_1(1-x_1)^4) = A/T + B$

where A = -2119.1747, B = 4.0842.

The agreement between experimental and calculated solubilities is good except in the vicinity of the dystectic point (table 8)

100 x1	t°C exp.	t °C calc	100 d
5.953	24.20	23.19	0.3
7.106	29.16	28.58	0.2
8.076	32.80	32,32	0.15
9.178	36.33	35.87	0.15
10.818	40.12	40.05	0.02
11.693	41.94	41.84	0.03
13.923	45.67	45.26	0.1
15.480	48.28	46.84	0.45
17.694	49.50	48.18	0.4
20.146	49.41	48.60	0.25
20.350	50.17	48.60	0.5
22.780	48.85	48.05	0.2
23.750	41.21	47.62	- 2
24.240	45.66	47.36	- 0.5
25.600	45.43	46.50	- 0.3

Table 8 System LiClO₄-Acetonitrile

The deviation is given by $d = (T_{exp.} - T_{calc.})/T_{calc}$. The congruent melting point (dystectic point) is located at $x_1 = 0.20$ and $t = 49 \pm 1^{\circ}C$

System LiClO4-DMSO [67-68-5]

The data of Kenttamaa [12] at 25, 35 and 45 °C are not accurate and all data must be considered as tentative.

System LiClO₄-Propionitrile [107-12-0]

The solubility of lithium perchlorate in propionitrile at temperatures between 230 and 285 K has been measured by Tomkins and Turner [46]. A congruent melting point is observed for $x_1 = 0.20$. The solid phase is LiClO4·4CH₃CN and the data are fitted by equation [3]. The values of coefficients are

A = -628.3486 B = -0.17801

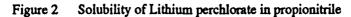
The agreement between experimental and calculated solubilities is good (table 9, figure 2).

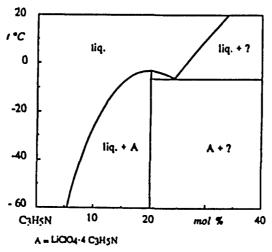
(continued)

[3]

CRIT	CRITICAL EVALUATION (continued)						
		Table 9	System LiC	lO4-Propioni	trile		
	100x1	r°C exp.	t°C calc	100 d	solid phase		
	7.23	- 43	- 44.935	0.8	LiClO4·4C3H5N		
	12.141	- 21.3	- 16.9	- 1.7	n		
	14.218	- 12.1	- 10.3	- 0.7	•		
	17.049	- 0.5	- 4.9	- 1.6			
	18.62	- 3.9	- 3.6	- 0.1			
	27.378	2.1			9		
	30.97	12			?		

The deviation is given by $d = (t_{exp.} - t_{calc.})/t_{calc.}$ The congruent melting point is located at $x_I = 0.20$ and $\models -3.2 \pm 1^{\circ}C$ and the eutectic point are close to $x_I = 0.243$, $t = -6.3^{\circ}C$.





II TERNARY SYSTEMS

Solubility of LiClO4.3H2O in various solvents at 298.15 K

The values of solubility are presented in table 10, the solid phase was not specified. In some cases it is assumed to be LiClO4.3H2O

Solvent			mass %	ref.
CH40	[67-56-1]	Methanol	60.95	5
C ₂ H ₆ 0	[64-17-5]	Ethanol	42.16	5
C3H60	[67-64-1]	Acetone	49.04	5
C3H80	[71-23-8]	1-Propanol	26.82	5
C4H802	[141-78-6]	Ethyl acetate	27.41	5
C4H100	[71-36-3]	1-Butanol	21.40	5
C4H100	[78-83-1]	2-Methyl-1-propanol	18.85	5
C4H100	[60-29-7]	dithyl ether	0.196	5

10

Solubility in mixed solvents

Solubility in solvents containing a trace of water

Determinations at 25 and 60 °C have been made by Keller and Foster (25) with two solvents (propylene carbonate C4H6O3 and N,N-dimethylformamide C3H7NO) and containing slight quantities of water.

Table 11 Solubility of lithium perchlorate

in solvents containing a trace of water

Solvent	T / K	H2O mg dm ⁻³	LiClO4 c/mol dm ⁻³	ref
C ₃ H ₇ NO	298	45	4.4	25
(N,N-dimethylformamide)		1000	3.5	
•	333	45	4.8	
		1000	4.9	
C4H6O3	298	20	2.1	25
(propylene carbonate)		1000	3.1	
	333	20	3.1	
		1000	3.1	

System LiClO4 - Acetamide - H2O

The isothermal section 298 K has been determined by Tarakanov (45). Four stoichiometric phases are observed LiClO₄·3H₂O, LiClO₄·2CH₃CONH₂, LiClO₄·4CH₃CONH₂, CH₃CONH₂. The two intermediate compounds are very hygroscopic.

System LiClO4 - Dimethylurea- H2O

The isothermal section determined by Bestuzheva (55) shows that three solid phases must exist at 298 K : $LiClO_4 \cdot 3H_2O$, dimethylurea C3H8N2O and presumably, according to the compiler, $LiClO_4 \cdot 3C_3H8N_2O \cdot H_2O$. The double-saturation points are not observed and the intermediate compound has a non-congruent solubility.

System LiClO4 - Hexamethylenetetramine - H2O

Four solubility curves are observed, involving $C_{6}H_{12}N_4$, LiClO4·2C₆H₁₂N₄·2H₂O which is an incongruently soluble compound, LiClO4·C₆H₁₂N₄·3H₂O and LiClO4·3H₂O Several anomalies are observed on the data sheet :

• The solubility diagram presented on the compilation sheet is not correct since the ratio LiClO₄/H₂O is not the same for the various compounds, so that their representative points cannot be located on the same straight line.

• The nature of the solid phases presented in the last row of the table is not supported by the data.

Table 12 Solubility in mixed solvents at 298 K

Composition of double saturation points

Equilibrium	composition (1) mol % (2)		ref
System LiClO4-C2H5NO-H2Q			
liq. ↔ LiClO4·3 H2O + LiClO4·4CH3CONH2	18 .9 7	44.74	45
liq.↔LiClO4·4CH3CONH2 + LiClO4·2CH3CONH2	17.82	57.86	
liq. ↔ LiClO4·2CH3CONH2 + CH3CONH2	10.97	72.17	
System LiClQ4-C3H8N2Q-H2Q			
liq. ↔ LiClO4·3 H ₂ O + ?	12.17	9.157	55
$liq. \leftrightarrow ? + C_3H_8N_2O$?	?	
System LiClO4-C6H12N4-H2O			
liq.↔ LiClO4·3 H2O + LiClO4·C6H12N4·3H2O	8.89	2.09	43
$liq. \leftrightarrow LiClO_4 \cdot C_6H_{12}N_4 \cdot 3H_2O + LiClO_4 \cdot 2C_6H_{12}N_4 \cdot 2H_2O$	5.83*	7.0*	
liq.↔ LiClO4·2C6H12N4·2H2O+C6H12N4	1.62*	11.1*	

* assumed by evaluator

System LiClO4 - Methylacetate - Propylene carbonate

The solubility of LiClO4 has been measured by Il'in and Demakin (58) at 6 temperatures between 283.2 and 323.2 K. A fitting equation proposed by the authors is presented in data sheet; it allows a precision better than 10 %, the calculation of solubility at any composition of solvents and a temperature range between 10 and 50 °C.

Ternary salt systems involving the same anion

$LiClO_4 - MClO_4 - H_2O$, (M = Na, K, NH4, Tl)

The systems have been studied at temperatures between 298 and 323 K. All solid phases are stoichiometric: the solid phase involving lithium is always LiClO4·3H₂O, the other observed phases are anhydrous perchlorates except for NaClO4 which crystallizes, according to the temperature, as monohydrate or anhydrous salt. In a general way the data are coherent, but as they are presented in a single paper it was not possible to assess the accuracy of the data. The composition of eutonic points of the systems are presented in table 13

Table 13	Ternary systems LiClO ₄ - MClO ₄ - H ₂ O
	M = Na, K, NH4, Tl
	Composition of eutonic points

T/K	Equilibrium	(1) mol	% (2)	ref	
298	liq. ↔ LiClO4 . 3 H2O	+ NaClO4 . H2O	2.36*	20.23*	21
	liq. ↔ LiClO4 . 3 H ₂ O	+ KClO4	9.24*	0.036*	24
	liq. ↔ LiClO ₄ . 3 H ₂ O	+ NH4ClO4	8.92*	0.68*	23
	liq. ↔ LiClO4 . 3 H ₂ O	+ TICIO4	9.26*	0.14*	38
303	liq. ↔ LiClO4 . 3 H ₂ O	+ NH4ClO4	9.66*	0.599*	17
308	liq. ↔ LiClO4 . 3 H ₂ O	+ NH4ClO4	10.49*	0.519	22
323	liq. \leftrightarrow LiClO ₄ .3 H ₂ O	+ NaClO4	5.66*	21.40*	40
	liq. ↔ NaClO4	+ NaClO4, H2O	1.47**	27.4**	40

*average ** assumed by evaluator

Taking in account the common ion effect and the variation of the ionic strength of the solution, the ionic product S of LiClO₄·3H₂O, we have :

$$S = x_1 (x_1 + x_2) (1 - x_1 - x_2)^3 / (1 + x_1 + x_2)^5$$
^[4]

where x_1 and x_2 are the mole fractions of components. The data can be fitted by equation [5]

$$S = A + Bx_1 + Cx_1^2$$
 [5]

The coefficients A, B, C are presented in table 14 :

Table 14 Ionic product of $LiClO_4 \cdot 3H_2O$ in ternary systems $LiClO_4 - MClO_4 - H_2O$

<u>M</u>	T/K	A	B	<u> </u>
Na	298	- 0.5629	64.78	-151
	323	- 2.9187	94.57	-198
K	298	- 0.429	49.09	0
NH4*	298	1.8782	23.75	0
	298	1.3383	30.16	0

*at 303 and 308 K the calculation of coefficients was not possible due to the scattering of experimental data

13

14

CRITICAL EVALUATION (continued)

Ternary systems $LiClO_4 - M(ClO_4)_2 - H_2O$, (M = Ca, Ba, Mn, Co, Ni, Cu)

All systems have been studied at a single temperature 298 K. The isothermal sections have the same shape with two saturation curves and an eutonic point. The solid phases in equilibrium with liquid are LiClO4.3 H₂O and, according to the system Ca(ClO4)₂.4 H₂O, Ba(ClO4)₂.3 H₂O or an hexahydrate M(ClO4)₂.6 H₂O for M = Mn, Co, Ni, Cu). The eutonic points of the systems are given in table 15.

Table 15 Ternary systems LiClO4 - M(ClO4)2 - H2O

Composition of eutonic p	oints at 298 K
--------------------------	----------------

(1) mol	% (2)	ref	
3.14	7.608	36	
2.62	7.85	48	
1.13	6.98	51	
1.73*	6.23*	29	
2.157*	6.00*	29	
2.78*	7.10	43	
	3.14 2.62 1.13 1.73* 2.157*	3.14 7.608 2.62 7.85 1.13 6.98 1.73* 6.23* 2.157* 6.00*	3.14 7.608 36 2.62 7.85 48 1.13 6.98 51 1.73* 6.23* 29 2.157* 6.00* 29

* average

If the solvation of ions is not taken in account, the ionic product of trihydrate $LiClO_4\cdot 3 H_2O$ is represented by equation [6]:

$$S = x_1 (x_1 + 2x_2) (1 - x_1 - x_2)^3 / (1 + x_1 + 2x_2)^5$$
[6]

and can be fitted by relation [5]. The coefficients of fitting equations are given in table 16.

Table 16 Ionic product of LiClO4·3H2O
Systems LiClO4 - M(ClO4)2 - H2O at 298 K

<u>M</u>	A	<u> </u>	C
Ca	- 0.0833	64.61	-208
Ba	- 0.1628	68.62	-218
Mn,Co, Ni	0.1017	53.18	-107
Cu	0.8245	18.97	186

The ionic product of LiClO4.3 H₂O is given by the same equation when M = Mn, C0, Ni showing that the structure of the saturated solution is the same and consequently, in spite of

the fact that each system has been determined by a single author, the solubility data for the isothermal section 298 K of the systems involving Mn, Co and Ni can be recommended. For the other sytems the data are coherent but no assessment can be done concerning the accuracy.

Ternary systems $LiClO_4 - M(ClO_4)_3 - H_2O$ (M = Ce, Ga, Tb)

All systems have been studied at a single temperature, 298 K. The isothermal sections have two saturation curves and an eutonic point. The solid phases in equilibrium with liquid are $LiClO_4\cdot 3$ H₂O and, according to the system, Ce(ClO₄)₃·9 H₂O, Ga(ClO₄)₃·9 H₂O or Tb(ClO₄)₃·9 H₂O. The eutonic points of the systems are presented in table 17

Table 17 Ternary systems LiClO4 -	M(ClO ₄)3	- H ₂ O	
Composition of eutonic point	s at 298 K		
Equilibrium	(1) mo	1 % (2)	ref
liq. ↔ LiClO ₄ · 3 H ₂ O + Ce(ClO ₄) ₃ ·9 H ₂ O	1.54*	7.35*	47
liq. ↔ LiClO ₄ · 3 H ₂ O + Ga(ClO ₄) ₃ ·9 H ₂ O	0.38*	5.97*	54
liq. ↔ LiClO ₄ · 3 H ₂ O + Tb(ClO ₄) $_3$ ·9 H ₂ O	1.47*	6.64	42

* average

If the solvation of ions is not taken in account, the ionic product of trihydrate $LiClO4.3 H_2O$ is represented by equation [7]:

$$S = x1 (x_1 + 3x_2) (1 - x_1 - x_2)^3 / (1 + x_1 + 3x_2)^5$$
^[7]

and can be fitted by relation [5]. The coefficients of the fitting equations are given in table 18.

Systems LiClO4 - M(ClO4)3 - H2O at 298 K			
М	А	В	С
Ce	0.329	45.56	- 60
Ga	0.0678	53.33	-111
Тb	0.0696	60.19	-179

Table	18	Ionic	product of L	iClO ₄ ·	3H ₂ O	
C	т:	010	MOID AN	11-0	-+ 000	Ł

Ternary salt systems involving the same cation

Ternary system LiClO4 - LiNO3 - H2O

Isothermal sections at 298 and 323 K are reported in three publications. Two of them (28, 30) concern the same set of data and have been condensed in the same data sheet. Two solid

phases, LiClO₄·3H₂O and LiNO₃, are observed. The existence of LiNO₃·5H₂O reported by Donnan and Burt (33) was not confirmed by the work of other researchers (8). The coordinates of eutonic points are given in table 19:

Table 19 System LiClO₄ - LiNO₃ - H₂O

<i>T /</i> K	LiClO ₄ mol %	LiNO3	ref
298	2.09*	17.79*	28,30
323	4.30*	26.86*	40

* average

Ternary system LiClO4 - Li2CrO4 - H2O

Isothermal sections 298 and 308 K are reported (22, 26). Two solid phases, LiClO4·3H2O and Li2CrO4·2H2O, are observed. The coordinates of eutonic points are given in table 20.

Table 20	System	LiClO ₄ -	Li2CrO4	- H2O
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Coordinates of eutonic points			
T/K	LiClO ₄ mol %	Li2CrO4	ref
298	0.455	11.27	26
323	0.344*	2.09*	22
میافعید میں ایک ہوتی ہیں۔			

*average

If the solvation of ions is not taken in account, the ionic product of LiClO4.3 H₂O is represented by equation [6] and can be fitted by relation [5]. The coefficients of fitting equations are given in table 21.

Table 21 Ionic product of LiClO4·3H2O

Systems LiClO4 - Li2CrO4 - H2O

<i>T /</i> K	Α	В	С
298	- 0.0411	64.9	- 207
308	- 0.0359	63.75	- 164

III QUATERNARY SYSTEMS

In general a single set of data has been determined so that a critical evaluation cannot be performed.

Quaternary simple systems

LiClO₄ - Ethanol - Ethyl acetate - H₂O

The solubility of lithium perchlorate trihydrate in mixed solvent ethanol-ethyl acetate is determined at 25 °C (6). The composition of solvent is measured in volume % and the solubility is expressed in mass % of LiClO₄·3H₂O. The solid phase is assumed to be the trihydrate.

LiClO₄ -Mg(ClO₄)₂ - Hexamethylenetetramine - H₂O

The solubilities have been measured at 298 K by Kosheleva (52) The isobaric-isothermal monovariant lines and invariant points are determined. Six solid phases are observed LiClO₄·3H₂O, Mg(ClO₄)₂·2C₆H₁₂N₄·8H₂O, C₆H₁₂N₄, LiClO₄·2C₆H₁₂N₄·5H₂O, LiClO₄·C₆H₁₂·N₄·3H₂O, Mg(ClO₄)₂·6H₂O. A diagram has been drawn in Jänecke coordinates (see compilation sheet). Furthermore the quality of the graph shows evidently that all data must be considered as tentative

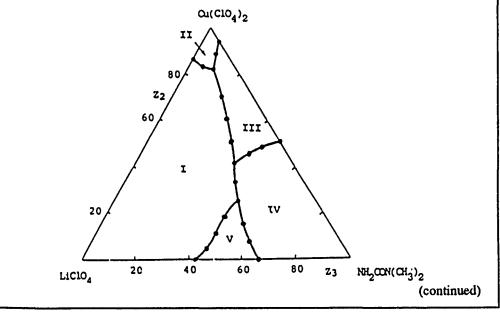
LiClO4 - Cu(ClO4)2 - N,N-dimethyl carbamide - H2O

The quaternary system LiClO₄ - Cu(ClO₄)₂ - N,N-dimethyl carbamide - H₂O has been investigated at 298 K.by Bestuzhzva et al. (50) The isobaric-isothermal monovariant lines and invariant points are determined. Five solid phases are observed :

I=LiClO₄·3H₂O, II=Cu(ClO₄)₂·6H₂O, III=Cu(ClO₄)₂·2NH₂CON(CH₃)₂·4H₂O IV=NH₂CON(CH₃)₂, V=LiClO₄·3NH₂CON(CH₃)₂·H₂O

A diagram has been drawn in Jänecke coordinates figure (3) where $Z_i = 100x_i(x_1 + x_2 + x_3)$ and i = compounds (1), (2) or (3).

Figure 3 System LiClO₄ - Cu(ClO₄)₂ - N,N-dimethylcarbamide - Water



Quaternary reciprocal systems

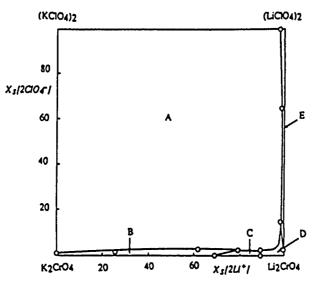
Three quaternary reciprocal systems involving LiCrO4 have been investigated. All data must be considered as tentative.

Li⁺, K⁺ // ClO₄⁻, CrO₄²⁻ - H₂O

The quaternary system Li⁺, K⁺ // ClO₄⁻, CrO₄²⁻ - H₂O has been investigated at 298 K by Voronina et al. (37). The isobaric-isothermal monovariant lines and invariant points are determined.

Five solid phases are observed A=KClO4, B=K2CrO4, C=Li2CrO4·K2CrO4·H2O, D=Li2CrO4·2H2O, E= LiClO4·3H2O. A diagram (figure 4) has been drawn in Jänecke coordinates. The crystallization field of K ClO4 is very large due to its small solubility.

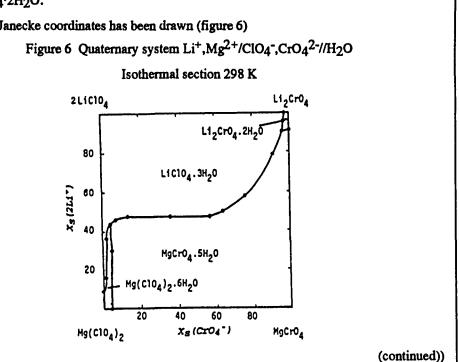
Figure 4 Qaternary system Li⁺, K⁺ / ClO₄⁻, CrO₄²⁻ // H₂O Isothermal section at 298 K



Li^+ , NH_4^+ // ClO_4^- , CrO_4^{2-} - H_2O

Two isothermal sections of the system Li⁺, NH₄⁺ // ClO₄⁻, CrO₄²⁻ - H₂O have been determined. At 298 K. (31) six solid phases are observed : $A=(NH_4)_2CrO_4$, $B=NH_4ClO_4\cdot(NH_4)_2CrO_4$, $C=NH_4ClO_4$, $D=LiClO_4\cdot 3H_2O$, $E=Li_2CrO_4\cdot 2H_2O$, $F=(NH_4)_2CrO_4\cdot Li_2CrO_4\cdot 2H_2O$. The compound F has a non congruent solubility. A diagram (figure 5) has been drawn in Jänecke coordinates. At 308 K (22) the phase diagram is very similar but the hydrated double salt F is no more observed. The isothermal section of the diagram is represented in figure 5 in dotted lines.

CRITICAL EVALUATION (continuation) Figure 5 Quaternary system Li⁺,NH4⁺/ClO4⁻,CrO4²⁻//H₂O Isothermal sections 298 and 308 K C+E LIZCO LICO4 100 XIAU 60 40 20 20 40 X:paor) 80 (NH4)2CrO4 NH4CIO4 _ 298 K 308 K - - - $Li^+, M_8^{2+} //ClO_4^-, CrO_4^{2-} - H_2O$ A section of the quaternary system Li⁺, Mg²⁺ // ClO₄⁻, CrO₄²⁻ - H₂O has been determined at 298 K by Voronina (34). Four solid phases are observed : A=LiClO4·3H2O, (NH4)2CrO4, B=Mg(ClO4)2·6H2O, C= MgCrO4·5H2O, D=Li2CrO4·2H2O. A graph in Janecke coordinates has been drawn (figure 6) Figure 6 Quaternary system Li⁺, Mg²⁺/ClO₄⁻, CrO₄²⁻//H₂O Isothermal section 298 K LigCr04 2L1C104 L12Cr04.2H20 80 L1C104.3H20 X_S (2LJ⁺) 60 40



CRITICAL EVALUATION (continued)

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CRITICAL EVALUATION (continued)

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COMPONENTS			ORIGINAL	MEASUREMENT	'S:
(1) Lithiu [7791-	um perchlorate; -03-9]	LiClO ₄	Willard	, H.H.; Smit	h, G.F.
(2) Water;	; H ₂ 0; [7732-18-	-5]	J. Am. 286-9	Chem. Soc. 6.	<u>1923</u> , <i>45</i> ,
VARIABLES:			PREPARED	BY:	
One tempe:	rature: 298.15 H	¢	C.Y. Ch	an	
EXPERIMENT	AL VALUES:		<u></u>	·,,,,	
Solubilit	y ^a of lithium p	perchlorate i	n water at	25.00°C :	
mass % (g/100 cm ⁻³ sln	mol X	mol dm ⁻³	mol kg ⁻¹	satd sln density/g c
37.385	47.42	9.182 ^b	4.457	5.612 b	1.2683
	id phaseis a mix r's calculations		drous LiCl(04 and LiClo	4.3H ₂ 0.
					4.3H ₂ 0.
b Compile:		AUXILIARY I	NFORMATION		
b Compiles METHOD/APPA A satd slr	r's calculations ARATUS/PROCEDURE h of the salt	AUXILIARY I 2: was prepared	NFORMATION SOURCE A Anhydro	ND PURITY OF us LiClO4 wa	MATERIALS: 8 prepared a
b Compiles METHOD/APP/ A satd slr at a tempe	ARATUS/PROCEDURE of the salt erature slightly	AUXILIARY I 2: was prepared above 25 ^o C	NFORMATION SOURCE A Anhydro describ	ND PURITY OF	MATERIALS: 8 prepared a
b Compiles METHOD/APP/ A satd sir at a tempe and sealed the anhydr tube, cape	ARATUS/PROCEDURE of the salt erature slightly together with cous salt in a actity 18-20 cm ³ .	AUXILIARY I AUXILIARY I was prepared vabove 25°C about 1 g of a solubility This tube	NFORMATION SOURCE A Anhydro describ	ND PURITY OF us LiClO4 wa	MATERIALS: 8 prepared a
b Compiles METHOD/APP/ A satd slr at a tempe and sealed the anhydr tube, cape was then n thermostat and stood	ARATUS/PROCEDURE a of the salt erature slightly i together with rous salt in a acity 18-20 cm ³ . rotated end-over t bath at 25.00 ² i vertically t	AUXILIARY I AUXILIARY I was prepared about 1 g of about 1	NFORMATION SOURCE A Anhydro describ	ND PURITY OF us LiClO4 wa	MATERIALS: 8 prepared a
b Compiles METHOD/APPA A satd shr at a tempe and sealed the anhydr tube, capa was then a thermostat and stood solids to	ARATUS/PROCEDURE a of the salt erature slightly i together with rous salt in a acity 18-20 cm ³ . rotated end-over t bath at 25.00 ² i vertically t	AUXILIARY I AUXILIARY I was prepared v above 25°C about 1 g of a solubility This tube r-end in the C for 24-48h to allow the aples of the	NFORMATION SOURCE A Anhydro describ	ND PURITY OF us LiClO ₄ wa ed in ref. 1	MATERIALS: 8 prepared a
b Compiles METHOD/APPA A satd sin at a tempe and sealed the anhydr tube, capa was then n thermostat and stood solids to clear sat for solute	ARATUS/PROCEDURE of the salt erature slightly together with cous salt in a acity 18-20 cm ³ . cotated end-over t bath at 25.00 ^c i vertically to settle. San td sln were the	AUXILIARY I AUXILIARY I was prepared above 25°C about 1 g of a solubility This tube c-end in the C for 24-48h to allow the aples of the ben analysed evaporation-	NFORMATION SOURCE A Anhydro describ ESTIMATE Precisi	ND PURITY OF us LiClO ₄ wa ed in ref. 1 D ERROR:	MATERIALS: 8 prepared a
b Compiles METHOD/APP/ A satd sir at a tempe and sealed the anhydr tube, capa was then a thermostat and stood solids to clear sat for solute 250°C in	ARATUS/PROCEDURE a of the salt erature slightly d together with rous salt in a acity 18-20 cm ³ . rotated end-over t bath at 25.00 ⁶ d vertically to settle. San td sln were th	AUXILIARY I AUXILIARY I was prepared about 1 g of about 1 g of about 1 g of this tube r-end in the C for 24-48h to allow the aples of the evaporation- tr dried with	NFORMATION SOURCE A Anhydro describ ESTIMATE Precisi	ND PURITY OF us LiClO ₄ wa ed in ref. 1 D ERROR:	MATERIALS: B prepared a
b Compiles METHOD/APP/ A satd sir at a tempe and sealed the anhydr tube, capa was then n thermostat and stood solids to clear sat for solute 250°C in P ₂ O ₅ . Do were made	ARATUS/PROCEDURE a of the salt erature slightly d together with rous salt in a acity 18-20 cm ³ . rotated end-over t bath at 25.00 ⁶ i vertically to settle. San td sln were the content by an a current of ai uplicate soly de t those analys	AUXILIARY I AUXILIARY I above 25°C about 1 g of solubility This tube c-end in the c-end in the c-end in the c-end in the c-end in the c	NFORMATION SOURCE A Anhydro describ ESTIMATE Precisi	ND PURITY OF us LiClO ₄ wa ed in ref. 1 D ERROR: on in temp.	MATERIALS: B prepared a
^b Compiles METHOD/APPA A satd sin at a tempe and sealed the anhydr tube, capa was then n thermostat and stood solids to clear sat for solute 250°C in P ₂ O ₅ . Do were made, chloride	ARATUS/PROCEDURE a of the salt erature slightly together with rous salt in a acity 18-20 cm ³ . rotated end-over t bath at 25.00 ⁶ i vertically to settle. San td sln were the content by an a current of ai uplicate soly de	AUXILIARY I AUXILIARY I above 25°C about 1 g of solubility This tube c-end in the C for 24-48h to allow the aples of the nen analysed evaporation- tr dried with eterminations tes in which ecomposition)	NFORMATION SOURCE A Anhydro describ ESTIMATE Precisi REFEREN 1. Wil	ND PURITY OF us LiClO ₄ wa ed in ref. 1 D ERROR: on in temp. CES: lard, H.H.;	MATERIALS: B prepared <i>a</i> was ±0.01 °C Smith, G.F.
^b Compiles METHOD/APPA A satd sin at a tempe and sealed the anhydr tube, capa was then n thermostat and stood solids to clear sat for solute 250°C in P ₂ O ₅ . Do were made, chloride	ARATUS/PROCEDURE a of the salt erature slightly I together with cous salt in a acity 18-20 cm ³ . cotated end-over t bath at 25.00 ⁶ i vertically t b settle. San td sln were the content by an a current of ai uplicate soly de those analys (from thermal de	AUXILIARY I AUXILIARY I above 25°C about 1 g of solubility This tube c-end in the C for 24-48h to allow the aples of the nen analysed evaporation- tr dried with eterminations tes in which ecomposition)	NFORMATION SOURCE A Anhydro describ ESTIMATE Precisi REFEREN 1. Wil	ND PURITY OF us LiClO ₄ wa ed in ref. 1 D ERROR: on in temp. CES: lard, H.H.;	MATERIALS: B prepared a was ±0.01 °C

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COMPONENTS:	ORIGINAL MEASUREMENTS:	
. (1) Lithium perchlorate; LiClO ₄ ; {7791-03-9}	Simmons, J.P.; Ropp, C.D.L.	
(2) Water; H ₂ O; [7732-18-5]	J. Am. Chem. Soc. <u>1928</u> , 50, 1650-3.	
VARIABLES:	PREPARED BY:	
Temperature: 273 - 445 K.	C.Y. Chan	

EXPERIMENTAL VALUES:

Solubility of $LiClO_4$ in water at various temperatures:

t / °C	T ^a / K	mass %	mol X ^a	molality ^a /mol kg ⁻¹	Solid phase
0.0	273.2	29.90	6.736	4.009	LiCl04.3H20
10.0	283.2	32.88	7.660	4.604	7 2
20.0	293.2	35.95	8.679	5.276	**
25.0	298.2	37.48	9.216	5.635	**
30.0	303.2	38.87	9.721	5.977	**
40.0	313.2	41.97	10.911	6.798	**
64.6	337.8	50.0	14.48	9.40	*1
77.9	351.1	55.0	17.15	11.49	н
89.2	362.4	60.0	20.26	14.10	**
92.3	365.5	62.5	22.01	15.67	
94.3	367.5	65.0	23.92	17.46	"
95.1	368.3	66.32	25.01	18.51	**
94.8	368.0	66.67	25.30	18.80	H j
93.2	366.4	70.0	28.3	21.9	**
92.7	365.9	70.3	28.6	22.2	**
92.5	365.7	70.33	28.64	22.28	14
93.2	366.4	70.5	28.8	22.5	LiClO ₄ .H ₂ O
97.3	370.5	71.0	29.3	23.0	
108.9	382.1	72.8	31.2	25.2	н
120.7	393.9	75.0	33.7	28.2	
136.9	410.1	80.0	40.4	37.6	
144.0	417.2	82.5	44.4	44.3	
148.5	421.7	85.0	49.0	53.3	**
149.3	422.5	87.5	54.2	65.8	**
144.2	417.4	90.0	60.4	84.6	**
167.5	440.7	91.04	63.24	95.50	LiClO ₄
172.0	445.2	91.11	63.44	96.33	

^a Compiler's calculations.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Soly measurements at the lower temperatures were carried out by agitating an excess of anhydrous salt with water in a soly tube in a thermostat until constancy in concentration was reached at the set temperature. These determinations were supplemented by results obtained by sealing known amounts of the anhydrous salt and water SOURCE AND PURITY OF MATERIALS: Anhydrous LiClO₄ was made using Richards and Willard's method (ref. 1). Two analyses using a modification of Lamb's method (ref. 2) gave values of 100.10 % and 100.15 % LiClO₄ purity.

ESTIMATED ERROR: Temp. \pm 0.1 ^OC; soly precision better than \pm 0.1% (compiler). (continued next page)

	25
COMPONENTS: (1) Lithium perchlorate; LiClO ₄ ; [7791-03-9] (2) Alcohols: (A) Methanol (methyl alcohol); CH_4O ; [67-56-1] (B) Ethanol (ethyl alcohol); C_2H_6O ; [64-17-5] (C) 1-Propanol (n-propyl alcohol); C_3H_8O ; [71-23-8] (D) 1-Butanol (n-butyl alcohol); $C_4H_{10}O$; [71-36-3] (E) 2-Methyl-1-propanol (iso- butyl alcohol); $C_4H_{10}O$; [78-83-1]	ORIGINAL MEASUREMENTS: Willard, H.H.; Smith, G.F. <i>J. Am. Chem. Soc.</i> <u>1923</u> , 45, 286-96.
VARIABLES: One temperature: 298.15 K	PREPARED BY: C.Y. Chan
EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ in various alco soly in : methanol ethanol g/100 g sin : 64.57 60.28 $g/100 \text{ cm}^{-3} \text{ sin}$: 89.44 79.41 g/100 g solvent : 182.25 151.76 mol % b : 35.44 39.66 mol dm ⁻³ : 8.406 7.463 mol kg ⁻¹ b : 17.130 14.265 A In terms of the anhydrous salt which b Compiler's calculations.	1-propanol 1-butanol 2-methyl- 1-propanol 51.22 44.23 36.73 61.49 49.25 38.94 105.00 79.31 58.05 37.23 35.59 28.80 5.779 6.646 3.660 9.870 7.454 5.457
AUXILIARY IN	FORMATION
METHOD/APPARATUS/PROCEDURE: A satd sin of the salt was prepared at a temperature slightly above 25 ^o C and sealed together with about 1 g of the anhydrous salt in a solubility tube, capacity 18-20 cm ³ . This tube was then rotated end-over-end in the	SOURCE AND PURITY OF MATERIALS: Lithium perchlorate trihydrate was prepared as described in ref.1. Alcohols were purified by reflux- ing with calcium and fractional distillation. (continued next page)

26					
COMPONENTS: (1) Lithium perchlor [7791-03-9] (2) Alcohols: (A) Methanol (me $CH_4O; [67-56]$ (B) Ethanol (eth $C_2H_6O; [64-1]$ (C) 1-Propanol ($C_3H_8O; [71-2]$ (D) 1-Butanol (me $C_4H_{10}O; [71-2]$ (E) 2-Methyl-1-p butyl alcoho [78-83-1]	ethyl a. -1] nyl alco .7-5] n-prop :3-8] -butyl -36-3] propanol	lcohol); ohol); yl alcohol) alcohol); l (iso-	Willard, <i>J. Am. C.</i> 286-96	1EASUREMENTS H.H.; Smith hem. Soc. <u>1</u>	, G.F.
EXPERIMENTAL VALUES:		nued) ethanol	1-propanol	1-butanol	2-methyl-
satd sln density/g cm ⁻³ : 1. pure solvent density/g cm ⁻³ : 0.			1.2006	0.8059	1-propanol 1.0602
METHOD/APPARATUS/PROC thermostat bath at 2 and stood vertical solids to settle. clear satd sln wer for solute content b	EDURE: 5.00°C ly to Sampl e ther	for 24-48h allow the les of the n analysed		•	as <u>+</u> 0.01 ⁰ C.
to-dryness method us making sure that org completely removed was dried to constan in a current of air Duplicate soly det made, those analys ride (from thermal d found present being	anic so before t weigh dried erminat es in v lecompos	olvent was the salt at $250^{\circ}C$ with P_2O_5 . tions were which chlo- sition) was	REFERENCES 1. Willan J. Am 2816.	S: rd, H.H.; Sm . <i>Chem.Soc.</i>	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Lithium perchlorate; LiClO ₄ ;	Simmons, J.P.; Ropp, C.D.L.
<pre>(7791-03-9) (2) Water; H₂O; [7732-18-5]</pre>	J. Am. Chem. Soc. <u>1928</u> , 50,
	1650-3.

EXPERIMENTAL VALUES: (continued)

COMMENTS AND/OR ADDITIONAL DATA

Densities of the saturated solutions at the lower temperatures were made by weighing a known volume of each.

Densities of saturated solutions of LiClO₄

t /	°c :	0	10	20	25	30	40	
density / g cm	-3 :	1.215	1.236	1.258	1.269	1.277	1.300	

Saturated solutions of $LiClO_4$ cooled from temperatures between 0 $^{\circ}C$ to 90 $^{\circ}C$, approximately, yielded hydrates which, after careful drying between filter papers, showed upon analysis a water content of 33.90 %, (theoretical value for the trihydrate is 33.68 %). A powdered quantity of the trihydrate placed in a desicator over the anhydrous salt for six weeks yielded a lower hydrate. Determinations of the water content of this hydrate were made at frequent intervals until a constant value of 14.52 % was obtained. The theoretical value of the water content of the monohydrate is 14.48 %.

The transition temperature for $LiClO_4.3H_2O = LiClO_4.H_2O$ was 92.53 °C.

The transition temperature for $LiClO_4.H_2O = LiClO_4$ was 145.75 °C.

The melting point of the trihydrate was 95.1 $^{\circ}$ C while that for the monohydrate was 149 $^{\circ}$ C.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: (continued)

in a tube immersed in water and gradually heating until the solid phase disappeared. The tube was cooled until hydrate crystallized out. The temperature was then carefully raised 0.1 $^{\circ}$ C at a time, with constant agitation, and the temperature noted at which the last trace of solid phase disappeared. This latter method was used for the measurements at the higher temperatures.

REFERENCES:

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- 2. Lamb; Marden J. Am. Chem. Soc. <u>1912</u>, 34, 812.

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COMPONENTS:		ORIGINAL	MEASUREMENT	S:	
(1) Lithium perchlorat	e; LiClO ₄ ;	Markowit	z, M.M.; Ha	wley, W.N.	;
[7791-03-9]		Boryta	, D.A.; Har	ris, R.F.	
(2) Alcohols :					
(A) 1,2-ethanediol	(ethylene	J. Chem.	Eng. Data	<u>1961</u> , 6,	1
glycol); C ₂ H ₆ O	2; [107-21-1]	325-7.	,		
(B) 2-propanol (<i>is</i>	opropyl				
alcohol); C ₃ H ₈	0; [67-63-0]				
(C) 2-methyl-2-pro	panol				
(t-butyl alcoh	<i>ol</i>); C ₄ H ₁₀ O;				
[75-65-0]					
(D) 2-butanol (<i>sec</i>	-butyl				
alcohol); C ₄ H ₁	₀ 0; [78-92-2]				
(E) Cyclohexanol;	C ₆ H ₁₂ O;				
[108-93-0]					
(F) Benzenemethano	l (benzyl				
alcohol); C ₇ H ₈	D; [100-51-6]				
(G) 1-octanol; C ₈ H	18 ⁰ ;				
[111-87-5]					
(H) 2-octanol; C ₈ H	18 ⁰ ;				
[123-96-6]					
VARIABLES:	5 1/	PREPARED			
VARIABLES: One temperature: 298.1 EXPERIMENTAL VALUES:	5 K	C.Y. Cha			
One temperature: 298.1 EXPERIMENTAL VALUES: Solubility [®] of LiClO ₄	in various alco	C.Y. Cha bhols at 25	5.00 ⁰ C :		
One temperature: 298.11 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent	in various alco g/100g solvent	C.Y. Cha phols at 25 mol X	n 5.00°C : mol kg ^{-1 t}		
One temperature: 298.1 EXPERIMENTAL VALUES: Solubility [®] of LiClO ₄ solvent (A) ethylene glycol	in various alco g/100g solvent 96.7 <u>+</u> 0.4	C.Y. Cha phols at 25 mol X 36.1	n .00°C : mol kg ^{-1 t} 9.09	Method	
One temperature: 298.1 EXPERIMENTAL VALUES: Solubility [®] of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol	in various alco g/100g solvent 96.7 <u>+</u> 0.4 112.1 <u>+</u> 0.1	C.Y. Cha phols at 25 mol % 36.1 38.8	n 5.00 [°] C : mol kg ^{-1 k} 9.09 10.54		I
One temperature: 298.1 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol	in various alco g/100g solvent 96.7 <u>+</u> 0.4 112.1 <u>+</u> 0.1 0.6	C.Y. Cha phols at 25 mol % 36.1 38.8 0.4	5.00 [°] C : mol kg ^{-1 k} 9.09 10.54 0.06	Method "	I I II
One temperature: 298.1 EXPERIMENTAL VALUES: Solubility [®] of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol	in various alco g/100g solvent 96.7 <u>+</u> 0.4 112.1 <u>+</u> 0.1 0.6	C.Y. Cha phols at 25 mol % 36.1 38.8 0.4	5.00 [°] C : mol kg ^{-1 k} 9.09 10.54 0.06	Method	II
One temperature: 298.1 EXPERIMENTAL VALUES: Solubility [®] of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous sa	C.Y. Cha phols at 25 mol X 36.1 38.8 0.4 34.9	5.00 [°] C : mol kg ^{-1 k} 9.09 10.54 0.06	Method "	I I II
One temperature: 298.11 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol (D) sec-butyl alcohol ^a The solid phase was t	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous sa	C.Y. Cha phols at 25 mol % 36.1 38.8 0.4 34.9 .1t.	5.00 [°] C : mol kg ^{-1 k} 9.09 10.54 0.06	Method "	I I II
One temperature: 298.11 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol (D) sec-butyl alcohol a The solid phase was to b Compiler's calculation	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous satisfies AUXILIARY IN	C.Y. Cha phols at 25 mol X 36.1 38.8 0.4 34.9 .lt.	5.00°C : mol kg ^{-1 k} 9.09 10.54 0.06	Method " "	
One temperature: 298.1 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol (D) sec-butyl alcohol ^a The solid phase was t	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous satisfies AUXILIARY IN URE:	C.Y. Cha phols at 25 mol % 36.1 38.8 0.4 34.9 lt.	5.00°C : mol kg ^{-1 k} 9.09 10.54 0.06 7.25	Method """"""""""""""""""""""""""""""""""""	
One temperature: 298.11 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol (D) sec-butyl alcohol a The solid phase was to b Compiler's calculation METHOD/APPARATUS/PROCED	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous satisfies AUXILIARY IN URE: ent was deter-	C.Y. Cha phols at 25 mol % 36.1 38.8 0.4 34.9 lt. FORMATION SOURCE AN Anhydrou	5.00°C : mol kg ^{-1 k} 9.09 10.54 0.06 7.25 ID PURITY OF	Method " " " " " " " " " " " " " " " " "	I I I I I I I I I I I I I I I I I I I
One temperature: 298.11 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol (D) sec-butyl alcohol (D) sec-butyl alcohol ^a The solid phase was a ^b Compiler's calculation METHOD/APPARATUS/PROCED Method I: Solute conterval	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous satisfies AUXILIARY IN URE: ent was deter- in perchlorate.	C.Y. Cha phols at 25 mol X 36.1 38.8 0.4 34.9 It.	5.00°C : mol kg ^{-1 k} 9.09 10.54 0.06 7.25 D PURITY OF is lithium pe	Method "" " " MATERIALS srchlorate	i I I I
One temperature: 298.11 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol (D) sec-butyl alcohol a The solid phase was the b Compiler's calculation METHOD/APPARATUS/PROCED Method I: Solute contour mined by pptn as nitros	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous satisfies AUXILIARY IN URE: ent was deter- in perchlorate. tent was de-	C.Y. Cha phols at 25 mol X 36.1 38.8 0.4 34.9 At.9 Anhydrou prepared precipit rate. A	In 5.00°C : mol kg ^{-1 k} 9.09 10.54 0.06 7.25 ID PURITY OF Is lithium per i (ref. 1) and cation as nither in allysis show	Method " " " " " MATERIALS schlorate ad analyse tron perc wed 93.7 %	i I I I i was was was was
One temperature: 298.11 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol (D) sec-butyl alcohol (D) sec-butyl alcohol A The solid phase was the b Compiler's calculation METHOD/APPARATUS/PROCED Method I: Solute content mined by pptn as nitron	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous satisfies AUXILIARY IN URE: ent was deter- in perchlorate. tent was de- conversion of	C.Y. Cha phols at 25 mol X 36.1 38.8 0.4 34.9 At.9 Anhydrou prepared precipit rate. A	<pre>in i</pre>	Method " " " " " MATERIALS schlorate ad analyse tron perc wed 93.7 %	i I I I i i was was was was
One temperature: 298.11 EXPERIMENTAL VALUES: Solubility ^a of LiClO ₄ solvent (A) ethylene glycol (B) isopropyl alcohol (C) t-butyl alcohol (D) sec-butyl alcohol (D) sec-butyl alcohol Method I: Solute contour Method II: Solute contour Method II: Solute contour termined as AgCl after	in various alco g/100g solvent 96.7 ± 0.4 112.1 ± 0.1 0.6 77.1 ± 0.1 the anhydrous sature the anhydrous sature AUXILIARY IN URE: ent was deter- in perchlorate. tent was de- conversion of with anhydrous	C.Y. Cha phols at 25 mol X 36.1 38.8 0.4 34.9 At.9 At.9 Mathematical SOURCE AN Anhydrou prepared precipit rate. A Cl04 (th	In 5.00°C : mol kg ^{-1 k} 9.09 10.54 0.06 7.25 ID PURITY OF Is lithium per i (ref. 1) and cation as nither in allysis show	Method " " " " " " " " " " " " " " " " " " "	i I I I i i was was was was

COMPONENTS:		ORIGINAL	MEASUREMENTS	5:
(1) Lithium perchlor	ate; LiClO ₄ ;	Markowit	z, M.M.; Haw	ley, W.N.;
[7791-03-9]	-	Boryta	a, D.A.; Harr	is, R.F.
(2) Alcohols :				
(A) 1,2-ethanedi	ol (<i>ethylene</i>	J. Chem	. Eng. Data	<u>1961,</u> 6,
glycol); C ₂ H	6 ⁰ 2; [107-21-1]	325-7.	,	
(B) 2-propanol (isopropyl			
alcohol); C ₃ 1	H ₈ 0; [67-63-0]			
(C) 2-methyl-2-p	ropanol			
(t-butyl alc	ohol); C ₄ H ₁₀ O;			
[75-65-0]				
(D) 2-butanol (s				
-	H ₁₀ 0; [78-92-2]			
(E) Cyclohexanol	; ^C 6 ^H 12 ^O ;			
[108-93-0]				
(F) Benzenemethan				
	H ₈ 0; [100-51-6]			
(G) 1-octanol; C_{g}	^{8ⁿ18⁰;}			
[111-87-5]	4	1		
(H) 2-octanol; C _g [123-96-6]	8*180;			
[120-30-0]				·····
VARIABLES:		PREPARED	BY:	
One temperature: 298	.15 K	C.Y. Cha	n	
		ohols at 25	6.00°C :	
EXPERIMENTAL VALUES: (Solubility ^a of LiCl(D ₄ in various alc g/100g solven	t mol %	mol kg ^{-1 b}	Analysis
Solubility ^a of LiCl(solvent (E) cyclohexanol	0 ₄ in various alc g/100g solven 5.9 <u>+</u> 0.1	t mol % 5.3	mol kg ⁻¹ b 0.55	
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol	04 in various alc g/100g solven 5.9 ± 0.1 49.8 ± 0.3	t mol % 5.3 33.6	mol kg ⁻¹ b 0.55 4.68	Method I " I
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol	04 in various alc g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1	t mol % 5.3 33.6 34.9	mol kg ^{-1 b} 0.55 4.68 4.12	Method I " I " I
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol	04 in various alc g/100g solven 5.9 ± 0.1 49.8 ± 0.3	t mol % 5.3 33.6 34.9	mol kg ⁻¹ b 0.55 4.68	Method I " I " I
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol	$\begin{array}{c} 0_4 \text{ in various alc} \\ g/100g \text{ solven} \\ 5.9 \pm 0.1 \\ 49.8 \pm 0.3 \\ 43.8 \pm 0.1 \\ 44.7 \pm 0.2 \end{array}$	t mol % 5.3 33.6 34.9 35.4	mol kg ^{-1 b} 0.55 4.68 4.12	Method I " I " I " I
Bolvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol	$\begin{array}{c} 0_4 \text{ in various alc} \\ g/100g \text{ solven} \\ 5.9 \pm 0.1 \\ 49.8 \pm 0.3 \\ 43.8 \pm 0.1 \\ 44.7 \pm 0.2 \end{array}$	t mol % 5.3 33.6 34.9 35.4 alt. b	mol kg ^{-1 b} 0.55 4.68 4.12 4.20 Compiler's c	Method I " I " I " I
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol	D_4 in various ald g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 s the anhydrous s AUXILIARY I	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN	mol kg ^{-1 b} 0.55 4.68 4.12 4.20 Compiler's c (continued)	Method I " I " I alculations MATERIALS:
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol a The solid phase was METHOD/APPARATUS/PROCE Three determinations	D_4 in various ald g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 s the anhydrous s AUXILIARY I EDURE: were made from	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN Solvents	mol kg ⁻¹ b 0.55 4.68 4.12 4.20 Compiler's c (continued) D PURITY OF E,F and G	Method I " I " I alculations MATERIALS: were furth
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol a The solid phase was METHOD/APPARATUS/PROCE Three determinations two separate samples.	D_4 in various ald g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 s the anhydrous s AUXILIARY I EDURE: were made from . Constancy of	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN Solvents purified	mol kg ⁻¹ b 0.55 4.68 4.12 4.20 Compiler's c (continued) D PURITY OF E,F and G by fraction	Method I " I " I alculations MATERIALS: were furth al distill
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol METHOD/APPARATUS/PROCE Three determinations two separate samples. density or of refract	D_4 in various alc g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 as the anhydrous s AUXILIARY I EDURE: were made from . Constancy of tive index was	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN Solvents purified tion aft	mol kg ⁻¹ b 0.55 4.68 4.12 4.20 Compiler's c (continued) D PURITY OF E,F and G by fraction er drying ov	Method I " I " I alculations MATERIALS: were furth al distill
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol ^a The solid phase was METHOD/APPARATUS/PROCE Three determinations two separate samples density or of refract taken as the criterio	D_4 in various ald g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 Is the anhydrous s AUXILIARY I SDURE: were made from . Constancy of tive index was on for satura-	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN Solvents purified tion aft	mol kg ⁻¹ b 0.55 4.68 4.12 4.20 Compiler's c (continued) D PURITY OF E,F and G by fraction	Method I " I " I alculations MATERIALS: were furth al distill
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol a The solid phase was METHOD/APPARATUS/PROCE Three determinations two separate samples. density or of refract taken as the criteric tion equilibrium.	D_4 in various ald g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 Is the anhydrous s AUXILIARY I EDURE: were made from . Constancy of tive index was on for satura- No details of	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN Solvents purified tion aft calcium	mol kg ⁻¹ b 0.55 4.68 4.12 4.20 Compiler's c (continued) D PURITY OF E,F and G by fraction er drying ov sulfate.	Method I " I " I alculations MATERIALS: were furth al distill
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol ^a The solid phase was METHOD/APPARATUS/PROCE Three determinations two separate samples density or of refract taken as the criterio	D_4 in various ald g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 Is the anhydrous s AUXILIARY I EDURE: were made from . Constancy of tive index was on for satura- No details of	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN Solvents purified tion aft calcium ESTIMATED	mol kg ⁻¹ b 0.55 4.68 4.12 4.20 Compiler's c (continued) D PURITY OF E,F and G by fraction er drying ov sulfate.	Method I " I " I alculations MATERIALS: were furth al distill er anhydro
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol a The solid phase was METHOD/APPARATUS/PROCE Three determinations two separate samples. density or of refract taken as the criteric tion equilibrium.	D_4 in various ald g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 Is the anhydrous s AUXILIARY I EDURE: were made from . Constancy of tive index was on for satura- No details of	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN Solvents purified tion aft calcium ESTIMATED	mol kg ⁻¹ b 0.55 4.68 4.12 4.20 Compiler's c (continued) D PURITY OF E,F and G by fraction er drying ov sulfate.	Method I " I " I " I alculations MATERIALS: were furth al distill er anhydro
Solubility ^a of LiClo solvent (E) cyclohexanol (F) benzyl alcohol (G) 1-octanol (H) 2-octanol a The solid phase was METHOD/APPARATUS/PROCE Three determinations two separate samples. density or of refract taken as the criteric tion equilibrium.	D_4 in various ald g/100g solven 5.9 ± 0.1 49.8 ± 0.3 43.8 ± 0.1 44.7 ± 0.2 Is the anhydrous s AUXILIARY I EDURE: were made from . Constancy of tive index was on for satura- No details of	t mol % 5.3 33.6 34.9 35.4 alt. b NFORMATION SOURCE AN Solvents purified tion aft calcium ESTIMATED	mol kg ⁻¹ b 0.55 4.68 4.12 4.20 Compiler's c (continued) D PURITY OF E,F and G by fraction er drying ov sulfate.	Method I " I " I alculations MATERIALS: were furth al distill er anhydro

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Lithium perchlorate; LiClO₄; Markowitz, M.M.; Hawley, W.N.; [7791-03-9] Boryta, D.A.; Harris, R.F. (2) Amines : (A) 1,2-ethanediamine (ethylene-J. Chem. Eng. Data <u>1961</u>, 6, 325-7. diamine); C₂H₈N₂; [107-15-3] (B) 1-propanamine (n-propylamine); C₃H₉N; [107-10-8] (C) 1-butanamine (n-butylamine); C4H11N; [109-73-9] (D) 2-butanamine (sec-butylamine); $C_4H_{11}N$; [13952-84-6] (E) 2-methyl-2-propanamine; $C_4H_{11}N$; [75-64-9] (F) Pyridine; C₅H₅N; [110-86-1] (G) Benzenamine (aniline); C₆H₇N; [62-53-3] (H) Cyclohexanamine (cyclohexylamine); C₆H₁₂N; [108-91-8] (I) N-methylbenzenamine (N-methylaniline); C7H9N; [100-61-8] (J) N-butyl-1-butanamine (*dibutylamine*); C₈H₁₉N; {111-92-2} VARIABLES: PREPARED BY: C.Y. Chan One temperature: 298.15 K **EXPERIMENTAL VALUES:** Solubility^a of LiClO₄ at 25.00°C : mol kg^{-1 b} solvent mol % g/100g solvent Analysis (A) ethylenediamine 48.0 ± 0.3 21.3 4.51 Method I н (B) n-propylamine 59.1 ± 0.3 24.7 5.56 II (C) n-butylamine 45.7 ± 0.3 23.9 4.30 Ι (D) sec-butylamine ## 45.7 ± 0.2 4.30 23.9 Ι ^A The solid phase was the anhydrous salt. ^b Compiler's calculations. AUXILIARY INFORMATION **METHOD/APPARATUS/PROCEDURE:** SOURCE AND PURITY OF MATERIALS: Method I: Solute content was deter-Anhydrous lithium perchlorate was mined by pptn as nitron perchlorate. prepared (ref. 1) and analysed by Method II: Solute content was deprecipitation as nitron perchlotermined as AgCl after conversion of rate. Analysis showed 93.7 % in perchlorate by fusion with anhydrous ClO_4 (theoretical 93.5 %). Na₂CO₃ in a Pt crucible. Solvents were reagent grade. Solvents B,C,D,E,F,G and H were Three determinations were made from (continued next page)

COMPONENTS:		ORIGINAL	MEASUREMENTS	5:	
(1) Lithium perchlora	te; LiClO ₄ ;	Markowit	z, M.M.; Haw	ley, W.N	•;
[7791-03-9]		Boryta	., D.A.; Harr	is, R.F.	
(2) Amines :					
(A) 1,2-ethanedia	mine (<i>ethylene-</i>	J. Chem.	Eng. Data	<u>1961</u> , 6	,
diamine); C ₂ H	1 ₈ N ₂ ; [107-15-3]	325-7.			
(B) 1-propanamine	(n-propyl-				
amine); C ₃ H ₉ N	; [107-10-8]				
(C) 1-butanamine					
C ₄ H ₁₁ N; [109-	73-9]				
	(sec-butylamine);	C4H11N; (13952-84-6}		
	opanamine; C ₄ H ₁₁ N				
(F) Pyridine; C ₅ H					
•	aniline); C ₆ H ₇ N;	[62-53-3]			
	ne (cyclohexylami		N: [108-91-8	1	
	enamine (N-methyla				
	anamine (<i>dibutyla</i>		• •		
		mrue), 080	19", [111-52		
EXPERIMENTAL VALUES: (continued)				
	Solubility ^a of	LiClo ₄ a	t 25.00°C :		
solvent	g/100g solvent	mol X	mol kg ⁻¹ b	Analy	sis
(E) t-butylamine	10.7 ± 0.3	6.8	1.01	Metho	dI
(F) pyridine	8.7 <u>+</u> 0.1	6.1	0.82	н	I
(G) aniline	6.1 ± 0.2	5.1	5.7		II
(H) cyclohexylamine	16.9 ± 0.1	13.6	1.59	"	11
(I) N-methylaniline	1.4 ± 0.1		0.13	"	II
(J) dibutylamine	45.6 <u>+</u> 0.4	35.6	4.29	**	II
^a The solid phase was ^b Compiler's calculat	ions.				
·····	AUXILIARY IN	FORMATION	(continued)		
METHOD/APPARATUS/PROCE two separate samples. density or of refract taken as the criterio tion equilibrium.	Constancy of ive index was n for satura- No details of	further distilla	D PURITY OF purified b tion after s calcium su	y fract: drying	ional
saturation method wer	e given.	ESTIMATED <u>+</u> 0.02 °C	ERROR:	ure.	<u></u>
REFERENCE: 1. Markowitz, M.M. J	7. Phys. Chem. <u>19</u>	5 <u>8</u> , <i>62</i> , 82	7.	.	

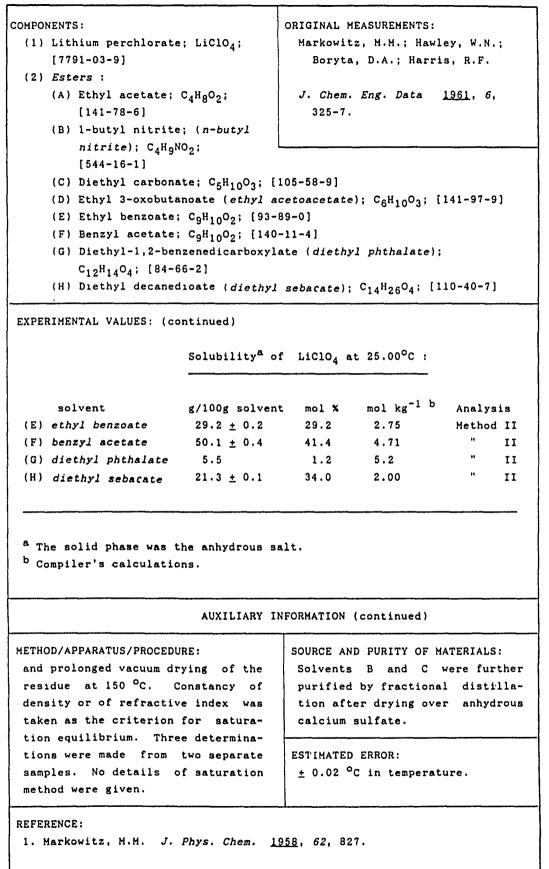
DRIGINAL MEASUREMENTS: Markowitz, M.M.; Hawley, W.N.; Boryta, D.A.; Harris, R.F. J. Chem. Eng. Data <u>1961</u> , 6, 325-7. PREPARED BY: C.Y. Chan
mol % molality ^b / mol kg ⁻¹ 38.0 10.217 11.1 1.10 33.2 5.64 30.3 3.02
ORMATION
SOURCE AND PURITY OF MATERIALS: Anhydrous lithium perchlorate was prepared (ref. 1) and analysed by precipitation as nitron perchlo- rate. Analysis showed 93.7 % in ClO_4 (theoretical 93.5 %). Solvents were reagent grade. ESTIMATED ERROR: \pm 0.02 ^O C in temperature.

COMPONENTS:					
		ORIGINAL MI	EASUREMENTS:	1	
(1) Lithium perchlorate;	LiClO ₄ ;	Markowitz	, M.M.; Hawl	ey, W.N.	;
[7791-03-9]		Boryta,	D.A.; Harri	s, R.F.	
(2) (A) Acetonitrile; C ₂ [75-05-8]	н ₃ и;	J. Chem. 3 325-7.	Eng. Data	<u>1961</u> , 6,	
(B) Benzonitrile; C ₇	H ₅ N;		· · · · · · · · · · · · · · · · · · ·		
[100-47-0]					
(C) Formamide; CH ₃ NO	; [75-12-7]				
(D) 2-aminoethanol;					
(E) N,N-dimethylform					
(F) Acetic anhydride					
(G) 2-ethoxyethanol;					
(H) 3-methylphenol;	C ₇ H ₈ O; [108-39	-4]			
VARIABLES:		PREPARED BY	 {:		
One temperature: 298.15	к	C.Y. Chan			
EXPERIMENTAL VALUES:					
	Solubility ^a of	LiClO ₄ at	25.00°C :		
solvent	g/100g solve		mol kg ^{-1 b}		
(A) acetonitrile(B) benzonitrile	16.3 ± 0.1	5.9	1.53	Metho "	
	21.9 ± 0.2	37.6			II
(C) formamide	142.1 ± 0.2 78.9 ± 0.9	••••	13.30		I
(D) 2-aminoethanol		31.2 34.0		**	I
(E) N,N-dimethylformami	de 75.0 <u>+</u> 0.2	34.0	1.05		1
					······,
^a The solid phase was th	e anhydrous sa	lt.			
^a The solid phase was th ^b Compiler's calculation		lt.			
^b Compiler's calculation	AUXILIARY IN	FORMATION			•
^b Compiler's calculation METHOD/APPARATUS/PROCEDUR	B. AUXILIARY IN E:	FORMATION SOURCE AND	PURITY OF H		
<pre>b Compiler's calculation METHOD/APPARATUS/PROCEDUR Method I : Solute conten</pre>	B. AUXILIARY IN E: t was deter-	FORMATION Source And Anhydrous	lithium per	chlorate	WAS
^b Compiler's calculation METHOD/APPARATUS/PROCEDUR <u>Method I</u> : Solute conten mined by pptn as nitron	AUXILIARY IN E: t was deter- perchlorate.	FORMATION SOURCE AND Anhydrous prepared	lithium per (ref. 1) and	chlorate l analyse	was d by
^b Compiler's calculation METHOD/APPARATUS/PROCEDUR <u>Method I</u> : Solute conten mined by pptn as nitron <u>Method II</u> : Solute conte	AUXILIARY IN E: t was deter- perchlorate. nt was de-	FORMATION SOURCE AND Anhydrous prepared precipita	lithium per (ref. 1) and tion as nitr	chlorate l analyse con perci	was d by hlo-
^b Compiler's calculation METHOD/APPARATUS/PROCEDUR <u>Method I</u> : Solute conten mined by pptn as nitron <u>Method II</u> : Solute conte termined as AgCl after c	AUXILIARY IN E: t was deter- perchlorate. nt was de- onversion of	FORMATION SOURCE AND Anhydrous prepared precipita rate. An	lithium per (ref. 1) and tion as nitr alysis showe	chlorate analyse con perc ed 93.7 %	was d by hlo-
^b Compiler's calculation METHOD/APPARATUS/PROCEDUR <u>Method I</u> : Solute conten mined by pptn as nitron <u>Method II</u> : Solute conte termined as AgCl after c perchlorate by fusion wi	AUXILIARY IN E: t was deter- perchlorate. nt was de- onversion of th anhydrous	FORMATION SOURCE AND Anhydrous prepared precipita rate. And ClO ₄ (the	lithium per (ref. 1) and tion as nitr alysis showe pretical 93.	cchlorate analyse con perc ad 93.7 % .5 %).	was d by hlo-
^b Compiler's calculation METHOD/APPARATUS/PROCEDUR <u>Method I</u> : Solute conten mined by pptn as nitron <u>Method II</u> : Solute conte termined as AgCl after c perchlorate by fusion wi Na ₂ CO ₃ in a Pt crucible.	AUXILIARY IN E: t was deter- perchlorate. nt was de- onversion of th anhydrous	FORMATION SOURCE AND Anhydrous prepared precipita rate. And ClO ₄ (the	lithium per (ref. 1) and tion as nitr alysis showe	cchlorate analyse con perc ad 93.7 % .5 %).	was d by hlo-
^b Compiler's calculation METHOD/APPARATUS/PROCEDUR <u>Method I</u> : Solute conten mined by pptn as nitron <u>Method II</u> : Solute conte termined as AgCl after c perchlorate by fusion wi Na ₂ CO ₃ in a Pt crucible. <u>Method III</u> : Solute cont	AUXILIARY IN E: t was deter- perchlorate. nt was de- onversion of th anhydrous ent was de-	FORMATION SOURCE AND Anhydrous prepared precipita rate. And ClO ₄ (the	lithium per (ref. 1) and tion as nitr alysis showe pretical 93.	cchlorate analyse con perc ad 93.7 % .5 %).	was d by hlo-
^b Compiler's calculation METHOD/APPARATUS/PROCEDUR <u>Method I</u> : Solute conten mined by pptn as nitron <u>Method II</u> : Solute conte termined as AgCl after c perchlorate by fusion wi Na ₂ CO ₃ in a Pt crucible.	AUXILIARY IN E: t was deter- perchlorate. nt was de- onversion of th anhydrous ent was de-	FORMATION SOURCE AND Anhydrous prepared precipita rate. And ClO ₄ (the	lithium per (ref. 1) and tion as nitr alysis showe pretical 93. were reagent	cchlorate analyse con perc ad 93.7 % .5 %).	was d by hlo- in

COMPONENTS: **ORIGINAL MEASUREMENTS:** Markowitz, M.M.; Hawley, W.N.; (1) Lithium perchlorate; LiClO₄; [7791-03-9] Boryta, D.A.; Harris, R.F. J. Chem. Eng. Data <u>1961</u>, 6, (2) (A) Acetonitrile; C₂H₃N; 325-7. [75-05-8] (B) Benzonitrile; C₇H₅N; [100-47-0] (C) Formamide; CH₃NO; [75-12-7] (D) 2-aminoethanol; C₂H₇NO; [141-43-5] (E) N, N-dimethylformamide; C₃H₇NO; [68-12-2] (F) Acetic anhydride; $C_4H_6O_3$; [108-24-7] (G) 2-ethoxyethanol; C₄H₁₀O₂; [110-80-5] (H) 3-methylphenol; C7H8O; [108-39-4] PREPARED BY: VARIABLES: One temperature: 298.15 K C.Y. Chan **EXPERIMENTAL VALUES:** Solubility^a of LiClO₄ at 25.00^oC : g/100g solvent mol X mol kg^{-1 b} solvent Analysis (F) acetic anhydride 8.1 7.2 0.76 Method III (G) 2-ethoxyethanol 136.6 ± 0.4 53.6 12.84 II ... (H) 3-methylphenol 142.1 ± 0.2 37.6 13.36 II ^a The solid phase was the anhydrous salt. ^b Compiler's calculations. AUXILIARY INFORMATION (continued) SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: and prolonged vacuum drying of the Solvents A,C,E,G,& H were further residue at 150 °C. Constancy of purified by fractional distilladensity or of refractive index was tion after drying over anhydrous taken as the criterion for saturacalcium sulfate. tion equilibrium. Three determinations were made from two separate **ESTIMATED ERROR:** \pm 0.02 °C in temperature. samples. No details of saturation method were given. **REFERENCE:** 1. Markowitz, M.M. J. Phys. Chem. 1958, 62, 827.

COMPONENTS: (1) Lithium perchlorate [7791-03-9] (2) Aldehydes and keton (A) Propanal (propin C_3H_60 ; [123-38-1 (B) Cyclopentanone; [120-92-3] (C) Cyclohexanone; (108-94-1] (D) Benzaldehyde; C. [100-52-7]	es : onaldehyde); 6] C ₅ H ₈ O; C ₆ H ₁₀ O;	ORIGINAL MEASUREMENTS: Markowitz, M.M.; Hawley, W.N.; Boryta, D.A.; Harris, R.F. J. Chem. Eng. Data <u>1961</u> , 6, 325-7.
VARIABLES:		PREPARED BY:
One temperature: 298.15	K	C.Y. Chan
EXPERIMENTAL VALUES:		
	Solubility ^a o	of $LiClO_4$ at 25.00°C.
solvent (A) propionaldehyde (B) cyclopentanone (C) cyclohexanone (D) benzaldehyde ^A The solid phase was th ^b Compiler's calculation		37.6 10.39 33.5 6.00 33.2 5.08 33.9 4.84
	AUXILIARY IN	FORMATION
METHOD/APPARATUS/PROCEDU Solute content was de AgCl after conversion of by fusion with anhydroun Pt crucible. Constant or of refractive index of the criterion for satur brium. No details of method were given. Thre tions were from two se ples.	etermined as f perchlorate s Na_2CO_3 in a cy of density was taken as ration equil- f saturation ee determina-	SOURCE AND PURITY OF MATERIALS: Anhydrous lithium perchlorate was prepared (ref. 1) and analysed by precipitation as nitron perchlo- rate. Analysis showed 93.7 % in ClO_4 (theoretical 93.5 %). Solvents were reagent grade. Solvents A, B and C were further purified by fractional distilla- tion after drying over anhydrous calcium sulfate. ESTIMATED ERROR: ± 0.02 °C in temperature.
REFERENCE: 1. Markowitz, M.M. J.	Phys. Chem. <u>19</u>	1

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Lithium perchlorate; LiClO₄; Markowitz, M.M.; Hawley, W.N.; [7791-03-9] Boryta, D.A.; Harris, R.F. (2) Esters : (A) Ethyl acetate; $C_4H_8O_2$; J. Chem. Eng. Data 1961, 6, 325-7. [141 - 78 - 6](B) 1-butyl nitrite; (n-butyl nitrite); C₄H₉NO₂; [544 - 16 - 1](C) Diethyl carbonate; C₅H₁₀O₃; [105-58-9] (D) Ethyl 3-oxobutanoate (ethyl acetoacetate); $C_6H_{10}O_3$; [141-97-9] (E) Ethyl benzoate; $C_{9}H_{10}O_{2}$; [93-89-0] (F) Benzyl acetate; $C_{9}H_{10}O_{2}$; [140-11-4] (G) Diethyl-1,2-benzenedicarboxylate (diethyl phthalate); $C_{12}H_{14}O_4$; [84-66-2] (H) Diethyl decanedioate (*diethyl sebacate*); C₁₄H₂₆O₄; [110-40-7] PREPARED BY: VARIABLES: C.Y. Chan One temperature: 298.15 K **EXPERIMENTAL VALUES:** Solubility^a of LiClO₄ at 25.00^oC : mol kg^{-1 b} solvent g/100g solvent mol X Analysis (A) ethyl acetate 44.1 8.94 95.1 Method II Ħ (B) n-butyl nitrite 3.4 3.2 III 0.32 (C) diethyl carbonate 52.6 ± 0.1 36.9 4.94 I н (D) ethyl acetoacetate 76.7 \pm 0.1 7.21 II 48.4 ^a The solid phase was the anhydrous salt. ^b Compiler's calculations. AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: Method I : Solute content was deter-Anhydrous lithium perchlorate was mined by pptn as nitron perchlorate. prepared (ref. 1) and analysed by Method II: Solute content was deprecipitation as nitron perchlotermined as AgCl after conversion of rate. Analysis showed 93.7 % in perchlorate by fusion with anhydrous ClO_4 (theoretical 93.5 %). Solvents were reagent grade. Na_2CO_3 in a Pt crucible. Method III: Solute content was determined by evaporation of solvent (continued next page)



		1			
COMPONENTS: (1) Lithium perchlorat [7791-03-9] (2) Ethers : (A) Methyl-oxirane oxide); C ₃ H ₆ O; (B) Tetrahydrofura [109-99-9] (C) 1,1'-oxybis-bu ether); C ₈ H ₁₈ O	e (<i>propylene</i> [75-56-9] an; C ₄ H ₈ O; atane (<i>n-butyl</i>	Markowit Boryta	MEASUREMENTS 22, M.M.; Haw 4, D.A.; Harr 5, Eng. Data	vley, W.N. ris, R.F.	
VARIABLES: One temperature: 298.1	.5 К	PREPARED C.Y. Cha	·		
EXPERIMENTAL VALUES:	Solubility ^a c	of LiClo ₄	at 25.00°C.		
solvent	g/100g solvent		8.59	' Analys Method	
 (A) propylene oxide (B) tetrahydrofuran (C) n-butyl ether ^A The solid phase was ^b Compiler's calculation 		14.3	2.55	••	
 (A) propylene oxide (B) tetrahydrofuran (C) n-butyl ether ^A The solid phase was 	27.1 ± 0.2 36.0 ± 0.2 the anhydrous set	14.3 			-

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Lithium perchlorate; LiClO₄; Willard, H.H.; Smith, G.F. [7791-03-9] (2) Acetone; C₃H₆O; [67-64-1] J. Am. Chem. Soc. 1923, 45, 286-96. PREPARED BY: VARIABLES: C.Y. Chan One temperature: 298.15 K **EXPERIMENTAL VALUES:** Solubility^a of lithium perchlorate in acetone at 25.00 $^{\circ}$ C, the solid phase being the anhydrous salt : satd sln g/100g mol % mol dm⁻³ mol kg⁻¹ $g/100 \text{ cm}^3$ density / g/100g g cm⁻³ sln sln solvent 136.52 42.70^a 7.1785 57.72 76.38 12.83^a 1.3233 ^a Compiler's calculations. AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: A satd sln of the salt was prepared Lithium perchlorate was prepared at a temperature slightly above 25°C as described in ref. 1. Acetone refluxed with powdered KOH and and sealed together with about 1 g of the anhydrous salt in a solubility purified by the bisulfite process. tube, capacity 18-20 cm³. This tube Its density was 0.7852 g cm^{-3} at was then rotated end-over-end in the 25 °C; b.p. 56.16-56.51 °C. thermostat bath at 25.00°C for 24-48h and stood vertically to allow the solids to settle. Samples of the clear satd sln were then analysed for solute content by an evaporation-todryness method using Pt crucibles. The salt was dried to constant wt. at 250°C in a current of air dried with ESTIMATED ERROR: P_2O_5 , after ensuring that organic Precision in temp. was $\pm 0.01^{\circ}$ C. solvent was removed completely enough to avoid any danger of explosion. Duplicate soly determinations were **REFERENCES:** made, those analyses in which chlo-1. Willard, H.H.; Smith, G.F. J. ride (from thermal decomposition) was Am. Chem. Soc. <u>1922</u>, 44, 2816. found present being rejected.

COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Lithium perchlorate; LiClO ₄	Markarenko, B.K.; Mendzheritskii
[7791-03-9]	E.A.; Sobolev, R.P.; Povarov,
(2) Tetrahydrofuran; C ₄ H ₈ O;	Yu.M.; Sereda, P.A.
[109-99-9]	Elektrokhimiya <u>1974</u> , 10, 355-8;
	*Soviet Electrochem. (Engl.
	Transl.), <u>1974</u> , <i>10</i> , 337-40.
VARIABLES:	PREPARED BY:
One temperature: 298.2 K	C.Y. Chan
EXPERIMENTAL VALUES:	

2.2 mol dm⁻³ and the specific conductivity of the saturated solution is 6.95×10^{-3} S cm⁻¹.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

No details of saturation method were given. The solubility was determined by polarographic analysis of the ions in the saturated solution. An MM34-04 conductivity meter was used to determine the specific conductivity of the solution. SOURCE AND PURITY OF MATERIALS: The perchlorate was recrystallized twice from aqueous solution and dried under vacuum at 150-160 °C for 20-25 hours. Tetrahydrofuran was dried for 5-7 days with metallic lithium. The saturated solution contained not more than 0.02 % water. Sources of starting materials not given.

ESTIMATED ERROR: Precision in temp. was ± 0.1 °C .

REFERENCES:

[779] (2) 1,1	TS: nium perchlon 91-03-9] '-oxybis-etha er); C ₄ H ₁₀ O;	ane (dieth	yl	Willard,	EASUREMENTS H.H.; Smith em. Soc. <u>1</u>	, G.F.
VARIABLES One temp	S: perature: 298	3.15 K		PREPARED B C.Y. Chan	Y:	
EXPERIMEN	NTAL VALUES:	······			<u></u>	
	ity of lithiu id phase beir				er at 25.00	
g/100g sln	g/100 cm ³ sln	g/100 g solvent	mol %	mol dm ⁻³	mol kg ⁻¹	satd sln density / g cm ⁻³
53.21	64.47	113.72	44.21	6.059 ^a	10.69 ^a	1.2116
		AUXI	LIARY IN	FORMATION		
A satd s at a ten and seal the anhy tube, ca was ther thermost and sto solids clear sa	PPARATUS/PROC sln of the aperature sli led together ydrous salt apacity 18-20 h rotated end tat bath at 2 bod vertical to settle. atd sln were content by a	CEDURE: salt was p ightly abov with about in a sol cm ³ . Th i-over-end 25.00°C for lly to al Samples then analy	repared e 25°C l g of ubility is tube in the 24-48h low the of the sed for	SOURCE AND Lithium pe as descr was puri P_2O_5 and The densit	ibed in rei fied by rei fractional d	was prepared f. 1. Ether fluxing with distillation. raction used
dryness The salt 250° C is P_2O_5 , as solvent to avoid Duplication made, the ride (for	method using t was dried t in a current after ensuri was removed id any dange te soly det hose analyse rom thermal c resent being	g Pt crucib to constant of air dri ing that completely ar of expl termination as in which decompositi	les. wt. at ed with organic enough osion. s were chlo-	REFERENCE: 1. Wills	n in temp. v S: rd, H.H.; S:	vas ±0.01 ⁰ C . mith, G.F. J. 1922, 44, 2816
_				1		

2						
COMPONEN				ORIGINAL ME	ASUREMENTS: .H.; Smith,	6 F
[77	91-03-9]	orate; LiClO	4;			
	yl acetate; 1-78-6]	C ₄ H ₈ O ₂ ;		J. Am. Che 286-96.	m. Soc. <u>19</u>	<u>23</u> , 45,
VARIABLE One tem	S: perature: 2	98.15 K		PREPARED BY C.Y. Chan	:	
EXPERIME	NTAL VALUES	:	L			
		ium perchlor ing the anhy			at 25.00°C	
g/100g sln	g/100cm ³ sln	g/100g solvent	mol X	mol dm^{-3}	mol kg ⁻¹	satd sln density / g cm ⁻³
48.75	63.40	95.12	44.06 ⁸	5.958	8.941 ^a	1.3005
	ler's calcu	lations. AUXII	LIARY IN	FORMATION		
	ler's calcu.	lations.				
METHOD/AI	PPARATUS/PR	AUXII		SOURCE AND		
METHOD/AN A satd a at a ter	PPARATUS/PR sln of the sperature s	AUXII	repared = 25 ⁰ C	SOURCE AND Lithium pe as descri	rchlorate bed in ref	was prepared . 1. Ethyl
METHOD/Al A satd a at a tem and sea the anh;	PPARATUS/PR sln of the sperature s led together ydrous salt	AUXII OCEDURE: salt was pi lightly above	repared = 25 ⁰ C 1 g of ubility	SOURCE AND Lithium pe as descri acetate wa P_2O_5 and f	rchlorate bed in ref s purified b ractional d	was prepared . 1. Ethyl by refluxing istillation.
METHOD/AL A satd a at a ter and sea the anh tube, ca was the	PPARATUS/PR sln of the sperature sl led togethen ydrous salt apacity 18-3 n rotated en	AUXII OCEDURE: salt was pu lightly above r with about in a solu	repared 25 ⁰ C 1 g of ubility is tube in the	SOURCE AND Lithium pe as descri acetate wa P_2O_5 and f Its densit	rchlorate bed in ref s purified b ractional d	was prepared . 1. Ethyl by refluxing istillation. was 0.8945
METHOD/AN A satd a at a ter and sea the anh tube, ca was ther thermost and sto	PPARATUS/PR sln of the sperature sl led together ydrous salt apacity 18-3 n rotated en tat bath at	AUXII OCEDURE: salt was pu lightly above r with about in a solu 20 cm ³ . Th: nd-over-end 25.00°C for ally to all	repared = 25 ^o C 1 g of ubility is tube in the 24-48h low the	SOURCE AND Lithium pe as descri acetate wa P_2O_5 and f Its densit	rchlorate bed in ref s purified b ractional d y at 25 ⁰ C	was prepared . 1. Ethyl by refluxing istillation. was 0.8945
METHOD/Al A satd a at a ter and sea the anhy tube, ca was ther thermost and sto solids clear sa	PPARATUS/PR sln of the sperature sl led together ydrous salt apacity 18-3 n rotated en tat bath at bod vertice to settle.	AUXII OCEDURE: salt was pu lightly above r with about in a solu 20 cm ³ . Th: nd-over-end 25.00°C for ally to all	repared = 25°C 1 g of ubility is tube in the 24-48h low the of the sed for	SOURCE AND Lithium pe as descri acetate wa P_2O_5 and f Its densit	rchlorate bed in ref s purified b ractional d y at 25 ⁰ C	was prepared . 1. Ethyl by refluxing istillation. was 0.8945
METHOD/AN A satd a at a ter and sea the anh tube, ca was then thermost and sta solids clear sa solute o dryness	PPARATUS/PR sln of the sperature sl led together ydrous salt apacity 18-3 n rotated en tat bath at to settle atd sln were content by method usin	AUXII OCEDURE: salt was pulightly above r with about in a solu 20 cm ³ . Thi nd-over-end 25.00 ^o C for ally to all . Samples e then analys	repared = 25 ^o C 1 g of ubility is tube in the 24-48h low the of the sed for lon-to- les.	SOURCE AND Lithium pe as descri acetate wa P_2O_5 and f Its densit	rchlorate bed in ref s purified b ractional d y at 25 ⁰ C	was prepared . 1. Ethyl by refluxing istillation. was 0.8945
METHOD/AI A satd a at a ter and sea the anh tube, ca was ther thermost and sto solids clear sa solute c dryness The salt 250°C 5	PPARATUS/PR sln of the sperature sl led together ydrous salt apacity 18-3 n rotated en tat bath at bod vertice to settle atd sln were content by method usin t was dried in a current after ensu	AUXII OCEDURE: salt was pulightly above r with about in a solu 20 cm ³ . This nd-over-end 25.00°C for ally to all . Samples then analyse an evaporation	repared = 25°C 1 g of ubility is tube in the 24-48h low the of the sed for lon-to- les. wt. at ed with organic	SOURCE AND Lithium pe as descri acetate wa P_2O_5 and f Its densit g cm ⁻³ ; b.;	rchlorate bed in ref s purified b ractional d y at 25 ⁰ C p. 77.14 -	was prepared . 1. Ethyl by refluxing istillation. was 0.8945 77.16 ^o C.
METHOD/All A satd a at a ter and seal the anhy tube, ca was then thermost and sta solids clear sa solute of dryness The sall $250^{\circ}C$ P_2O_5 , a solvent to avo:	PPARATUS/PR sln of the sperature sl led together ydrous salt apacity 18-3 h rotated en tat bath at bod vertice to settle atd sln were content by method usin t was dried in a current after ensur was removed id any dang	AUXII OCEDURE: salt was pulightly above r with about in a solu 20 cm ³ . This and-over-end 25.00°C for ally to all . Samples then analyst an evaporation to constant t of air drive ring that of	repared = 25°C 1 g of Jbility is tube in the 24-48h low the of the sed for lon-to- les. wt. at ed with organic enough osion.	SOURCE AND Lithium pe as descri acetate wa P_2O_5 and f Its densit g cm ⁻³ ; b.;	rchlorate to bed in ref s purified b ractional d y at 25°C p. 77.14 -	was prepared . 1. Ethyl by refluxing istillation. was 0.8945 77.16 ^o C.
METHOD/Al A satd a at a ter and sea the anh tube, ca was ther thermost and sto solids clear sa solute o dryness The sal 250° C s P ₂ O ₅ , a solvent to avo Duplicat made, th	PPARATUS/PR sln of the sperature sl led together ydrous salt apacity 18-3 n rotated en tat bath at bod vertice to settle atd sln were content by method using t was dried in a current after ensur- was removed id any dang te soly de-	AUXII OCEDURE: salt was pulightly above r with about in a solu 20 cm ³ . This nd-over-end 25.00°C for ally to all . Samples then analyse an evaporation to constant t of air drive ring that of d completely ger of explo	repared = 25°C 1 g of ubility is tube in the 24-48h low the of the sed for lon-to- les. wt. at ed with organic enough osion s were chlo-	SOURCE AND Lithium pe as descri acetate wa P ₂ O ₅ and f Its densit g cm ⁻³ ; b.; ESTIMATED Precision REFERENCES 1. Willar	rchlorate bed in ref s purified f ractional d y at 25°C p. 77.14 - FRROR: in temp. w d, H.H.; Sm.	was prepared . 1. Ethyl by refluxing istillation. was 0.8945 77.16 °C. as ±0.01°C . ith, G.F. J
METHOD/All A satd a at a ter and seal the anh tube, ca was then thermosi and sta solids clear sa solute of dryness The salf $250^{\circ}C$ $P_{2}O_{5}$, a solvent to avo: Duplicat made, th	PPARATUS/PR sln of the sperature sl led together ydrous salt apacity 18-3 n rotated en tat bath at bod vertice to settle atd sln were content by method using t was dried in a current after ensur- was removed id any dang te soly de-	AUXII OCEDURE: salt was pulightly above r with about in a solu 20 cm ³ . This and-over-end 25.00°C for ally to all . Samples then analyse an evaporation to constant t of air drive ring that of d completely ger of explo- ses in which decomposition	repared = 25°C 1 g of ubility is tube in the 24-48h low the of the sed for lon-to- les. wt. at ed with organic enough osion s were chlo-	SOURCE AND Lithium pe as descri acetate wa P ₂ O ₅ and f Its densit g cm ⁻³ ; b.; ESTIMATED Precision REFERENCES 1. Willar	rchlorate bed in ref s purified f ractional d y at 25°C p. 77.14 - FRROR: in temp. w d, H.H.; Sm.	was prepared . 1. Ethyl by refluxing istillation. was 0.8945

COMPONENTS :	ORIGINAL MEASUREMENTS:
<pre>(1) Lithium perchlorate; LiClO₄ [7791-03-9]</pre>	Sakk, Zh.G.; Rosolovskii, V.Ya.
(2) Hydrazine; N ₂ H ₄ ; [302-01-2]	Zh. Neorg. Khim. <u>1972</u> , 17, 1783- *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1972</u> , 17, 927-8.
VARIABLES:	PREPARED BY:
One temperature: 298.2 K	C.Y. Chan
EXPERIMENTAL VALUES:	J
14.08 % and 5.11 mol kg ⁻¹ , respecti	vely (calculated by compiler).
AUXILIARY I	NFORMATION
METHOD/APPARATUS/PROCEDURE: 4-6 g of the salt and 8-11 cm ³ of hydrazine were thermostated at 25°C for 7-8h with continuous stirring in a vessel isolated from atmospheric moisture. Samples for analysis were removed by withdrawing solution and	SOURCE AND PURITY OF MATERIALS: The methods of purification of th perchlorate and of the preparatio of anhydrous hydrazine were a described in ref. 1.
METHOD/APPARATUS/PROCEDURE: 4-6 g of the salt and 8-11 cm ³ of hydrazine were thermostated at 25°C for 7-8h with continuous stirring in a vessel isolated from atmospheric moisture. Samples for analysis were removed by withdrawing solution and part of the solid phase into another vessel fitted with a porosity no.4 filter at reduced pressure. After separating the phases, the solution	SOURCE AND PURITY OF MATERIALS: The methods of purification of th perchlorate and of the preparatio of anhydrous hydrazine were a described in ref. 1. Salt purity was about 99.5-99.9 % ESTIMATED ERROR: Error in soly value was 0.4 %.
METHOD/APPARATUS/PROCEDURE: 4-6 g of the salt and 8-11 cm ³ of hydrazine were thermostated at 25° C for 7-8h with continuous stirring in a vessel isolated from atmospheric moisture. Samples for analysis were removed by withdrawing solution and part of the solid phase into another vessel fitted with a porosity no.4 filter at reduced pressure. After	SOURCE AND PURITY OF MATERIALS: The methods of purification of th perchlorate and of the preparatio of anhydrous hydrazine were a described in ref. 1. Salt purity was about 99.5-99.9 % ESTIMATED ERROR:

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Zh. Neorg. Khim. <u>1970</u>, 15, 2262. 44 COMPONENTS: **ORIGINAL MEASUREMENTS:** (1) Lithium perchlorate; LiClO₄ Rosolovskii, V.Ya.; Sakk, Zh.G. [7791 - 03 - 9](2) Hydrazine; N₂H₄; [302-01-2] Zh. Neorg. Khim. <u>1970</u>, 15, 2262-4; *Russ. J. Inorg. Chem. (Engl. Transl.) 1970, 15, 1169-70. VARIABLES: PREPARED BY: C.Y. Chan One temperature: 273.2 K **EXPERIMENTAL VALUES:** Solubility of lithium perchlorate in hydrazine at 0.0 ^OC was reported as 47.1 g(1)/100 g(2). The corresponding mol % and molality values are 12.4 % and 4.43 mol kg⁻¹, respectively (calculated by compiler). The solid phase was $LiClO_4 \cdot 2N_2H_4$. AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: $LiClO_4$ was obtained by reacting A solution of the perchlorate in hydrazine in the presence of the solid 70 % $HClO_4$ (aq.) with Li_2CO_3 , rephase was stirred continuously for crystallized twice from water and 2h in a thermostat at 0.0 °C. dried in a vacuum at 200 - 250 °C The liquid and solid phases were separato constant weight. The hydrazine ted and analysed for perchlorate by was 99.5 - 99.8 % pure. precipitation as nitron perchlorate. Hydrazine in both phases was analysed by titration with standard iodine ESTIMATED ERROR: solution in the presence of sodium Precision in temp. was ± 0.1 °C. bicarbonate in excess. Soly precision not stated.

REFERENCES:

	TUS/PROCEDU		SOURCE AND PURITY OF MATERIALS:
		AUXILIARY	INFORMATION
Mean ^a : Std. dev. ^a :	0.106 0.008	99.36 0.02	(^a compiler's calculations).
	0.118	99.34	(compiler).
	0.101	99.38	
	0.104	99.37	······································
	0.100	99.36	The mean value of the solubility
	mas LiClO ₄	HClO ₄	
	: (the sol	id phase was	lithium perchlorate in perchloric presumably the anhydrous salt)
EXPERIMENTAL Y	ALUES:		
One temperatu	ure: 273.2 K	ζ.	C.Y. Chan
VARIABLES:		• • • • • • • • • • • • • • • • • • •	PREPARED BY:
(2) Perchlor: [7601-90-		.0 ₄ ;	Zh. Neorg. Khim. <u>1968</u> , 13, 1115- *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1968</u> , 13, 582-4.
[7791-03-		510104	Rosolovskii, V.Ya.; Sakk, Zh.G.
(1) Lithium 1	perchiorate:		

6.62 X, ClO₄ 92.69 X. Anhyd. $HClO_4$ was distilled from a mixture of oleum and perchloric acid dihydrate at 100 °C under vacuum (ref.1). Acid purity was 99.6-100.2 % w/w as analysed.

ESTIMATED ERROR: Not stated.

REFERENCES:

attained, solid and liquid phases were separated on a glass filter.

ClO₄ was determined gravimetrically as nitron perchlorate. Acid concentrations were determined by acidbase titration. LiClO₄ concentration was determined by dissolving a weighed sample of the satd solution (5-8g) in water and then evaporating to dryness. The dry residue was then dissolved in conc. H_2SO_4 , the sln evaporated to dryness, and the resulting sulfate heated to constant weight at 600 °C.

COMPONENTS: GRIGINAL MEASUREMENTS: Titova, K.V.; Kolmakova, E.I.; (1) Lithium perchlorate; $LiClO_{d}$; [7791-03-9] Rosolovskii, V.Ya. (2) Hydrogen peroxide; H₂O₂; [7722-84-1] Zh. Neorg. Khim. 1986, 31, 3213-5; *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1986</u>, 31, 1846-7. VARIABLES: PREPARED BY: C.Y. Chan One temperature: 273 K

EXPERIMENTAL VALUES:

The solubility^a of lithium perchlorate in hydrogen peroxide at 0 $^{\circ}$ C :

g(1)/ 100 g(2) molality/ mol kg⁻¹ mass X mol 🗙 62.3 38.4 5.86 16.61

^a Mass%, mol% and molality values calculated by compiler. The solid phase was an unstable solvate.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: No details of saturation method was given. Solubility equilibrium was established in 1-1.5 h. The concencentration of the solutions did not change noticeably during the next 3h but after that slow decomposition of The concentration peroxide began. of perchlorate in the satd solution was determined gravimetrically by precipitation as nitron perchlorate. The solvated lithium perchlorate solid phase was too unstable for its composition to be determined.

SOURCE AND PURITY OF MATERIALS: Sources not given. The H_2O_2 was 99.8% \pm 0.2% pure. No information on purity of salt.

ESTIMATED ERROR: Not stated.

REFERENCES:

	T
COMPONENTS: (1) Lithium perchlorate; LiClO ₄ [7791-03-9] (2) Acetonitrile; C ₂ H ₃ N; [75-05-8]	ORIGINAL MEASUREMENTS: Keller, R.; Foster, J.N.; Hansen, F.F.; Muirhead, J.S. NASA Contract. Rep. CR-1425 <u>1969</u> , Lewis Research Center, NASA, U.S.A.
VARIABLES: One temperature: 298 K	PREPARED BY: C.Y. Chan
EXPERIMENTAL VALUES: Solubility of lithium perchlorate in a 1.06 mol dm ⁻³ (1.40 mol kg ⁻¹). Density of the saturated solution is (7.09x10 ⁻⁴ N s m ⁻² .	
METHOD/APPARATUS/PROCEDURE: Saturated solutions were prepared by adding an excess of solute to the solvent in flasks in a dry box, the flasks being then stoppered with glass stoppers. The neck of each flask was then enclosed in a poly- thene bag containing dry N ₂ . The flasks were then placed in a bath which was at a temperature well above the final sampling temperature for 1-2 days, the solutions being magnetically stirred. After that they were equilibrated to 25 °C for several days with occasional stirr- ing. Samples of the supernatant liquid were analysed for Li by atom- ic absorption spectrophotometry.	SOURCE AND PURITY OF MATERIALS: Lithium perchlorate was 99.9 f pure (Atomergic Chemicals Co. and dried at 90-120 °C under vare cuum. Acetonitrile (J.T. Bakes) anal. reagent) was redistilled from its mixture with P_2O_5 , and the final fraction contained 45 mg dm ⁻³ of water but no detectard ble organic impurities. ESTIMATED ERROR: Not stated. REFERENCES:

COMPONENTS:		ORIGINAL MEASUREN	IENTS:
(1) Lithium perc	chlorate; LiClO ₄ ;	Tomkins, R.P.T.	; Turner, P.J.
[7791-03-9]			
(2) Acetonitrile	e; CoHoN;	J. Chem. Eng. D.	ata <u>1975</u> , 20,
[75-05-8]	25	50-2.	
VARIABLES:		PREPARED BY:	
Temperature: 29	7.35 K - 323.32 K	C.Y. Chan	
EXPERIMENTAL VAL		lubility of LiClO,	in ecetonitrile.
No. of		<u></u>	•
determinations	t / °C	molality / mol kg ⁻¹	l mol %
3	24.20 <u>+</u> 0.01	1.5419	5.953
3	29.16 <u>+</u> 0.20	1.8632	7.106
3	32.80 <u>+</u> 0.15	2.1402	8.075
3	36.33 <u>+</u> 0.05	2.4615	9.178
3	40.12 <u>+</u> 0.05	2.9548	10.818
4	41.94 <u>+</u> 0.05	3.2253	11.693
4	45.67 <u>+</u> 0.03	3.9402	13.923
3	48.28 <u>+</u> 0.05	4.4614	15.480
5	49.50 <u>+</u> 0.03	5.2365	17.694
4	49.41 <u>+</u> 0.01	6.1452	20.146
2	50.17 <u>+</u> 0.30	6.2239	20.35
2 ^b	48.85 <u>+</u> 0.05	7.1865	22.78
1 ^b	41.21	7.5868	23.75
1 ^b	45.66	7.7932	24.24
1 ^b	45.43	8.4018	25.60
			<u>.</u>
^b Poor reprodu	ucibility and forma-	tion of addition com	ipounds;
	ucibility and forma- lubility values onl;		ipourids;
apparent sol	lubility values onl;		ipounds;
apparent sol	lubility values onl; /PROCEDURE:	y.	
apparent sol METHOD/APPARATUS A cooling metho	lubility values onl; /PROCEDURE: d was used in which	y. . the temperature at	which crystalliza
apparent so METHOD/APPARATUS A cooling metho tion occurred w	lubility values onl; /PROCEDURE: d was used in which was recorded. Soli	y. h the temperature at d LiClO4 and solver	: which crystalliza ht were placed in
APPArent so METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube	lubility values onl; /PROCEDURE: d was used in which was recorded. Soli and stirred with	y. h the temperature at d LiClO ₄ and solver a teflon-coated mag	which crystalliza ht were placed in netic stirring bar
APPArent sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature	lubility values onl; /PROCEDURE: d was used in which was recorded. Soli and stirred with was measured with	y. h the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercury	which crystalliza ht were placed in netic stirring bar y-in-glass thermome
Apparent sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in	lubility values onl; /PROCEDURE: d was used in which was recorded. Soli and stirred with was measured with n 0.1 ^o C intervals.	y. a the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercur; The whole unit was	which crystalliza t were placed in netic stirring bar y-in-glass thermome placed in a 250 m
APPARENT SO METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in Erlenmeyer flas	lubility values only /PROCEDURE: d was used in which was recorded. Soli and stirred with was measured with n 0.1 ^o C intervals. k which served as s	y. the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercur; The whole unit was upport and air-jacks	which crystalliza at were placed in metic stirring bar y-in-glass thermome a placed in a 250 m et. Supercooling o
APPARENT Sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in Erlenmeyer flas 2-5 °C was observed	lubility values only /PROCEDURE: d was used in which was recorded. Soli e and stirred with was measured with n 0.1 ^O C intervals. k which served as s rved and corrected	y. a the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercury The whole unit war upport and air-jacke for by "back-extrapt	which crystalliza at were placed in metic stirring bar y-in-glass thermome s placed in a 250 m et. Supercooling o plation". To reduc
APPArent sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in Erlenmeyer flas 2-5 °C was obser supercooling to	lubility values onl; /PROCEDURE: d was used in which was recorded. Soli e and stirred with was measured with n 0.1 ^O C intervals. k which served as s rved and corrected 1-2 ^O C, it was nec	y. a the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercury The whole unit was upport and air-jacks for by "back-extrapo essary to cool the s	which crystalliza t were placed in netic stirring bar y-in-glass thermome s placed in a 250 m et. Supercooling o plation". To reduce solution until solid
APPArent sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in Erlenmeyer flas 2-5 °C was obser supercooling to formed, then ra	lubility values only /PROCEDURE: d was used in which was recorded. Soli and stirred with was measured with n 0.1 ^O C intervals. k which served as s rved and corrected 1-2 ^O C, it was nece size the temperatur	y. the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercury The whole unit was upport and air-jacks for by "back-extrapt essary to cool the s e to 3-5 ^o C above	which crystalliza the were placed in metic stirring bar y-in-glass thermome s placed in a 250 m et. Supercooling o plation". To reduct solution until solid the crystallization
APPArent sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in Erlenmeyer flas 2-5 °C was obser supercooling to formed, then ra point and cycle	lubility values only /PROCEDURE: d was used in which vas recorded. Soli e and stirred with was measured with n 0.1 °C intervals. k which served as s rved and corrected 1-2 °C, it was nec- sise the temperature 5 of	y. a the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercury The whole unit war upport and air-jacke for by "back-extrapt essary to cool the s e to 3-5 ^o C above or 6 times over a st	which crystalliza the were placed in thetic stirring bar y-in-glass thermome s placed in a 250 m the supercooling of the crystallizatio the crystallizatio the crystallizatio
APPARENT Sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in Erlenmeyer flas 2-5 °C was obser supercooling to formed, then ra point and cycle	lubility values only /PROCEDURE: d was used in which vas recorded. Soli e and stirred with was measured with n 0.1 °C intervals. k which served as s rved and corrected 1-2 °C, it was nec- sise the temperature 5 of	y. the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercury The whole unit was upport and air-jacks for by "back-extrapt essary to cool the s e to 3-5 ^o C above	t which crystalliza at were placed in metic stirring bar y-in-glass thermome s placed in a 250 m st. Supercooling o plation". To reduce solution until solid the crystallization fort range to ensure
APPArent sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in Erlenmeyer flas 2-5 °C was obser supercooling to formed, then ra point and cycle the presence of	lubility values onl; /PROCEDURE: d was used in which was recorded. Soli e and stirred with was measured with n 0.1 °C intervals. k which served as s rved and corrected 1-2 °C, it was nece which temperature the temperature 5 of nuclei in the solu	y. a the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercur; The whole unit war upport and air-jacke for by "back-extrapo essary to cool the s e to 3-5 ^o C above or 6 times over a sh stion. No details	t which crystalliza at were placed in metic stirring bar y-in-glass thermome s placed in a 250 m st. Supercooling o plation". To reduce solution until solid the crystallization fort range to ensure
APPArent sol METHOD/APPARATUS A cooling metho tion occurred w Pyrex test tube The temperature ter graduated in Erlenmeyer flas 2-5 °C was obser supercooling to formed, then ra point and cycle the presence of was given.	lubility values only /PROCEDURE: d was used in which vas recorded. Soli e and stirred with was measured with n 0.1 °C intervals. k which served as s rved and corrected 1-2 °C, it was nech size the temperature the temperature 5 of nuclei in the solu OF MATERIALS:	y. a the temperature at d LiClO ₄ and solver a teflon-coated mag a calibrated mercury The whole unit war upport and air-jacke for by "back-extrapt essary to cool the s e to 3-5 ^o C above or 6 times over a st	which crystalliza the were placed in metic stirring bar y-in-glass thermome s placed in a 250 mi set. Supercooling o plation". To reduce solution until solid the crystallization fort range to ensure of analysis method

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COMPONENTS: (1) Lithium perchlor [7791-03-9]	rate; LiClO ₄	ORIGINAL MEASUREMENTS: Kenttamaa, J.
<pre>(2) Sulfinylbis-meth sulphoxide, DMSC [67-68-5]</pre>		J. Suomen Chemist <u>1960</u> , 33B, 179-82.
VARIABLES: Three temperatures:	298 K, 308 K, 318 K.	PREPARED BY: C.Y. Chan
EXPERIMENTAL VALUES:		
	Solubility ^a	of lithium perchlorate in DMSO :
t / °C	mol / 100g DA	MSO molality / kg ⁻¹
25	0.27	2.7
35	0.27	2.7
45	0.29	2.9
^a The solid phase wa	s the solvate 2LiC	
^a The solid phase wa	as the solvate 2LiC AUXILIARY IN	3104.7(сн ₃) ₂ 50
METHOD/APPARATUS/PROC The solute and solve in glass-stoppered f a thermostat at 50 ^O the flasks were sh time. About two we for attainment of e which the temp. was desired temp. and th to stand for another	AUXILIARY IN EEDURE: ant were contained clasks immersed in C initially and taken from time to teks were allowed equilibrium, after a lowered to the te flasks allowed week. The solu-	3104.7(сн ₃) ₂ 50
METHOD/APPARATUS/PROC The solute and solve in glass-stoppered f a thermostat at 50 ^O the flasks were sh time. About two we for attainment of e which the temp. was desired temp. and th	AUXILIARY IN EDURE: Int were contained lasks immersed in C initially and taken from time to teks were allowed equilibrium, after to the te flasks allowed week. The solu- ted for lithium by All analyses were	TFORMATION SOURCE AND PURITY OF MATERIALS: DMSO of "practical quality" was purified by repeated crystalliza- tion. The final product used had a melting-point of 18.5 °C. The purity of the perchlorate was not specified. The salt was dried for a few days at a temperature "high enough" to remove any mois-

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COMPONENTS:
                                         ORIGINAL MEASUREMENTS:
 (1) Lithium perchlorate; LiClO<sub>4</sub>;
                                           Tomkins, R.P.T.; Turner, P.J.
     [7791-03-9]
 (2) Propionitrile; C<sub>3</sub>H<sub>5</sub>N;
                                           J. Chem. Eng. Data 1975, 20,
     [107 - 12 - 0]
                                            50-2.
VARIABLES:
                                         PREPARED BY:
                                          C.Y. Chan
 Temperature: 230 K - 285 K
EXPERIMENTAL VALUES:
                                  Solubility<sup>a</sup> of LiClO<sub>4</sub> in propionitrile:
  No. of
                                     molality / mol kg^{-1}
  determinations t / <sup>o</sup>C
                                                                mol %
                                                                 7.23
       1
                     -43
                                           1.4148
                 -21.3 \pm 0.1
                                           2.5088
       4
                                                                12.141
                 -12.1 \pm 0.2
       4
                                           3.0093
                                                                14.218
       4
                   -0.5 \pm 3.5
                                          3.7315
                                                               17.049
       3
                   -3.9 <u>+</u> 2.0
                                           4.1544
                                                                18.62
       2
                   2.1 \pm 0.1
                                          6.8443
                                                               27.378
       2
                     12 <u>+</u> 4
                                          8.1469
                                                                30.97
   <sup>a</sup> The solid phase was the anhydrous salt.
                            AUXILIARY INFORMATION
                                         SOURCE AND PURITY OF MATERIALS:
METHOD/APPARATUS/PROCEDURE:
A cooling method was used in which
 the temperature at which crystalli-
                                         Not stated.
 zation occurred was recorded. 15-
20 cm<sup>3</sup> samples were cooled with dry
 ice and methanol. The sample tube
was vacuum-jacketted and contents
stirred with a propeller through a
                                        ESTIMATED ERROR:
silicone oil seal. Temperature was
measured with a chromel-alumel
thermocouple immersed in a silicone
                                          precision as given above.
oil well and a Keithley 147 null
detector used in conjunction with a
Moseley X-Y recorder. The thermo-
                                        REFERENCES:
couple emf was also read on a
digital multimeter. Sample compo-
 sition was changed over a small
 range by adding solvent from a
weighed syringe through a septumcap
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on the end of a side arm of the

sample tube.

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Not stated, except for temperature

COMPONENTS:					
			ORIGINAL M	EASUREMENTS:	
(1) Lithium perc	chlorate; Li	1C10 ₄ ;	Willard, 1	H.H.; Smith,	G.F.
[7791-03-9]		-			
(2) Water; H ₂ O;	[7732-18-5]	ļ	J. Am. Ch	em. Soc. <u>19</u>	<u>23, 45,</u>
(3) Alcohols:			286-96.		
(A) Methanol		lcohol);			
CH40; [6					
(B) Ethanol		ohol);			
(C) 1-Propar	[64-17-5]	vi elcoholi			
-	[71-23-8]	aiconoi)	'		
(D) 1-Butanc		alcohol);			
	[71-36-3]				
(E) 2-Methyl		(iso-			
butyl al	lcohol); C ₄ H	1 ₁₀ 0;			
[78-83-1	[]				
VARIABLES:			PREPARED B	Υ:	<u>,</u>
One temperature:	298.15 K		C.Y. Chan		
soly in :	methanol	ethanol	1-propanol	1-butanol	2-methyl- 1-propanol
					1-propanol
g/100 g sln	60.95	ethanol 42.16 43.18	26.82	1-butanol 21.40 19.435	
	60.95 69.61	42.16	26.82 25.07	21.40	1-propanol
g/100 g sln g/100 cm ⁻³ sln	60.95 69.61	42.16 43.18	26.82 25.07	21.40 19.435	1-propanol 18.85 16.75
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³ mol kg ^{-1 c}	60.95 69.61 4.338	42.16 43.18 2.691	26.82 25.07 1.563	21.40 19.435 1.211	1-propanol 18.85 16.75 1.044
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³	60.95 69.61 4.338	42.16 43.18 2.691	26.82 25.07 1.563 3.445	21.40 19.435 1.211	1-propanol 18.85 16.75 1.044
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³ mol kg ^{-1 c} satd sln	60.95 69.61 4.338 14.671	42.16 43.18 2.691 6.851	26.82 25.07 1.563 3.445	21.40 19.435 1.211 2.559	1-propanol 18.85 16.75 1.044 2.183
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³ mol kg ^{-1 c} satd sln density/g cm ⁻³	60.95 69.61 4.338 14.671	42.16 43.18 2.691 6.851 1.0241	26.82 25.07 1.563 3.445 0.9349	21.40 19.435 1.211 2.559	1-propanol 18.85 16.75 1.044 2.183
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³ mol kg ⁻¹ c satd sln density/g cm ⁻³ pure solvent	60.95 69.61 4.338 14.671 1.1420	42.16 43.18 2.691 6.851 1.0241	26.82 25.07 1.563 3.445 0.9349	21.40 19.435 1.211 2.559 0.9082	1-propanol 18.85 16.75 1.044 2.183 0.8887
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³ mol kg ⁻¹ c satd sln density/g cm ⁻³ pure solvent density/g cm ⁻³	60.95 69.61 4.338 14.671 1.1420 0.78705	42.16 43.18 2.691 6.851 1.0241 0.78515	26.82 25.07 1.563 3.445 0.9349 0.8026	21.40 19.435 1.211 2.559 0.9082 0.8059	1-propanol 18.85 16.75 1.044 2.183 0.8887 0.7981
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³ mol kg ⁻¹ c satd sln density/g cm ⁻³ pure solvent density/g cm ⁻³ A In terms of th	60.95 69.61 4.338 14.671 1.1420 0.78705	42.16 43.18 2.691 6.851 1.0241 0.78515	26.82 25.07 1.563 3.445 0.9349 0.8026	21.40 19.435 1.211 2.559 0.9082 0.8059	1-propanol 18.85 16.75 1.044 2.183 0.8887 0.7981
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³ mol kg ⁻¹ c satd sln density/g cm ⁻³ pure solvent density/g cm ⁻³ A In terms of th specified; pre	60.95 69.61 4.338 14.671 1.1420 0.78705 me anhydrous	42.16 43.18 2.691 6.851 1.0241 0.78515 salt. Th was the tr	26.82 25.07 1.563 3.445 0.9349 0.8026 ne solid pha	21.40 19.435 1.211 2.559 0.9082 0.8059	1-propanol 18.85 16.75 1.044 2.183 0.8887 0.7981 exactly
g/100 g sln g/100 cm ⁻³ sln mol dm ⁻³ mol kg ⁻¹ c satd sln density/g cm ⁻³ pure solvent density/g cm ⁻³ A In terms of th	60.95 69.61 4.338 14.671 1.1420 0.78705 esumably, it 7, mixtures	42.16 43.18 2.691 6.851 1.0241 0.78515 salt. The was the transformed by the second sec	26.82 25.07 1.563 3.445 0.9349 0.8026 ne solid pha- rihydrate. and water fr	21.40 19.435 1.211 2.559 0.9082 0.8059 Ase Was not	1-propanol 18.85 16.75 1.044 2.183 0.8887 0.7981 exactly hydrate,
<pre>g/100 g sln g/100 cm⁻³ sln mol dm⁻³ mol kg⁻¹ c satd sln density/g cm⁻³ pure solvent density/g cm⁻³ A In terms of th specified; pre b More correctly (compiler). determined, but</pre>	60.95 69.61 4.338 14.671 1.1420 0.78705 e anhydrous sumably, it r, mixtures The alcoh st could be	42.16 43.18 2.691 6.851 1.0241 0.78515 salt. The was the transformed of alcohol sol-water as calculated	26.82 25.07 1.563 3.445 0.9349 0.8026 ne solid pha rihydrate. and water fr solvent comp if it was as	21.40 19.435 1.211 2.559 0.9082 0.8059 ase was not rom the tril positions we	1-propanol 18.85 16.75 1.044 2.183 0.8887 0.7981 exactly hydrate, ere not for each
<pre>g/100 g sln g/100 cm⁻³ sln mol dm⁻³ mol kg⁻¹ c satd sln density/g cm⁻³ pure solvent density/g cm⁻³ ^ A In terms of th specified; pre b More correctly (compiler).</pre>	60.95 69.61 4.338 14.671 1.1420 0.78705 esumably, it y, mixtures The alcohol t could be dissolved	42.16 43.18 2.691 6.851 1.0241 0.78515 salt. The was the transformed of alcohol sol-water as calculated	26.82 25.07 1.563 3.445 0.9349 0.8026 ne solid pha rihydrate. and water fr solvent comp if it was as	21.40 19.435 1.211 2.559 0.9082 0.8059 ase was not rom the tril positions we	1-propanol 18.85 16.75 1.044 2.183 0.8887 0.7981 exactly hydrate, ere not for each

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COMPONENTS:
                                              ORIGINAL MEASUREMENTS:
 (1) Lithium perchlorate; LiClO<sub>4</sub>;
      [7791 - 03 - 9]
 (2) Water; H<sub>2</sub>O; [7732-18-5]
 (3) Alcohols:
      (A) Methanol (methyl alcohol);
          CH_O; [67-56-1]
     (B) Ethanol (ethyl alcohol);
          C_2H_6O; [64-17-5]
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- (C) 1-Propanol (n-propyl alcohol); $C_{3}H_{8}O; [71-23-8]$
- (D) 1-Butanol (n-butyl alcohol); C₄H₁₀O; [71-36-3]
- (E) 2-Methyl-1-propanol (isobutyl alcohol); C₄H₁₀O; [78-83-1]

Willard, H.H.: Smith, G.F.

J. Am. Chem. Soc. 1923, 45, 286-96.

AUXILIARY INFORMATION (continued)

METHOD/APPARATUS/PROCEDURE:

A satd sln of the salt was prepared at a temperature slightly above 25°C and sealed together with about 1 g of the anhydrous salt in a solubility tube, capacity 18-20 cm³. This tube was then rotated end-over-end in the thermostat bath at 25.00°C for 24-48h and stood vertically to allow the ESTIMATED ERROR: solids to settle. Samples of the clear satd sln. were then analysed for solute content by an evaporationto-dryness method using Pt crucibles, making sure that organic solvent was REFERENCES: completely removed before the salt was dried to constant weight at 250°C in a current of air dried with P_2O_5 . Duplicate soly determinations were made, those analyses in which chloride (from thermal decomposition) was found present being rejected.

SOURCE AND PURITY OF MATERIALS: Lithium perchlorate trihydrate was prepared as described in ref.1 . Alcohols were purified by refluxing with calcium and fractional distillation.

Precision in temp. was $\pm 0.01^{\circ}$ C.

1. Willard, H.H.; Smith, G.F. J. Am. Chem.Soc. 1922, 44, 2816.

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[7791 (2) Water	5: Lum perchlorate L-03-9] r; H ₂ O; [7732-1 pne; C ₃ H ₆ O; [67	.8-5]	Willar	L MEASUREME d, H.H.; Sm <i>Chem. Soc.</i> 96.	aith, G.F.
VARIABLES: One tempe	erature: 298.15	ь к	PREPARE C.Y. C		9,
EXPERIMENT	TAL VALUES:		1		<u></u>
	ty ^a of lithium , the solid pł				
g/100g sln	g/100 cm ³ sln	g/100 g solvent	mol dm ⁻³	mol kg ⁻¹	satd sln density / g cm ⁻³
49.04	53.77	96.23	5.054 ^b	9.045 ^b	1.0965
	- 1419 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 1944 - 194	AUXILIARY	INFORMATIO		
A satd sl	PARATUS/PROCEDU n of the sal perature slight	RE: t was prepare	SOURCE d Lithiu	AND PURITY	OF MATERIALS: te was prepared ref. 1. Acetone
A satd sl at a temp and seale the anhyd tube, cap was then thermosta and stoo solids t clear sat	n of the sal perature slight ed together wit lrous salt in pacity 18-20 cm rotated end-ov at bath at 25.0 od vertically	RE: t was prepare ly above 25 ^C h about 1 g c a solubilit ³ . This tub rer-end in th 0 [°] C for 24-48 to allow th samples of the n analysed for	SOURCE d Lithiu C as de of reflux y purifi De Its de 125 °C; ch ae or	AND PURITY m perchlora scribed in ed with p ed by the b	te was prepared ref. 1. Acetone owdered KOH and isulfite process. 0.7852 g cm ⁻³ at
A satd sl at a temp and seale the anhyd tube, cap was then thermosta and stoo solids t clear sat solute co dryness m The salt 250° C in P_2O_5 , af solvent w	n of the sal perature slight ed together with rous salt in pacity 18-20 cm rotated end-ov to bath at 25.0 od vertically to settle. S ed sln were the	RE: t was prepare ly above 25 ^C h about 1 g c a solubilit ³ . This tut rer-end in th 0 ^C C for 24-48 to allow th amples of th n analysed for vaporation-to crucibles. constant wt. s air dried wit that organi pletely enoug	SOURCE Lithiu C as de of reflux y purifi De Its de 25 °C; C C C C C C C C C C C C C C C C C C	AND PURITY m perchlora scribed in ed with p ed by the b nsity was b.p. 56.16 TED ERROR:	te was prepared ref. 1. Acetone owdered KOH and isulfite process. 0.7852 g cm ⁻³ at

T			
COMPONENTS:	ORIGINAL MEASUREMENTS:		
(1) Lithium perchlorate; LiClO ₄ ;	Willard, H.H.; Smith, G.F.		
[7791-03-9]			
(2) Water; H ₂ O; [7732-18-5]	J. Am. Chem. Soc. <u>1923</u> , 45		

(3) Ethyl acetate; $C_4 H_8 O_2$; [141-78-6]

VARIABLES: One temperature: 298.15 K

EXPERIMENTAL VALUES:

Solubility^a lithium perchlorate trihydrate in ethyl acetate at 25.00° C, the solid phase being $LiClO_4.3H_2O$:

Chem. Soc. 1923, 45,

286-96.

PREPARED BY: C.Y. Chan

mass %	g/100 cm ³ sln	g/100 g solvent	mol dm ⁻³	mol kg ⁻¹	satd sin density / g cm ⁻³	
26.35	27.41	35.78	1.7085	3.363 ^b	1.0402	

^a In terms of the anhydrous salt. ^b Compiler's calculations.

AUXILIARY INFORMATION

SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: A satd sln of the salt was prepared Lithium perchlorate was prepared at a temperature slightly above 25°C as described in ref. 1. Ethyl and sealed together with about 1 g of acetate was purified by refluxing the anhydrous salt in a solubility with P_2O_5 and fractional distilltube, capacity 18-20 cm³. This tube ation. Its density at 25°C was 0.8945 g cm^{-3} and its b.p. was was then rotated end-over-end in the thermostat bath at 25.00°C for 24-48h 77.14 - 77.16 °C. and stood vertically to allow the solids to settle. Samples of the clear satd sln were then analysed for solute content by an evaporation-todryness method using Pt crucibles. The salt was dried to constant wt. at 250°C in a current of air dried with ESTIMATED ERROR: P_2O_5 , after ensuring that organic Precision in temp. was $\pm 0.01^{\circ}$ C solvent was removed completely enough to avoid any danger of explosion. Duplicate soly determinations were **REFERENCES:** 1. Willard, H.H.; Smith, G.F. J. made, those analyses in which chloride (from thermal decomposition) was Am. Chem. Soc. 1922, 44, 2816. found present being rejected.

					5
	S: ium perchlorat 1-03-9]	e; LiClO ₄ ;		MEASUREME , H.H.; Sm	
(3) 1,1'	r; H ₂ O; [7732-: -oxybis-ethane r); C ₄ H ₁₀ O; [((diethyl	J. Am. 286-9		<u>1923</u> , 45,
VARIABLES One temp	: erature: 298.1	5 K	PREPARED C.Y. Ch		
EXPERIMEN	TAL VALUES:		<u></u>		
		perchlorate tr		in diethy	lether ^b at
g/100g sln		hase being LiCl g/100 g i solvent		mol kg ⁻¹	satd sln density / g cm ⁻³
0.196	0.139	0.196	0.0131 ^b	0.0184 ^b	0.7091
A satd s at a temp and seal the anhyo tube, cap	perature slight ed together wit drous salt in	lt was prepared tly above 25 [°] C th about 1 g of	Lithium as desc	perchlora cribed in	DF MATERIALS: te was prepared ref. 1. Ether
thermost and stor solids clear sa solute c	at bath at 25.0 od vertically to settle. S td sln were the ontent by an e	n^3 . This tube ver-end in the 00° C for 24-48h to allow the Samples of the en analysed for evaporation-to-	The dens	i fraction sity of the	refluxing with al distillation. e fraction used ³ at 25 ^o C.
thermost and sto solids clear sa solute c dryness The salt 250° C in P_2O_5 , a solvent	at bath at 25.0 od vertically to settle. S td sln were the ontent by an o method using Pf was dried to o n a current of fter ensuring	a ³ . This tube ver-end in the DO ^O C for 24-48h to allow the Samples of the en analysed for evaporation-to- t crucibles. constant wt. at air dried with that organic mpletely enough	The dens was 0.70 ESTIMATE	d fraction sity of the D817 g cm	al distillation. e fraction used

COMPONENTS: (1) Lithium perchlorate; LiClO ₄ [7791-03-9] (2) Water; H ₂ O; [7732-18-5] (3) N,N-dimethylformamide; C ₃ H ₇ NO; [68-12-2]	ORIGINAL MEASUREMENTS: Keller, R.; Foster, J.N.; Hansen, F.F.; Muirhead, J.S. <i>NASA Contract. Rep. CR-1425</i> <u>1969</u> , Lewis Research Center, NASA, U.S.A.
VARIABLES: Two temperatures: 298 K and 333 K. Water content.	PREPARED BY: C.Y. Chan
EXPERIMENTAL VALUES:	
Solubility of lithium perchlorate in t trace concentrations of water at 25 ^d (the solid phase was the anhydrous so H ₂ O content / mg dm ⁻³	^D C and 60 ^O C :
45	4.4 4.8
1000	3.5 4.9
AUXILIARY II	NFORMATION
METHOD/APPARATUS/PROCEDURE: Saturated solutions were prepared by adding an excess of solute to the solvent in flasks in a dry box, the flasks being then stoppered with glass stoppers. The neck of each flask was then enclosed in a poly- thene bag containing dry N ₂ . The flasks were then placed in a bath which was at a temperature well above the final sampling temperature for 1-2 days, the solutions being magnetically stirred. After that they were equilibrated to 25 $^{\rm O}$ C for several days with occasional stirr- ing. Samples of the supernatant liquid were analysed for Li by atom- ic absorption spectrophotometry.	

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COMPONENTS:	ORIGINAL MEASUREMENTS:					
(1) Lithium perchlorate; LiClO ₄	Keller, R.; Foster, J.N.;					
[7791-03-9]	Hansen, F.F.; Muirhead, J.S.					
(2) Water; H ₂ O; [7732-18-5]						
(3) Propylene carbonate; $C_4H_6O_3$;	NASA Contract. Rep. CR-1425					
[108-32-7]	<u>1969</u> , Lewis Research Center, NASA, U.S.A.					
VARIABLES:	PREPARED BY:					
Two temperatures: 298 K and 333 K. Water content.	C.Y. Chan					
EXPERIMENTAL VALUES: Solubility of lithium perchlorate i trace concentrations of water at 2	5 °C and 60 °C :					
Solubility of lithium perchlorate i	5 °C and 60 °C :					
Solubility of lithium perchlorate i trace concentrations of water at 2 (the solid phase was the anhydrous	5 ^o C and 60 ^o C : salt) LiClO ₄ solubility / mol dm ⁻³					

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: Saturated solutions were prepared by adding an excess of solute to the solvent in flasks in a dry box, the flasks being then stoppered with glass stoppers. The neck of each flask was then enclosed in a polythene bag containing dry N₂. The flasks were then placed in a bath which was at a temperature well above the final sampling temperature for 1-2 days, the solutions being magnetically stirred. After that they were equilibrated to 25 °C for several days with occasional stirr-Samples of the supernatant ing. liquid were analysed for Li by atomic absorption spectrophotometry.

SOURCE AND PURITY OF MATERIALS: Lithium perchlorate was 99.9 % pure (Atomergic Chemicals Co.) and dried at 90-120 $^{\circ}$ C under vacuum. Propylene carbonate (Matheson, Coleman and Bell, spectro pure) was fractionally distilled in the presence of CaH₂ and dry N₂. The sample used contained 20 mg dm⁻³ H₂O and less than 35 mg dm⁻³ of organic impurities.

ESTIMATED ERROR: Not stated.

REFERENCES:

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COMPONENTS:
                                            ORIGINAL MEASUREMENTS:
 (1) Lithium perchlorate; LiClO<sub>4</sub>;
                                              Tarakanov, V.F.
     [7791-03-9]
 (2) Acetamide; C<sub>2</sub>H<sub>5</sub>NO; [60-35-5]
                                            Sb. Tr. Yarosl. Gos. Ped. Inst.
 (3) Water; H<sub>2</sub>O; [7732-18-5]
                                                1975, 144, 92-4.
VARIABLES:
                                            PREPARED BY:
                                             E.S. Gryzlova
 One temperature: 298 K.
 Composition.
EXPERIMENTAL VALUES:
 Solubility system LiClO<sub>4</sub>-CH<sub>3</sub>CONH<sub>2</sub>-H<sub>2</sub>O at 25°C :
                                                                      Solid<sup>b</sup>
                        Liquid phase composition
                                mol X<sup>a</sup> molality<sup>a</sup>/mol kg<sup>-1</sup>
               mass %
                                                                      phase
            (1) (2)
                             (1)
                                      (2)
                                               (1)
  Point
                                                         (2)
            37.50
                              9.223
                                                5.640
     1
                                                                         A
            36.55 14.60 10.40
                                      7.48
                                               7.033
                                                        5.060
                                                                         A
     3
          37.98 49.72 18.97 44.74 29.02 68.43
     6
                                                                     A + B
     8
          35.43 53.99 18.15 49.83 31.48 86.39
                                                                       В
          32.96 59.42 17.82 57.86 40.66 132.0
    11
                                                                      B + C
    15
          24.43 66.59 12.38 60.76 25.57 125.5
                                                                       С
          20.35 74.35 10.97 72.17 36.09 237.5
                                                                      C + D
    17
          10.35 81.53 5.045 71.58 11.98 170.0
    20
                                                                        D
    22
                    84.24
                                     61.98
                                                        90.49
                                                                        D
    <sup>a</sup> Values calculated by C.C. Ho;
    <sup>b</sup> A = LiClo<sub>4</sub>.3H<sub>2</sub>O; B = LiClo<sub>4</sub>.2CH<sub>3</sub>CONH<sub>2</sub>; C = LiClo<sub>4</sub>.4CH<sub>3</sub>CONH<sub>2</sub>;
      D = CH_3 CONH_2.
                                AUXILIARY INFORMATION
                                            SOURCE AND PURITY OF MATERIALS:
METHOD/APPARATUS/PROCEDURE:
No details were given.
                                             No details were given.
                                            ESTIMATED ERROR:
                                             Nothing specified.
                                            REFERENCES:
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(continued next page)

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COMPONENTS:

(1) Lithium perchlorate; LiClO<sub>4</sub>;

[7791-03-9]

(2) Acetamide; C<sub>2</sub>H<sub>5</sub>NO; [60-35-5]

(3) Water; H<sub>2</sub>O; [7732-18-5]
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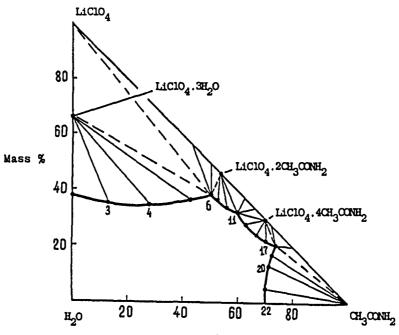
ORIGINAL MEASUREMENTS: Tarakanov, V.F.

Sb. Tr. Yarosl. Gos. Ped. Inst. <u>1975</u>, 144, 92-4.

EXPERIMENTAL VALUES: (continued)

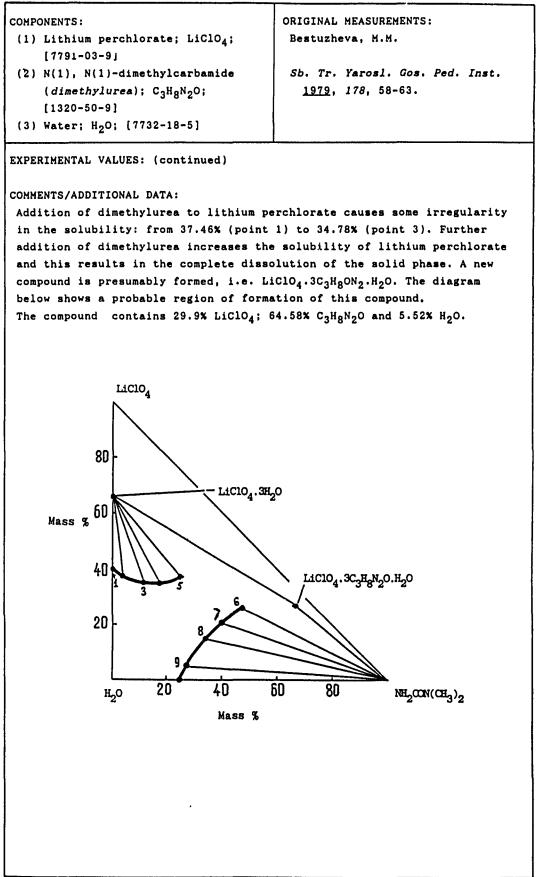
COMMENTS/ADDITIONAL DATA:

The solubility isotherm (see Figure below) shows four branches of crystallization: lithium perchlorate crystallizes as trihydrate; lithium perchlorate diacetamide; lithium perchlorate tetraacetamide; and acetamide. $LiClO_4.2CH_3CONH_2$ and $LiClO_4.4CH_3CONH_2$ are very hygroscopic. The compounds are formed through the interaction between Li^+ cations and acetamide molecules.





					·····				
[779 (2) N(1) (dim [132 (3) Wate VARIABLES	ium perch y-03-9] , N(1)-di ethylures 0-50-9] r; H ₂ O; [: erature:	.methylc a); C ₃ H ₈ 7732-18	arbamide N ₂ O;	B S PR	ORIGINAL MEASUREMENTS: Bestuzheva, M.M. Sb. Tr. Yarosl. Gos. Ped. Inst. 1979, 178, 58-63. PREPARED BY: I.S. Bodnya				
EXPERIMEN	TAL VALUE	es:							
Solubili	ty system	h LiClO	4 ^{-C3H8N2(}	D-H ₂ O at	25°C :				
		Li	quid phas	se compos	ition		Solid		
	mass	. *	mol	xª	molality	^a /mol kg ⁻¹	phase		
Point	(1)	(2)	(1)	(2)	(1)	(2)			
1 2 3 4 5	35.61	17.09	9.209 9.222 9.627 10.61	- 0.490 4.175 6.149 9.157		0.301 2.688 4.101	LiClO ₄ .3H ₂ O " "		
·					0.000				
6	25.40	47.19	10.40	23.33	8.710	19.54	с ₃ н ₈ N ₂ O		
7 8 9 10	17.91 3.53 -	25.28 23.55	5.156 0.777	6.717 5.925	33 5.676 12.82 " 49 3.433 7.653 " 717 0.466 4.030 "				
	a Values		AUXII	LIARY INF					
Equilibr	PARATUS/F hermal me ium was r determin	thod wa eached	s used. in 2-3 da	N N		PURITY OF	MATERIALS:		
by precip was dete	pitating rmined by ities and	with ni Kjelda	tron. (2) hl's meth) ES nod. N	TIMATED othing s	ERROR: pecified.			
	ities and d solutio				FERENCES	:			
						(continued	next page)		



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COMPONENTS: (1) Lithium perchlorate; LiClO ₄ ; [7791-03-9]					ORIGINAL MEASUREMENTS: Karnaukhov, A.S.; Kosheleva, N.I.			
(2) Hex [10	amethyle 0-97-0}	netetrami [7732-18	•••	2 ^N 4;	Sb. Tr. Yarosl. Gos. Ped. Inst. <u>1975</u> , 144, 107–11.			
VARIABLES: One temperature: 298 K. Composition.					REPARED			
EXPERIME	NTAL VAL	UES:			<u>,</u>	. <u></u>		
Solubil	ity syste	em LiClO	4 ^{-C} 6 ^H 12 ^N	$4 - H_2O$ at	25°C :			
			quid pha			.a1	Solid ^b	
Point					(1)	y ^a /mol kg ⁻¹ (2)	phase	
1					-		A	
					0.888		A	
3					1.285		A	
4	8.48	45.10	1.98	10.48	1.258	6.644	C C	
5 6	12.23	37.26	3.610	8.346	2.276	5.262	С	
7					2.989		С	
8						5.639	D	
9 10	18.60 20.53	34.54 27.82	5.785 5.922	8.152 6.090	3.731 3.736	5.258 3.842	D D	
11	21.75	24.62	6.090	5.232	3.812	3.275	D	
12 13	25.25	17.06			4.340 4.401		D D	
14 15	30.22 32.82				5.026 5.431	1.674 1.304	D D	
			AUXI	LIARY IN	FORMATIO	4		
METHOD/AI	PPARATUS	PROCEDUR	E :	s	OURCE ANI	D PURITY OF	MATERIALS:	
		nethod wa			No detail	ls were give	n.	
•		reached ined grav	•					
•		pitation.			STIMATED	ERROR :		
determin	ned by K	jeldahl's the soli	method.	The		specified.	······································	
determin by Schro	ned by cl einemake:	nemical a rs' metho	nalyses d of res	and R idues.	EFERENCE	5:		
		nd viscos Lons Were				(continued	next page)	

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Lithium perchlorate; LiClO₄; Karnaukhov, A.S.; Kosheleva, N.I. [7791-03-9] (2) Hexamethylenetetramine; $C_{6}H_{12}N_{4}$; Sb. Tr. Yarosl. Gos. Ped. Inst. [100-97-0] 1975, 144, 107-11. (3) Water; H₂O; [7732-18-5] EXPERIMENTAL VALUES: (continued) Solid^b Liquid phase composition mol X^A molality^a/mol kg⁻¹ mass X phase Point (1) (2) (1)(2) (1)(2) 1.305 16 33.26 10.32 8.886 2.093 5.541 B + D 17 33.75 6.95 8.671 1.355 5.350 0.836 .. B 18 36.55 3.11 9.247 0.597 5.694 0.368 19 37.55 9.241 -5.652 В -^a Values calculated by C.C. Ho; ^b A = $C_6H_{12}N_4$; B = LiClO₄.3H₂O; C = LiClO₄.2C₆H₁₂N₄.2H₂O; $D = LiClO_4 \cdot C_6 H_{12} N_4 \cdot 3 H_2 O_1$ COMMENTS/ADDITIONAL DATA: The solubility isotherm (see Figure below) shows four branches of crystallization: the crystallization of hexamethylenetetramine (point 1-2); the crystallization of the compound $L1ClO_4.2C_6H_{12}N_4.2H_2O$ which is congruently soluble (point 4 through 7); the crystallization of the double complex compound $LiClO_4.C_6H_{12}N_4.3H_2O$ (points 9 through 15); the branch from point 17 to point 19 indicates the crystallization of lithium perchlorate trihydrate. Hexamethylenetetramine is salted out. C₆H₁₂N₄ 80 LiCl0₄.2C₆H₁₂N₄.2H₂O 60 Mass % $LiC10_4.C_6H_{12}N_4.3H_2O$ 40 LiClO₄.3H₂O 20 80 20 60 40 LiClO4 H_0 Mass %

COMPONENTS :		-,		ORIGI	NAL MEA	SUREMENTS :			
(1), Lithiu	m perchlor	ate: L	.iClO₄:		Il'in, K.K.; Demakhin, A.G.				
[779]	[7791-03-9]				Zh. Neorg. Khim. <u>1989</u> , 34,				
(2) Methyl acetate; $C_3H_6O_2$;					-				
[79-20			1		uss. J. Inorg. C				
(3) Propy		ate; C	4 1603			ansl.) <u>1989</u> , 34	•		
[108-3			43	6-8.					
VARIABLES:					RED BY: Chan				
-	Temperature: 283.2 K - 323.2 K.								
Composition	•								
EXPÉRIMENTAL	VALUES:								
Solubility	system LiC	10 ₄ -m	ethyl aceta	te-prop	ylene c	arbonate at vari	ous		
temperature	s (the so	lid	phase was	the anh;	ydrous	salt over the wh	ole		
temperature	range stu	died	for both th	e pure a	and mix	ed solvents):			
		Lio	uid phase c	omnosit	ion		<u> </u>		
t/°C		mass :			mol %	A			
			(3)	(1)					
10.0						50 0			
10.0		0.0	52.6 41.6	46.4 45.2	0.0 14.1	53.6 40.8			
	49.0		30.6	44.5					
	49.9	30.1	20.0		37.9	18.3			
	50.9	39.3	9.8	43.3	48.0	8.7			
	52.5	47.5	0.0	43.5	56.5	0.0			
20.0	47.8	0.0	52.2	46.8	0.0	53.2			
		10.3		45.7		40.4			
	49.4				26.4	28.8			
	50.5	38.8	9.7		37.5 47.5	18.1			
	53.5	46.5	0.0	44.5					
^a Compiler's	calculati	ons.							
			·						
			AUXILIARY I	NFORMATI	(ON				
HETHOD/APPAR	ATUS/PROCE	DURE:		SOURCE	E AND PU	JRITY OF MATERIA	LS:		
Special ves	sels, repo	rted i	in ref.(1)			y pure " LiClO ₄			
were used i	n the prep	aratio	on of the			n a vacuum at 16			
satd soluti				for 3	1 h. "C	hem, pure" prop	ylene		
solvents we	re placed	in the	e vessels	carbo	onate v	as vacuum-dist	illed		
under condi	tions whic	h ensu	ured that	and "	'pure" g	rade methyl ac	etate		
atmospheric	moisture	Was	excluded.	WAS I	ourified	i as recommended	d in		
The vessels	were equi	librat	ted in an	ref.	(3).	The solvents	were		
U-10 ultrat	hermostat	which	was main-	dried	l using	zeolites of	type		
tained to w	ithin +0.	1 K	of the re-		-	r content in pro			
quired temp						te was 0.015 ma	••		
		-							
reached af			-		n meth)	rl acetate 0.014	ma 2 2		
#			1070 TPAM	x .					
for 7-8 h a	nd was read	cued t							
for 7-8 h a	nd was read	cued t			(continued next p	page)		

COMPONENTS:							
				ORIGI	NAL MEA	SUREMENTS :	
(1) Lithiur [7791-	ClO4;	11'ii	Il'in, K.K.; Demakhin, A.G.				
(2) Methyl	acetate; C	C3 H6O2	:			Khim. <u>198</u>	
[79-20-	•			780	0-2; TR	uss. J. In	org. Chem.
(3) Propyle	H ₆ O3	(E1	ngl. Tr	ansl.) <u>19</u>	<u>89</u> , <i>34</i> ,		
[108-32		436	5-8.				
EXPERIMENTAL	VALUES:	(contir	nued)				
		Liqu	id phase	composit	lon		
t/°C		mass 7	ĸ		mol X	8.	
	(1)	(2)	(3)	(1)	(2)	(3)	
25.0	48.2	0.0	51.8	47.2	0.0	52.8	
	48.4	5.2	46.4		7.2		
	48.7	10.3	41.0 35.6	45.8	13.9 20.3	40.2	
		20.2		45.1	26.4	28.6	
	50.7	29.6	19.7	44.6	37.4 47.3	18.0	
	51.7	38.6	9.7				
	53.5	46.5	0.0	44.5	55.5	0.0	
30.0			51.6		0.0		
			40.8	46.2 45.5	13.8	40.0	
			30.0				
			19.6	45.0			
	52.1	38.3 46.1	9.6	44.5	47.0 55.1	8.5 0.0	
			UXILIARY	INFORMATI	ION		<u></u>
by gravime was the mean were checked	ted and tric pre n of 5 de d by me	unsatu ecipitat etermins easuring	rated sln. tion with ations. g their r	LiClO ₄ nitron The compo efractive	(2). Ea osition e indice	ach report s of sol	s determined ed soly value vent mixtures parison with s.
-need prove							
ESTIMATED ER "Relative e Temperature	rror" in			not excee	ad <u>+</u> 0.!	5 x .	
ESTIMATED ER "Relative e Temperature	rror" in			not excee	ad <u>+</u> 0.9	5 %.	
ESTIMATED ER "Relative e Temperature REFERENCES:	rror" in precisio	on <u>+</u> 0.1	ι к.				Neorg Khim
ESTIMATED ER "Relative e Temperature REFERENCES: (1) Frontas	rror" in precisio	on <u>+</u> 0.1	ι к.				Neorg, Khim.
ESTIMATED ER "Relative e Temperature REFERENCES: (1) Frontas <u>1965</u> , 1 (2) Schumac	rror" in precisio 'ev, V.P. 0, 1816. her, J.C.	$\frac{1}{2}$ $\frac{1}$	l K. arova, Yu	G.; Sakhi	arova, l	N.N. Zh.	Neorg. Khim. dat, Moscow,
ESTIMATED ER "Relative e Temperature REFERENCES: (1) Frontas <u>1965</u> , 1 (2) Schumac <u>1963</u> , 2 (3) Keil, B	rror" in precisio 'ev, V.P. 0, 1816. her, J.C. 74.	on ± 0.1 ; Sakha Perch. torni Ta	l K. arova, Yu lorates (G.; Sakha Russ. Tra	arova, 1 ansl.),	N.N. Zh. Goskhimiz	dat, Moscow,

				ORIGIN	IAL MEAS	UREMENTS:	
(1) Lithiur [7791-	•	rate; Li	CIO4;	Il'ir	а, К.К.;	Demakhin,	A.G.
•	acetate; C	H6On		Zh. N	Veorg. k	(him. <u>1989</u> ,	34,
[79-20-				780)-2; [*] <i>R</i> L	iss. J. Inoi	rg. Chem.
(3) Propyle	ene carboi	nate; C ₄	H603	(Er	ngl. Tra	insl.) <u>1989</u>	, 34,
[108-32	7]			436	5-8.		
XPERIMENTAL	VALUES:	(contin	nued)				
		Liqu	id phase o	compositi			
t/°C		mass ?			mol % ^a		
	(1)	(2)	(3)	(1)	(2)	(3)	
40.0	49.0	0.0	51.0		0.0	52.0	
			40.4		13.7		
		19.8 29.0	29.6	46.0 45.6	25.9 36.7		
			9.5		46.5		
		45.7	0.0	45.3		0.0	
50.0	49.5	0.0	50.5	48.5	0.0	51.5	
	50.1		39.9	47.2	13.5		
		19.5 28.6	29.2		25.5 36.3		
		28.8	19.1 9.4	46.2 45.6	46.0	8.4	
			0.0		54.1		
		IONAL C	DATA				
OMMENTS AND	VOR ADDI						
At all temp	eratures higher (han th	at in pr	opylene	carbona	te which is	the more
At all temp acetate is polar solve	eratures higher 1 nt. Th	than th ne solu	at in pr bility of	opylene the s	carbona alt inc	te which is reases line	the more arly with
At all temp acetate is polar solve temperature	eratures higher 1 nt. Th	than th ne solu be appr	at in pr bility of oximated b	copylene the s by an equ	carbona alt inc ation o	te which is reases line	the more arly with
temperature	eratures, higher (nt. T) and may s = A + H he absolu	than the solution of the solut	at in pr bility of coximated b where s cerature, a	ropylene the s py an equ is the and A and	carbona alt inc ation o solubi . B are	te which is reases line f the form, lity of th empirical c	the more arly with e salt in onstants,
At all temp acetate is polar solve temperature log mass %, T t	eratures higher (nt. T) and may s = A + I he absolu res best-	than the solution of the solut	hat in pr bility of coximated b where s cerature, a lues of wh	topylene the s oy an equ is the and A and hich are	carbona alt inc ation o solubi .Bare given b	te which is reases line f the form, lity of th empirical c elow for pu	the more arly with e salt in onstants, re methyl
At all temp acetate is polar solve temperature log mass %, T t "least squa	eratures higher (nt. T) and may s = A + I he absolu res best- re propy]	than the solution of the solut	hat in pr bility of coximated b where s cerature, a lues of wh	topylene the s oy an equ is the and A and hich are	carbona alt inc ation o solubi .Bare given b	te which is reases line f the form, lity of th empirical c elow for pu	the more arly with e salt in onstants, re methyl
At all temp acetate is polar solve temperature log mass X, T t "least squa acetate, pu	eratures higher (nt. T) and may s = A + I he absolu res best- re propy] ass X of	chan th he solu be appr 3/T , te temp fit" va .ene car	hat in pr bility of coximated b where s cerature, a lues of wh	topylene the s oy an equ is the and A and hich are	carbona alt inc ation o solubi .Bare given b	te which is reases line f the form, lity of th empirical c elow for pu	the more arly with e salt in onstants, re methyl
At all temp acetate is polar solve temperature log mass %, T t "least squa acetate, pu Solvent m	eratures higher (nt. T) and may s = A + I he absolu res best- re propy] ass X of	than the solution T , be approximate the temp of tem	hat in pr bility of coximated b where s cerature, a clues of wh conate and	topylene the s y an equ is the and A and hich are i mixture	carbona alt inc ation o solubi B are given b s of th	te which is reases line f the form, lity of th empirical c elow for pu e two solve 80.00	the more arly with e salt in onstants, re methyl nts.

							6
[779 (2) Sodi [760	TS: nium perc 91-03-9] Lum perch 01-89-0] er; H ₂ 0;	lorate; N	NaClO ₄ ;		Andronov Gulyak Sb. Tr.	ova, N.I.	Bogomolova, V.V.; os. Ped. Inst.
VARIABLES One temp Composit	perature:	298 K.			PREPARED E.S. Gry		
EXPERIMEN	NTAL VALU	ES:					
Solubili	ity syste		-NaClO ₄ quid pha	-			Solid
	mas	= X				v ^a /molkg	-1 phase
Point					(1)		£
1	37.62	-	9.266	-	5.669	-	LIC104.3H20
2 3 4 5 6 7 8 9 10	36.82 36.31 35.91 31.26 28.72 21.84 13.14 7.23 6.23	2.00 4.00 11.92 16.74 29.09	9.024 9.108 8.288 7.861 6.483 4.308 2.728	0.432 0.882 2.746 3.981 7.503 12.51	5.617 5.171 4.950 4.183 2.875 1.932	0.265 0.544 1.713 2.507 4.842 8.346 13.37	" " " LiClO ₄ .3H ₂ O + NsClO ₄ .H ₂ O
11 12	6.10 5.96		2.35 2.31	20.07 20.26	1.684 1.655		11
13	5.76	60.21	2.22	20.20	1.591	14.45	NaClO4.H2O
14 15	0.38 - a Values	66.99 67.89 calcula	0.15 - ted by C	23.73	0.109	16.77 17.27	**
					NFORMATIO	N	
The iso	PPARATUS/ thermal m rium was	ethod was	s used.			D PURITY (ls were g:	DF MATERIALS: iven.
days. L perioda	rium was i ⁺ was de te method g with ni	termined ; ClO ₄ b;	by the y preci-		ESTIMATED Nothing	ERROR:	•
sitions determin	of the s ned by Sc dues. The	olid pha hreinema	ses were kers' me	thod	REFERENCE	'S :	

ties and refractive indexes of the saturated solutions were measured.

68								
COMPONENTS: (1) Lithiu [7791-	ım, perch	lorate;	LiClO ₄ ;		ORIGINAL MEASUREMENTS: Andronova, N.P.			
(2) Sodium [7601- (3) Water;	89-0]		•			. Yarosl. gos. ped. Inst. 120, 43-6.		
VARIABLES: One temper Compositio		323 K		(REPARED H R.A. Vasi			
EXPERIMENTA Solubility			NaClO4-H	1 ₂ 0 at 32	:3 K:			
mas	Liqu: s X		composi ol % ^a n	ition molality ⁸	/mol kg	Solid phase		
31.58 25.78 21.43 17.01 13.45 13.29 13.28 13.28 13.28 13.28 10.42 9.75	$\begin{array}{c} 7.37\\ 10.60\\ 22.06\\ 31.62\\ 40.55\\ 49.98\\ 56.91\\ 57.72\\ 57.75\\ 57.74\\ 57.83\\ 60.62 \end{array}$	9.73 8.46 7.62 6.66 5.65 5.66 5.66	1.81 2.67 5.91 9.01 12.53 17.01 20.78 21.37 21.39 21.39	4.844 4.265 4.309 4.309 4.307 4.321	1.158 1.719 3.886 6.062 8.711 12.366 15.681 16.261 16.281 16.272 16.349 17.096 17.768	$LiClo_4.3H_2O$ $UIClo_4.3H_2O + NaClO_4$ $UIClo_4.3H_2O + NaClO_4$ $UIClo_4 = UIClO_4$		
3.26	70.07 73.75	1.47	27.47 29.25	1.149	21.458 22.946	NaClO ₄ .H ₂ O "		

^a Compiler's calculation

AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: Isothermal method was used. Details of saturation were not given. The composition of solid phases was determined graphically by Schreinemaker's method of "residues". SOURCE AND PURITY OF MATERIALS: Not stated. ESTIMATED ERROR: Not stated.

REFERENCES:

					69	
COMPONENTS:		ORIGINAL	MEASUREMEN	(TS :		
<pre>(1) Lithium perchlorate; LiClO₄; [7791-03-9]</pre>	;	Karnaukhov, A.S.; Voronina, T.N.				
(2) Potassium perchlorate; KClO	Sb. Tr.	Yarosl. Go	os. Ped. Inst.			
[7778-74-7]	<u>1969</u> ,	66, 132-7	,			
(3) Water; H ₂ O; [7732-18-5]						
VARIABLES:	PREPARED					
One temperature: 298 K. Composition.	E.S. Gry	zlova				
EXPERIMENTAL VALUES:	<u>. </u>					
Solubility system LiClO ₄ -KClO ₄	-H ₂ O at	25°C :				
Liquid ph	ase com	position		Solid		
			y ^a /mol kg	1 phase		
Point (1) (2) (1)	(2)	(1)	(2)			
	0.2714		0.1511	KC104		
2 2.29 1.27 0.400 3 6.41 0.70 1.154	0.170 0.0968		0.0950 0.0544			
4 11.84 0.68 2.238	0.0987		0.0561	**		
	0.1000		0.0572 0.0564			
7 26.95 0.50 5.913	0.0842	3.492		**		
8 23.30 0.40 4.914 9 26.12 0.37 5.672	0.0648		0.0378 0.0363			
10 31.67 0.18 7.293	0.0318		0.0191	"		
11 37.50 0.19 9.245	0.0360	5.657	0.0220	кс10 ₄ +		
				LIC104.3H20		
12 37.48 0.197 9.239	0.0373	5.653	0.0228	"		
13 37.49 0.19 9.242	0.0360	5.654	0.0220	**		
14 37.52 0.19 9.252	0.0360	5.662	0.0220	"		
15 37.70 - 9.295		5.688	-	L1C104.3H20		
^a Values calculated by C	.C. Ho.					
AUX:	ILIARY	INFORMATIC	N			
METHOD/APPARATUS/PROCEDURE:		SOURCE AN	D PURITY C	OF MATERIALS:		
The isothermal method was used.		Lithium	and potass	ium perchlora-		
Equilibrium was reached after 3-	-4	tes were	reagent g	rade. They were	e	
days. The salt concns were calcu	ulated	further	purified b	by recrystalli-	,	
using the data of chemical analy	ysis.	zation.				
K ⁺ was determined gravimetrical	ly by					
the tetraphenylborate method; L	i ⁺ by	ESTIMATE	ERROR:			
the volumetric periodate method	;	Nothing	specified	•		
Clo_4^- by difference. The composition	tions	<u> </u>	<u></u>			
of the solid phases were determ:	ined	REFERENCE	CS:			
by Schreinemakers' method of rea	sidues	Į				
and then confirmed under a micro	oscope.					
The densities, viscosities of the						
saturated solutions were measure						
		İ				

ORIGINAL MEASUREMENTS: Karnaukhov, A.S.; Ganina, G.I. Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1969</u> , 66, 101-6 PREPARED BY: N.A. Kozyreva 10_4 -H ₂ O at 25 ^o C sition Solid ality ^a /mol kg ⁻¹ phase 1) (2) - 2.123 NH ₄ ClO ₄ 164 2.008 "
N.A. Kozyreva 10_4-H_20 at $25^{\circ}C$ sition Solid ality ^a /mol kg ⁻¹ phase 1) (2) - 2.123 NH ₄ ClO ₄ 164 2.008 "
sition Solid ality ^a /mol kg ⁻¹ phase 1) (2) - 2.123 NH ₄ ClO ₄ 164 2.008 "
ality ^a /mol kg ⁻¹ phase 1) (2) - 2.123 NH ₄ ClO ₄ 164 2.008 "
ality ^a /mol kg ⁻¹ phase 1) (2) - 2.123 NH ₄ ClO ₄ 164 2.008 "
164 2.008 "
164 2.008 "
$\begin{array}{cccccccccccccccccccccccccccccccccccc$
SOURCE AND PURITY OF MATERIALS: Not stated. ESTIMATED ERROR: Not stated. REFERENCES: None.

COMPONENT	e.			OPICINAL	MEACUDEMEN	TC .		
	ium perchlo	orstat I.4	c10.+	ORIGINAL MEASUREMENTS: Aravamudan, G.				
	1um perchi(1-03-9]	viace; L1	4,	Aravadu	ually Ur			
-	nium perchi	lorate; N	H₄C10₄;	Ind. J. Chem. <u>1964</u> , 43,				
	0-98-9]			475-507.				
(3) Wate	r; H ₂ 0; [7'	732-18-5]						
ARIABLES	:			PREPARED	BY:			
One temp	erature: 30	03.15 К.		C.Y. Ch	an			
Composit	ion.							
EXPERIMEN	TAL VALUES	:				<u></u>		
Solubili	ty system	Liclo ₄ -N	H ₄ ClO ₄ -H ₂ C	at 303.1	5 K :			
	S	olution c	omposition	····		Solid		
mas	s X			molality ^A /	mol kg ⁻¹	phase		
(1)	(2)	(1)		(1)	(2)			
38.87	-	9.72	-	5.977 5.958	-	LiCl04.3H20		
38.23 37.85	1.457 2.591	9.66 9.66	0.3334	5.958 5.973	0.2056 0.3703	LiClO ₄ .3H ₂ O		
			0.0000			+ NH4C104		
36.22 30.22	2.880 4.228	9.09 7.175		5.590 4.333	0.4025 0.5490	NH4C104		
22.99		5.167	1.336	4.333 3.067		*1		
17 24	0 0/6	3.742	1.778	2.198	1:045	**		
15.42	10.20 13.31	3.324	1.991	1.949		**		
10.50 4.96	13.31	2.222	2.551 3.321	1.295 0.602	1.487 1.928	**		
-	22.00	-	4.146	-	2.401	**		
" Compil	er's calcu	lations.						
		٨١	UXILIARY I	NFORMATION	1			
HETHOD/AP	PARATUS/PR	OCEDURE:						
•	d solution		ariously p	repared as	follows:			
						ions at 30°C;		
		• •			f both salt			
(iii) s l	ow evapora	tion of s	olutions	containing	both salt	s at 30°C until		
slightly	beyond the	e point o	f incipien	t crystall	ization.			
They wer	e then agi	itated co	ntinuousl	y at 30.00	0 ⁰ C until e	quilibrium was		
attained	, generall;	y after le	ess than 2	4h. Sat	urated sol	utions were then		
separate	d from the	solid ph	ases, whos	e composit	ions were a	scertained using		
Schreine	makers' me	thod.	Ammonium d	lon was a	nalysed us:	ing the formalin		
Abad (ref.1) and	lithium	by weighin	g as sulph	ate after v	olatilization of		
metnoa (and percho:	rate using	g sulphuri	c acid.				
ammonia			La :					
ammonia SOURCE AN	D PURITY O					NH 010 #		
ammonia SOURCE AN LiClO ₄ .3	H ₂ O was pro	epared fr		•		NH ₄ ClO ₄ from ials were given.		
ammonia SOURCE AN LiClO ₄ .3	H ₂ O was pro and HClO ₄ .	epared fr	ls of puri	•		• •		
ammonia SOURCE AN LiClO ₄ .3 ammonia ESTIMATED	H ₂ O was pro and HClO ₄ .	epared fro No detai	ls of puri REFER	ty of star	ting mater	• •		

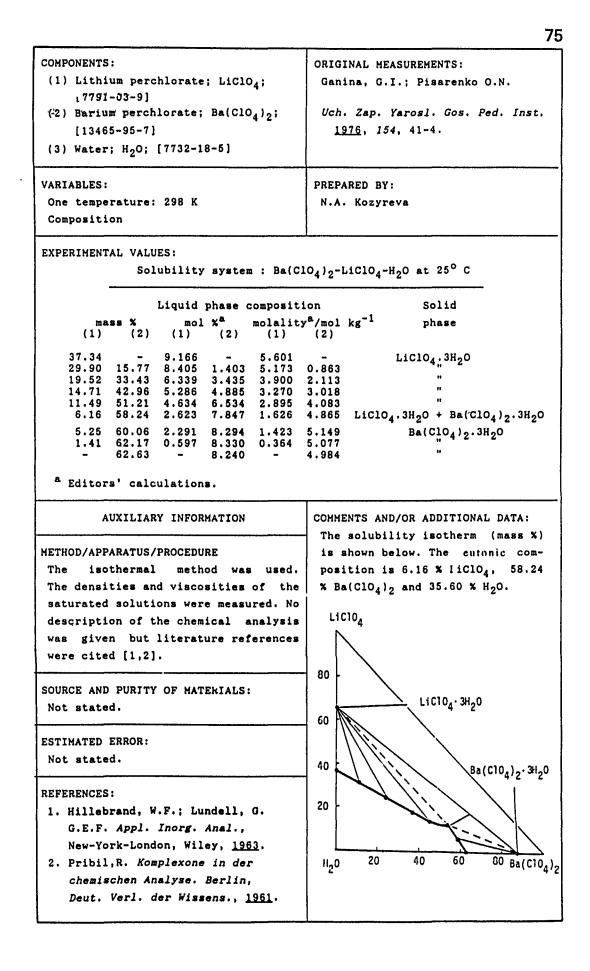
COMPONENTS: **ORIGINAL MEASUREMENTS:** (1) Lithium perchlorate; LiClO₄; Guseva, A.D.; Lepeshkov, I.N. [7791-03-9] (2) Ammonium perchlorate; NH₄ClO₄; Uch. Zap. Yarosl. Gos. Ped. Inst. 1969, 66, 3-22 [7790-98-9] (3) Water; H_2O ; [7732-18-5] VARIABLES: PREPARED BY: I.S. Bodnya ; N.A. Kozyreva Temperature: 308 K Composition **EXPERIMENTAL VALUES:** Solubility system : $NH_4ClO_4-LiClO_4-H_2O$ at $35^{\circ}C$ Solid Liquid phase composition mol %^a molality^a/mol kg⁻¹ phase . Point mass X (2) (1) (1) (2) (1) (2) 22.43 NH4C104 4.246 2.461 1 --3.34 20.62 0.709 3.964 0.413 2.308 2 3 4.80 19.46 1.022 3.752 0.596 2.187 1.254 1.824 4 9.90 15.90 2.141 3.113 5 17.15 3.814 2.286 2.255 1.351 11.35 1.156 6 21.20 9.42 4.824 1.941 2.872 7 25.76 7.31 6.024 1.548 3.618 0.930 8 30.05 5.00 7.187 1.083 4.349 0.655 7.599 1.021 9 31.40 0.620 4.66 4.616 10 35.13 3.62 8.780 0.819 5.391 0.503 39.80 6.476 0.358 NH₄ClO₄ + LiClO₄.3H₂O 11 2.43 10.39 0.574 12 2.19 10.47 0.518 6.531 0.323 40.10 13 40.35 1.99 10.54 0.471 6.578 0.294 40.38 2.1710.580.5156.6070.3211.8810.670.4466.6620.279 14 40.70 LiC104.3H20 15 40.80 16 0.97 10.58 0.228 6.586 0.142 17 41.09 10.56 6.556 ^a Editors' calculations. AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE; The chemically pure salts were Isothermal method. Details of satu-Li⁺ was ration were not given. further purified by recrystallidetermined by precipitating The hydrate of lithium 85 zation. lithium zinc uranyl acetate; NH_A^+ by perchlorate was dehydrated. distillation of NH_3 ; ClO_4^- by ESTIMATED ERROR: difference. Not stated. **REFERENCES:** None.

COMPONEN	TS.					MEACUDEVEL	
	is: hium perc	hlorate	: LiClO.:			MEASUREMEN S.A.; Smir	
	91-03-91	·	·4·		· · ·		•
	llium per		; T1C10 ₄	;			Gos. Ped. Inst.
•	453-40-2]				<u>1972</u> ,	103, 33-5.	
(3) Wate	er; H ₂ O;	[7732-18	3-5]				
VARIABLE	S :				PREPARED	BY:	
	perature:	298 K.		Ì	N.A. Vas	ina	
Composi	tion.						·
EXPERIME	NTAL VALU	ES:					
Solubil	ity syste	m LiClo	0 ₄ -T1C10 ₄	-H ₂ O at	25°C :		,
		Li	iquid pha	use comp	osition		Solid
		8 %				y ^a /mol kg ⁻	1 phase
	(1)					(2)	
1 2	9.35	14.09 5.26	1.814	0.9631 0.357	- 1.029 2.250	0.5398 0.203	TICIO4
4 5	18.67	3.33	3.886	0.243	2.250	0.141 0.0938	**
6	28.17 36.76	1.78	9.182	0.156	3.791 5.622	0.0953	**
7	37.14	1.70	9.310	0.149	5.708	0.0915	T1C10 ₄ + LiC10 ₄ .3H ₂ 0
9	36.92	1.58	9.215	0.138	5.643	0.0846	**
10 11	37.12 37.78	1.83	9.320 9.323	0.161	5.715 5.707	0.0987	Liclo ₄ .3H ₂ O
٩	Values c	alculate	ed by C.C	. Но.			
<u> </u>		<u></u>	AUXI	LIARY I		N	
METHOD/AI	PPARATUS/	PROCEDUR	RE:		SOURCE ANI	D PURITY O	F MATERIALS:
No deta:	ils were	given.			Nothing	specified.	
				1	ESTIMATED	ERROR:	
					Nothing a	specified.	
					REFERENCE	S:	
					·····		

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COMPONENTS: (1) Lithium perc [7791-03-9]	chlorate	; LiClO,	4:	ORIGINAL . Ivanov,	MEASUREMEN S.A.	TS:	
<pre>(2) Calcium perc [13477-36-6] (3) Water; H₂O;</pre>	1		0 ₄) ₂ ;		. Yarosl. 5, 11-13	Gos. Ped. Ins	
VARIABLES: One temperature Composition.	: 298 K			PREPARED BY: Kozyreva, N.A.			
EXPERIMENTAL VAL	UES :				<u></u>		
Solubility of t			•		25°C :	. h	
	:	Liguid p	hase com	position		Solid ^b phase	
ma	55 X	mo	1 × ^a	molality	^a /mol kg ⁻¹		
• . •	(2)	(1)		(1)	(2)		
14.24	31.58	9.230 7.748 4.089 3.130	4.037	2.470	2.439	A A A A	
8.89	48.35	3.14	7.608	1.954	4.731	A + B	
3.26 0.00	52.71 65.50	1.14 0.00	8.183 12.52	0.696 0.00	5.009 7.944	B B	
^a Compiler's ca The solid phase Ca(ClO ₄) ₂ .4H ₂ O	es at th	e isothe	B = Ća(ermal do	104.3H20 C104)2.4H2 uble sat ur		it are	
		IXUA	LIARY IN	FORMATION			
METHOD/APPARATUS Isothermal meth saturation were	od. Con	ditions		SOURCE AN Not stat		DF MATERIALS:	
	c and X-	ESTIMATED ERROR: Not stated.					
chemical, therm powder analyses	were e	mbroleg:		Not stat			

t



COMPONENTS: ORIGINAL MEASUREMENTS: (1) Lithium perchlorate; LiClO₄; Ganina, G.I. [7791 - 03 - 9](2) Manganese perchlorate; Mn(ClO₄)₂; Sb. Tr. Yarosl. Gos. Ped. Inst. [13770-16-6] 1977, 164, 58-60. (3) Water; H₂O; [7732-18-5] VARIABLES: PREPARED BY: One temperature: 298 K. E.S. Gryzlova Composition. **EXPERIMENTAL VALUES:** Solubility system $LiClO_4 - Mn(ClO_4)_2 - H_2O$ at 25°C : Solid^b Liquid phase composition mol X^a molality^a/mol kg⁻¹ mass X phase (2) Point (1)(2) (1)(2) (1)1 37.34 9.166 5.601 A 4.23 0.447 5.367 0.273 2 34.81 8.777 A 3 30.87 9.07 7.928 0.976 4.831 0.595 A 26.43 23.72 4 13.00 6.784 1.399 4.101 0.8455 A 5 16.91 6.219 1.858 3.755 1.122 A 6 20.48 21.19 5.478 2.376 3.300 1.431 A 7 13.83 30.76 3.907 3.642 2.346 2.187 A 8 1.764 9.60 39.25 2.926 5.014 3.023 A 9 5.30 44.36 1.650 5.789 0.990 3.472 A 10 1.301 A 4.02 47.74 6.477 0.783 3.899 3.38 49.95 6.980 11 1.13 0.681 4.216 A + B 12 4.206 1.54 50.84 0.506 7.008 0.304 B 13 51.91 7.116 4.252 В ^a Values calculated by C.C. Ho; ^b A = LiClO₄.3H₂O; B = Mn(ClO₄)₂.6H₂O. AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: The isothermal method was used. No details were given. The compositions of liquid phases and residues were analysed for ESTIMATED ERROR: perchlorate ion (ref. 1) and Nothing specified. manganese ion (ref. 2). Densities and viscosities of the solutions **REFERENCES:** 1. Hillebrand, W.F.; Lundell, G. were measured. E.F. Applied Inorganic Analysis, 2nd edi, New York, Wiley, 1963. 2. Pribil, R. Komplexone in der chemischen Analyse, Berlin, 1961.

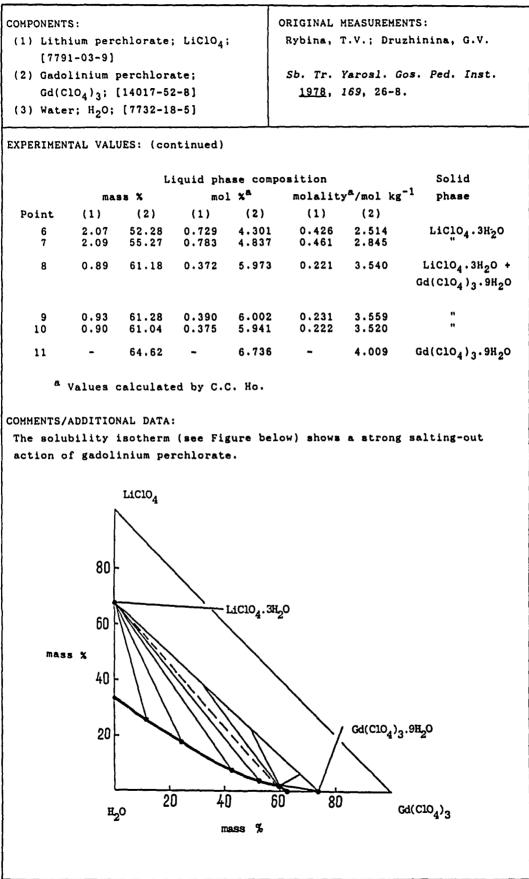
COMPONENT	S:				ORIGINAL M	IEASUREMENT	S:
	ium percl 1-03-9]	hlorate;	LiCl0 ₄ ;		Druzhinir	ма, G.V.; G	useva, A.D.
-	lt perchl	lorate: (;o(ClO,),		Sb. Tr. Y	Yarosl. Gos	. Ped. Inst.
	55-31-7]		4.4			79, 32-5.	
(3) Wate	r; H ₂ 0;	[7732-18-	-5]				
VARIABLES	;			1	PREPARED E	9Y :	
One temp	erature:	298 К.			E.S. Gryz	lova	
Composit	ion.						
EXPERIMEN	TAL VALU	ES:					
Solubili	ty system	m LiClO ₄ -	-Co(ClO ₄) ₂ -H ₂ O	at 25°C :		
		Lic	uid phas	se comp	osition		Solid ^b
	mass % mol % ^a Point (1) (2) (1) (1						phase
Point	(1)	(2)	(1)	(2)	(1)	(2)	
1	37.53	-	9.23	-	5.647 4.716	-	A
2 3	30.73 26.11	8.02 13.60	7.765 6.733	0.836	4.716 4.071	0.508 0.875	A A
4	17.75	23.74	4.758	2.626	4.071 2.851	1.574	A
5 6	13.24 6.67	32.71 43.72	3.827	3.902	2.302 1.264	2.347 3.418	A A
7 8	5.29 5.41	46.64 46.48	1.715 1.752	6.240 6.213	1.034 1.057	3.763 3.747	A + B A + B
9 10		47.90 51.93	1.488		0.897		B B
^a Val	ues calcu	ulated by	C.C. Ha	р; ^в А :	= LiClO ₄ .3	H ₂ O; B ≠ Co	o(ClO ₄) ₂ .6H ₂ O
METHOD/AP	PARATUS/I	PROCEDURE		<u> </u>	NFORMATION	PURITY OF	MATERIALS:
Co ²⁺ was metric t	determin itration;	ned by co ; ClO ₄ by	: mplexo- precipi			PURITY OF	MATERIALS:
Co ²⁺ was metric t tating w	determin itration; ith nitro	ned by co; ClO_4 by con. The c	:: mplexo- / precipi compositi	- Long -	SOURCE AND Nothing a	PURITY OF	MATERIALS:
Co ²⁺ was metric t tating w of the t	determin itration;	ned by co ; ClO4 by on. The c d phases	C: omplexo- o precipi compositi were	L- Lons	SOURCE AND Nothing s ESTIMATED	PURITY OF	MATERIALS:
Co ²⁺ was metric t tating w of the t	determin itration; ith nitro rue solid ed by Sch	ned by co ; ClO4 by on. The c d phases	C: omplexo- o precipi compositi were	L- Lons	SOURCE AND Nothing s ESTIMATED	PURITY OF tated. ERROR:	MATERIALS:
Co ²⁺ was metric t tating w of the t determin	determin itration; ith nitro rue solid ed by Sch	ned by co ; ClO4 by on. The c d phases	C: omplexo- o precipi compositi were	L- Lons -	SOURCE AND Nothing s ESTIMATED	PURITY OF tated. ERROR: opecified.	MATERIALS:
Co ²⁺ was metric t tating w of the t determin	determin itration; ith nitro rue solid ed by Sch	ned by co ; ClO4 by on. The c d phases	C: omplexo- o precipi compositi were	L- Lons -	SOURCE AND Nothing a ESTIMATED Nothing a	PURITY OF tated. ERROR: opecified.	MATERIALS:
metric t tating w of the t determin	determin itration; ith nitro rue solid ed by Sch	ned by co ; ClO4 by on. The c d phases	C: omplexo- o precipi compositi were	L- Lons -	SOURCE AND Nothing a ESTIMATED Nothing a	PURITY OF tated. ERROR: opecified.	MATERIALS:
Co ²⁺ was metric t tating w of the t determin	determin itration; ith nitro rue solid ed by Sch	ned by co ; ClO4 by on. The c d phases	C: omplexo- o precipi compositi were	L- Lons -	SOURCE AND Nothing a ESTIMATED Nothing a	PURITY OF tated. ERROR: opecified.	MATERIALS:
Co ²⁺ was metric t tating w of the t determin	determin itration; ith nitro rue solid ed by Sch	ned by co ; ClO4 by on. The c d phases	C: omplexo- o precipi compositi were	L- Lons -	SOURCE AND Nothing a ESTIMATED Nothing a	PURITY OF tated. ERROR: opecified.	MATERIALS:
Co ²⁺ was metric t tating w of the t determin	determin itration; ith nitro rue solid ed by Sch	ned by co ; ClO4 by on. The c d phases	C: omplexo- o precipi compositi were	L- Lons -	SOURCE AND Nothing a ESTIMATED Nothing a	PURITY OF tated. ERROR: opecified.	MATERIALS:

				1					
COMPONENT	rs:				ORIGINAL N	EASUREMENT	rs:		
	nium pere 91-03-9]	chlorate	Liclo ₄ ;		Druzhinina, G.V.; Guseva, A.D.				
(2) Nick	tel perci	hlorate;	Ni(C104)	2;	Uch. Zap. Yarosl. Gos. Ped. Inst.				
[136	337-71-3]	-	-	1970,	79, 32-5.			
(3) Wate	er; H ₂ O;	[7732-18	3-5]						
VARIABLES	5:				PREPARED	BY:			
•		: 298 K.			E.S. Gry	zlova			
Composit	tion.								
EXPERIMEN	NTAL VAL	UES:							
Solubili	ity syst	em LiClO	-Ni(ClO4) ₂ -H ₂ O	at 25°C :				
		L	iguid pha	ase com	position		Solid ^b		
	mas	89 X			molalit	y ^a /mol kg ⁻¹	l phase		
Point	(1)	(2)	(1)	(2)	(1)	(2)			
1	37.58	-	9.252	-	5.659	-	А		
2	32.96	4.97	8.208	0.511	4.991	0.311	Α		
3 4	28.41 21.11	11.02 20.22	5.615	2,221	4.409 3.382		A A		
5	14.40	29.12	4.000	3.341	2.396	2.001	A		
6 7		36.90 41.11	3.063		$1.840 \\ 1.448$		A A		
8 9		45.15 45.03			1.290		A + B A + B		
10					0.614		B		
11		52.05	-	7.056		4.214	В		
^a Val	ues calo	culated h	ру С.С. Н	lo; ^b A	= LiClO ₄ .3	3H ₂ 0; B = N	(i(ClO ₄) ₂ .6H ₂ O		
			AUXI	LIARY	INFORMATION				
METHOD/AF	PARATUS	/PROCEDU			SOURCE ANI	PURITY OF	MATERIALS:		
-	•	nethod wa		Ni2+			was synthesized		
		by comple			from nick	el carbons	te by treating		
titratio	n. C104	by preci	pitating				chloric acid		
with nit	ron. The	e composi	tions of	the	followed	by recryst	allization.		
		es were d method d			PETTMATED		<u></u>		
Schreine	makers	mechod c	i residu	les.	ESTIMATED ERROR: Nothing specified.				
					REFERENCES	5:			
1									

•	-						/		
COMPONENT	rs:				ORIGINAL	MEASUREMEN	TS:		
(1) Lith	ium per	chlorate	LiClO4	;	Karnaukh	ov, A.S.;	Kosheleva, N.Į.;		
· ·	91-03-9]				Pisare	nko, O.N.			
		hlorate;	Cu(C10 ₄)2;					
	70-18-8	-			Sb. Nauch. Tr. Yarosl. Gos. Ped.				
(3) Wate	er; H ₂ O;	[7732-18	3-5]		Inst.,	<u>1975</u> , 144	, 3-7.		
VARIABLES	5:				PREPARED	BY:			
		: 298 К.			E.S. Gry				
Composit					-				
EXPERIMEN	NTAL VAL	UES:		I					
Solubili	ity syst	em LiCl(0₄-Cu(Cl	04)2-H2(D at 25 ⁰ C	:			
			•				Solid ^b		
					position				
Daint	mass % Point (1) (2) (molalit;		1 phase		
roint	(1)	(2)	(1)	(2)	(1)	(2)			
1	37.58	- 4.18	9.252	-	5.659	-	A		
2 3	~~ ~~	~ ~ ~		~ ~ ~ /			A		
4	29.60 23.10	12.10	5.625	1.194	3.351		A A		
5	17.33	19.50	4.351	1.985	2.579	1.176	A		
6 7	14.26	22.80	3.608	2.339	2.130	1.380 1.796	A A		
8	10.00	32.50	2.757	3.632	1.635	2.154	Â		
9	8.94	6.60 12.10 19.50 22.80 28.10 32.50 40.00	2.737	4.963	1.646	2.154 2.985	A		
		49.30				4.360	A + B		
11	8.00	49.25	2.85	7.119	1.759	4.390	A + B		
12 13	2.94	51.40 63.20		7.101		4.289 6.544	B		
							-		
^a Val	lues cal	culated b	oy C.C.	Ho; ^b A	= $LiClo_4$.	3H ₂ 0; B =	Cu(ClO ₄) ₂ .6H ₂ O		
		<u></u>	••••••• <u>•</u> •••	<u> </u>	<u></u>				
			AUX	ILIARY 1	INFORMATIO	N			
METHOD/AF	PARATUS	PROCEDU	E:		SOURCE ANI	D PURITY O	F MATERIALS:		
The isot	hermal :	method wa	used.		No detai	ls were gi	ven.		
• • • • • • • • •		the satur		. -		<u> </u>			
solution	IS WAS TO	eached in	a 2h. Cu	2+	ESTIMATED	ERROR:			
was dete	rmined a	spectropi	otome-		Nothing	specified.			
	•	gravimeti							
precipit	tating w	ith nitro	on; Li ⁺	WAS	REFERENCE	S:			
determin	ned by d	ifference							
				1					

[779 (2) Ceri [140	lium perc 1-03-9] .um perc 17-47-1	chlorate; hlorate;] [7732-18	Ce(ClO ₄)	; 	ORIGINAL MEASUREMENTS: Druzhinina, G.V.; Rybina, T.V. Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1976</u> , 154, 52-5.				
VARIABLES One temp Composit	erature	: 298 K.			PREPARED E N.A. Vasi				
EXPERIMEN	TAL VAL	UES:							
Solubili	ty syste	em LiCl(0 ₄ -Ce(ClC	0 ₄) ₃ -H ₂ 0) at 25 ⁰ C :	:			
		Li	lquid pha	ase comp	osition		Solid ^b		
	mai	58 X				/mol kg ⁻¹	phase		
Point	(1)	(2)	(1)	(2)	(1)	(2)			
1 2 3 4 5 6 7	$22.57 \\ 17.24 \\ 9.44$	17.80 24.94 39.50 47.42	5.955 4.727 2.945 2.290	0.297 1.139 1.659 2.990 3.974 6.147	1.738 1.356	0.681 0.984 1.764 2.354	A A A A A A		
8 9	3.35 3.16	64.05 64.14	1.585	7.351 7.347	0.966 0.908	4.481 4.473	A + B A + B		
10	-				-		В		
^a Val	ues calo	culated b			= LiClO ₄ .3		се(ClO ₄) ₃ .9H ₂ O		
Equilibr	hermal n	PROCEDUE method wa reached letermine	as used. after 1-	-2	SOURCE ANI No detail		F MATERIALS:		
trically nitron,	by pred Ce ³⁺ by	cipitatir titratir	ng with ng with	1	ESTIMATED Nothing a	ERROR:			
Trilon E xylenol		the indic	ator		REFERENCES :				
			· · · · · · · · · · · · · · · · · · ·						

						0
COMPONENTS:				ORIGINAL	MEASUREMEN	rs:
(1) Lithium per [7791-03-9]		Liclo ₄	;	Rybina, '	T.V.; Druzl	ninina, G.V.
(2) Gadolinium		te;		Sb. Tr.	Yarosl. Go:	s. Ped. Inst.
Gd(ClO ₄) ₃ ;	[14017-52	2-8]	Ì	<u>1978</u> ,	<i>169</i> , 26-8.	
(3) Water; H ₂ O;	[7732-18	3-5]				
VARIABLES:				PREPARED	BY:	
One temperature	: 298 K.		l l	E.S. Gry	zlova	
Composition.						
EXPERIMENTAL VAL	UES:					
Solubility syst	em LiClO	0 ₄ -Gd(C10	0 ₄) ₃ -H ₂	D at 25 ⁰ C	:	
	Li	iquid pha	ase com	position		Solid
ma	85 X				y ^a /mol kg ⁻¹	l phase
Point (1)	(2)	(1)				
1 27 24	-	0 166	-	5 E01	-	1.1010. 24.0
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	11.73	6.611	0.692	5.601 2 3.959	0.4145	Liclo ₄ .3H ₂ O
3 15.10	27.36 35.03	4.179	1.768	2.467	1.044	**
5 6.07	44.45	1.967	3.363	1.153	1.972	49
<u></u>		AUXI	LIARY	INFORMATIO	N	
METHOD/APPARATUS The isothermal Samples of liqu were taken one second salt was sed. ClO ₄ was d cally as nitron Gd ³⁺ by complex. Trilon B in the orange with uro (ref. 2).	method wa id phases or two da added an etermined perchlor ometric t presence	as used. and res ays after ad then a l gravime rate (ref itration e of xyle	r a analy- stri- f. 1). h with	Gadolinit pared in Analysis perchlora to corres ESTIMATED Temperatu Solubilit REFERENCES 1. Mulles titat Leipz 2. Nikola of Rakola, 3. Parage G.V.	um perchlor the labora revealed fa ate and wat spond to Go ERROR: ure: ± 0.1° ty : Nothin S: r, G. Prakt ig, <u>1951</u> , 3 ayev (ed) a diochemists Moscow <u>199</u> uzova, T.V. Sb. Tr. Yas <u>1977</u> , 164	ng specified. tikum der Quan- schen Analyse, 328. 4 Short Course ry, Vysshaya sh- 39 (in Russian). .; Druzhinina, rosl. Gos. Ped.



							8	83	
		chlorate;	LiClO ₄ ;		ORIGINAL ANDRONOV	MEASUREMENT a, N.P.	rs:		
(2) Tert Tb(C	pium pero $(10_4)_3;$	chlorate; [14014-09 [7732-18	9-6]		Sb. Nauch. Tr. Yarosl. Gos. Ped. Inst. <u>1975</u> , 144, 24-6.				
VARIABLES One temp Composit	perature	: 298 K.			PREPARED BY: I.S. Bodnya				
EXPERIMEN	TAL VAL	UES:		I					
Solubili	ty syste	em LiClO ₄	-ть(с10 ₄) ₃ -H ₂ 0	at 25°C :				
					position	1 ـ ـ ـ ـ ٩	Solid ^b		
- • ·		ss %				y ^a /mol kg ⁻¹	phase		
Point 1 2 3 4 5 6 7 8	37.66 24.17 19.87 18.16		9.280 6.623 5.590 5.355 3.742 1.645 1.212	1.203	5.678 3.988 3.343	0.7245 0.9496 1.176 1.671	A A A A A A A		
9 10 11	3.42 3.05	62.87 62.53 62.54	1.561 1.38	6.641 6.590	0.944 0.833		A + B A + B A + B		
12 13 ^a Velu	-	64.21	-	6.602		3.923	В В b(ClO ₄) ₃ .9H ₂ O.		
					INFORMATIO			_	
Clo_4 was as nitro determin titratic presence	hermal r determ on perchl ded by co on with 1 e of ind	/PROCEDUF nethod wa ined grav lorate. T omplexome Trilon B icator xy tropin bu	RE: dimetrics Tb ³⁺ was etric in the vlenol		SOURCE AND Terbium y by heating then disa in 56% per was recry water and After der salt cont Tb(ClO ₄) ESTIMATED Nothing	D PURITY OF perchlorate ng terbium solving the erchloric a ystallized d washed wi siccating of tained 72.5 3 ERROR: specified.	F MATERIALS: was prepared nitrate and terbium oxide acid. The salt from distilled th chloroform. over P_2O_5 , the i2 mass %		
					REFERENCE	5:			

<pre>COMPONENTS: (1) Lithium perchlorate; LiClO₄; [7791-03-9] (2) Lithium nitrate; LiNO₃; [7790-69-4] (3) Water; H₂O; [7732-18-5]</pre>	ORIGINAL MEASUREMENTS: Ganina, G.I.; Karnaukhov, A.S.; Lepeshkov, I.N. Zh. Neorg. Khim. <u>1970</u> , 15, 2825-7; *Russ. J. Inorg. Chem., (Engl.Transl.) <u>1970</u> , 15, 1469-70. Andronova, N.P.; Ganina, G.I. Sb. Tr. Yarosl. Gos. Ped. Inst. <u>1970</u> , 78, 55-8.
VARIABLES: One temperature: 298 K. Composition.	PREPARED BY: C.Y. Chan, I.S. Bodnya

EXPERIMENTAL VALUES:

Solubility system $LiClO_4$ -LiNO₃-H₂O at 25 °C :

		Soluti	Solid			
mas	ss %	mol	× ^a	molality ^a /	mol kg ⁻¹	phase
(1)	(2)	(1)	(2)	(1)	(2)	
37.34	-	9.17	-	5.601	-	LiC104.3H20
35.52	2.40	8.75	0.91	5.378	0.561	
32.88	5.68	8.13	2.17	5.030	1.341	
30.19	8.41	7.44	3.20	4.622	1.987	••
26.79	11.98	6.58	4.54	4.113	2,838	**
25.04	14.29	6.18	5.44	3.879	3.416	**
21.32	18.23	5.25	6.92	3.315	4.374	
17.91	22,28	4.417	8.48	2.815	5.403	
15.47	26.78	3,889	10.39	2.518	6.726	**
13.41	30.98	3.441	12.27	2.267	8.08	"
10.29	36.82	2.712	14.97	1.829	10,10	
7.86	39,69	2.075	16.17	1.409	10.98	**
7.68	42.43	2.086	17.80	1.447	12.34	

^A Compiler's calculations.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: Details of saturation method were

not given. The composition and nature of the solid phases were determined using Schreinemakers' method, chemical analysis and X-ray and optical crystallography methods. Nitrate was determined using Devarda's method (no ref. given), lithium by lithium zinc uranyl acetate precipitation (ref.1), and perchlorate by difference. SOURCE AND PURITY OF MATERIALS: No information given.

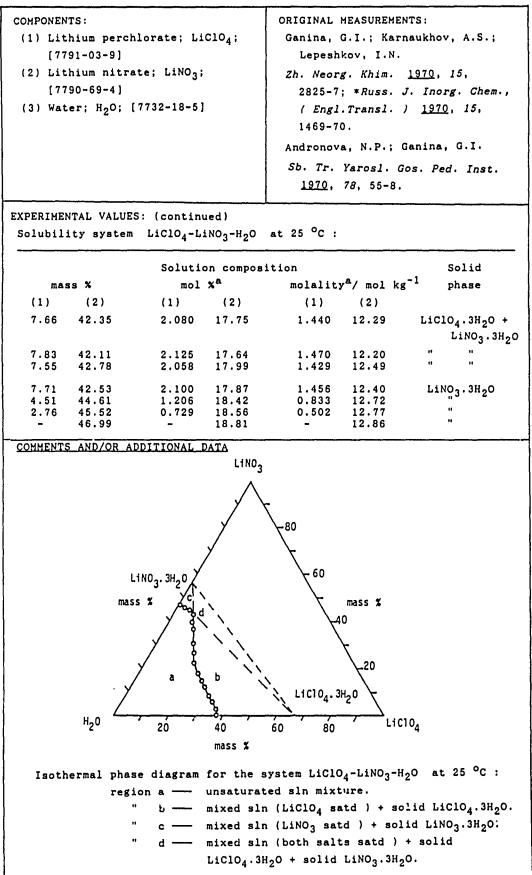
ESTIMATED ERROR:

Not stated.

REFERENCES:

1. Grüttner, B. Z. Analyt. Chem. 1951, 133, 40.

(continued next page)



86 COMPONENTS: ORIGINAL MEASUREMENTS: (1) Lithium perchlorate; LiClO₄; Andronova, N.P. [7791 - 03 - 9](2) Lithium nitrate; LiNO₃; Uch. Zap. Yarosl. Gos. Ped. Inst. [7790-69-4] 1973, 120, 44-6. (3) Water; H₂O; [7732-18-5] **PREPARED BY:** VARIABLES: One temperature: 323 K. N.A. Vasina Composition. EXPERIMENTAL VALUES: Solubility system $LiNO_3$ -LiClO₄-H₂O at 50°C : Liquid phase composition Solid mol %^a molality^a/mol kg⁻¹ mass % phase Point (1) (2) (1) (2) (1)(2) 45.27 7.775 LiClO4.3H20 1 12.29 2 38.08 8.98 10.45 3.801 6.761 2.460 35.75 9.942 5.467 3 12.74 6.524 3.587 ... 4 27.80 20.84 7.653 8.853 5.088 5.885 5 22.90 27.73 11.98 8.147 6.410 4.360 ... 6 12.80 25.96 20.64

3.343 51.21 4.206 7 12.92 52.07 4.306 26.78 3.469 21.57 LIC104.3H20 + LiNO3 8 12.70 52.30 4.232 26.89 3.411 21.67 9 13.03 52.17 4.357 26.92 3.519 21.74 11.33 LiNO3 10 27.21 3.013 21.88 53.32 3.747 11 8.30 55.98 2.716 28.26 2.184 22.73 *1 12 4.18 60.03 1.356 30.06 1.098 24.33 30.43 ... 13 24.42 1.20 61.98 0.382 0.306 .. 14 30.58 24.46 62.77

^A Values calculated by C.C. Ho.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: The isothermal method was used. Equilibrium was reached in 6-8 days, and in the LiNO3 crystallization field in 10 days. The solubility isotherm was constructed using data from chemical analysis. Analytical methods were not stated.

SOURCE AND PURITY OF MATERIALS: Nothing specified.

ESTIMATED ERROR: Nothing specified.

REFERENCES:

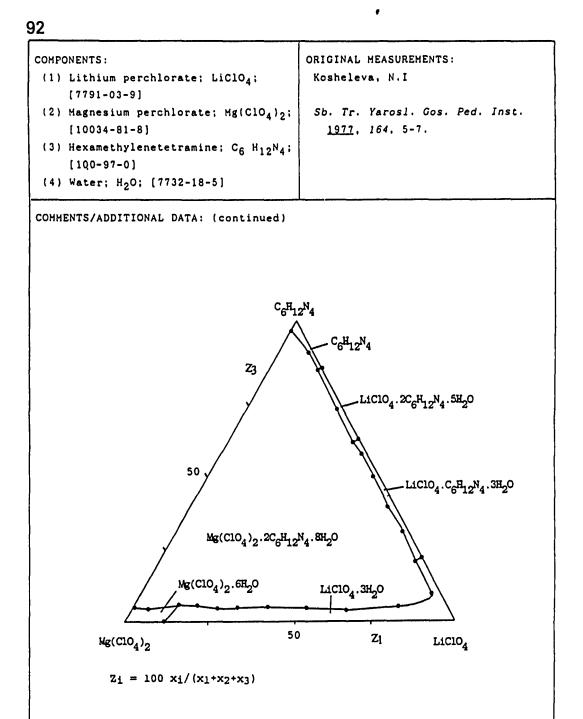
								0/	
COMPONENT	rs:				ORIGINAL M	EASUREMEN	TS:		
	hium per 91-03-9]	chlorate	LiC104	•	Lepeshkov	, I.N.; G	anina, G.I.		
(2) Lit!	hium chr	omate; Li	2 ^{Cr0} 4;		Sb. Tr. Yarosl. Gos. Ped. Inst.				
	307-35-8 er: H ₂ O:] [7732-18	-51		<u>1969</u> , 6	6, 96-100	•		
		•••••							
VARIABLES	S: perature	• 208 K			PREPARED B				
Composi		. 250 K.			1.5. 500.	. 7 a			
EXPERIME	NTAL VAL	UES:							
Solubili	ity syst	em Li ₂ Cr	0 ₄ -Liclo	4 ^{-H} 2 ^O	at 25 ⁰ C :				
		Li			position		Solid ^b		
					molality		1 phase		
						(2)			
1 2	37.34 36.24	-	9.166	-	5.601 57 5.499	- 0.225	A A		
3	35.42	1.81 3.34	8.859	0.6	5.601 57 5.499 34 5.436	0.420	Ä		
4 5	36.16	0.74	8.268	1.3	35 5.080	0.857	A A		
6	24.82	14.71	6.838 6.300	3.0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1.873	Â		
7 8	16.99	22.01	4.298	4.5	52 2.618	2.778	A		
9	7.54	32.79	3.190	5.64	14 1.942 15 1.188	4.231	A A		
10	4.81	32.79 37.32	1 275	8.10	0.781	4.966	A		
11 12	2.75	40.97 42.32	0.746	9.10)4 0.459 34 0.336	5.605 5.851	A A		
13	1.45	45.90	0.414	10.74	0.259		A		
14	1.56	47.17	0.455	11.27	0.286	7.084	A + B		
15 16		47.17 47.17	0.455	11.27	0.286	7.084	A + B A + B		
17	1.56	47.17	0.455 0.455		0.286	7.084 7.084	A + B A + B		
18 19	0.91	48.15 48.88	0.27	11.56 11.71	0.168	7.278 7.363	B B		
^a Val	lues cal	culated b	у с.с. н	o; ^b A	= LiClO ₄ .3	H ₂ 0; B = 1	Li ₂ Cr0 ₄ .2H ₂ O		
			AUXI	LIARY	INFORMATION				
METHOD/AI	PPARATUS	/PROCEDUR	E :		SOURCE AND	PURITY O	F MATERIALS:		
The isot	thermal i	method wa	s used.		No detail	s were gi	ven.		
-		reached							
		ions and						_	
	-	sed for t			ESTIMATED	ERROR:			
		m ions. T	-		Nothing a	pecified.			
		lid phase							
-		nemakers'							
residues	s. The de	ensities,	viscosi	ties	REFERENCES	:			
and elec	ctric co	nductivit	ies of t	he					
saturate	ed solut	ions were	measure	d.					

				T						
COMPONENT	rs:				ORIGINAL M	EASUREMEN	TS:			
<pre>(1) Lithium perchlorate; LiClO₄; [7791-03-9]</pre>					Guseva, A.D.;Lepeshkov, I.N.					
	-	omate; L	igCr04:		Uch. Zap.	Yarosl.	Gos. Ped. Inst.			
[14307-35-8]					<u>1969</u> , <i>66</i> , 3-22.					
(3) Wate	er; H ₂ 0;	[7732-1	8-5]							
VARIABLES	3:				PREPARED B	Y:				
One temp	perature	: 308 К.			N.A. Vasi	na				
Composit	tion.									
EXPERIMEN	TAL VAL	UES:								
Solubili	ity syst	em Li ₂ C	r0 ₄ -LiClC	04-H20	at 35°C :					
		L	iquid pha	ASC COM	position		Solid			
	ma	88 X	mol	L X ^a	molality	^a /mol kg ⁻	1 phase			
Point	(1)	(2)	(1)	(2)	(1)	(2)				
1	41.09	-	10.56	-	6.556	-	LICIO4.3H2O			
23	38.35 36.23	3.34 4.89	9.950 9.339		0 6.182 3 5.784					
4	32.32	9.41	8.414	2.00						
5	25.51	17.67				2.395	69 18			
67	17.48	25.16 36.09	4.639 2.166			3.377 4.968				
8		42.48	1.130		-		**			
9	1.18	49.36	0.354	12.12	0.224	7.684	LiClO ₄ .3H ₂ O + Li ₂ CrO ₄ .2H ₂ O			
10	1.20	49.19	0.359	12.05	0.227	7.635	6 7 6 H			
11	1.22	49.18	0.365	12.05	0.231	7.635	**			
12	1.06	49.34 49.48	$0.317 \\ 0.327$	12.09	0.201 0.207	7.660 7.708				
14 15	1.02	49.54 50.56	0.306 -	$12.17 \\ 12.42$		7.715 7.874	Li ₂ Cr0 ₄ .2H ₂ O			
	a Valu	es calcu	lated by	с.с. н	0.					
[
			AUX .		INFORMATION					
METHOD/AF	PARATUS	/PROCEDU	RE:		SOURCE AND	PURITY O	F MATERIALS:			
	The isothermal method was used.					Chemically pure salts were further				
			ethod wer			• • ·	tallization.			
			rmined by		-		m salts were			
			ium zinc		-					
	-		jum zinc y iodine		dehydrate	u.				
ş					ESTIMATED	EBBOB ·				
LILFALIC	m; 0104	by diff	erence.		Nothing s					
					REFERENCES	:				
L	······									

								8
COMPONENTS: (1) Lithium perc [7791-03-9] (2) Water; H ₂ O; (3) Ethanol (<i>eth</i> C_2H_6O ; [64-1 (4) Ethyl acetat	[7732-18 yl alcoh 7-5]	-5] 01);	78-6]	Smith		REMENTS: Soc. <u>192</u>	<u>5</u> , 47,	
VARIABLES: One temperature:		PREPARED BY: C.Y. Chan						
EXPERIMENTAL VALU	ES :		l					
Solubility of li mixtures at 25.0	-	rchlorat	e trihy	vdrate	in ethan	ol-ethyl	acetate	
			Volu	ime %				
Ethanol (abs) : Ethyl acetate :	0 100	5 95	10 90	20 80	30 70	40 60	50 50	
			mass >	(LiC10	4 ^{.3H} 2 ^{O)^a}			
	26.35	-	31.05	33.5	9 35.1	0 36.51	37.96	
			Volu	ime X				
Ethanol (abs) : Ethyl acetate :	60 40	70 30	80)	90 10	95 5	100	
			mass	%(LiCl	0 ₄ .3H ₂ 0)	a		
	38.58	39.79	40.	84	41.77	-	42.16	
^a Solute and sol	id phase	were the	e trihy	drate.				
		AUXILI	ARY INF	ORMATI	ои			
METHOD/APPARATUS/ The experimental essentially the ted in ref. 1 (Duplicate measur	techniq same as see com	ue used that repo pilation	or-).	Lithi prepa	um perch red in	ITY OF MA lorate tr the sam in ref.	ihydrate w e manner	
ESTIMATED ERROR: Temperature \pm 0.	1 °C.	Precis	ion in	soly d	etermina	tion not	stated,	
REFERENCES: 1. Willard, H.H	.; Smith	, G.F.	J. Am.	Chem.	Soc. 1	<u>923</u> , 45,	286.	

COMPONE		perchlo	rate; LiC	104;	1		MEASUREMENTS	:		
<pre>(1) Lithium perchlorate; LiClO₄; [7791-03-9]</pre>										
<pre>(2) Magnesium perchlorate; Mg(ClO₄)₂; [10034-81-8]</pre>						Sb. Tr. Yarosl. Gos. Ped. Inst. <u>1977</u> , 164, 5-7.				
			tramine;	C ₆ H ₁₂ N ₄ ;						
	.00-97.		32-18-5]		ł					
		2						<u> </u>		
EXPERIM	IENTAL	VALUES:	(continu	ed)						
			Liquid	phase co	mposit	tion	Solid ^b			
			ss %			nol % ⁴		phase		
Point	(1)) (;	2) (3) (1)	(2)	(3)			
7	6.03	3 0.	22 44.	80 1.8	32	0.031	19 10.33	A + B + C		
8	10.21	0.	35 15.	84 2.2	34	0.036	5 2.630	A + C + D		
9	35.58	3 0.	41 4.	23 9.0	76	0.049	0.819	A + D + E		
10	3.63	46.	76 1.	56 1.1	68	7.170	0.381	F + A + E		
		male	lity ^a /mol	kg-1	501	dab				
Poi	nt		(2)		pha					
	1	-	0.091	6.338	Α -	► B				
			-							
	3	3.667		5.458						
	4		-	1.305						
	5		3.924	-						
		-		0.154						
			0.0201							
			0.0213							
	9		0.0307							
	0		4.360							
					•	-				
			ted by C.							
							$= \text{Liclo}_4.2\text{C}$ $= \text{Mg(ClO}_4)_2$			
5	- 510	104.06.	124.020	,	104101	201 1				
		TIONAL			-		• • • • •			
	-						lubility iso solid phases			
							94.C ₆ H ₁₂ N ₄ .3H			
-							and (6) LiCl			
						100	tinued next	nagel		
							.vended nert	20001		

[7 (2) Ma [1 (3) He [1	thium pe 791-03-9 gnesium 0034-81- xamethyl 00-97-0]	perchlora 8] enetetram	te; Mg(Cl ine; C ₆ H ₁	.0 ₄) ₂ ;	Kosheleva,	arosl. Gos.	: Ped. Inst.
VARIABL One te Compos	mperatur	e: 298 K.			REPARED BY E.S. Gryz]		
EXPERIM	ENTAL VA	LUES:	<u></u>	L			
Solubi	lity sys	tem LiCl	0 ₄ -Mg(C10) ₄) ₂ -C ₆ H ₁	2 ^N 4-H2O A1	25 ⁰ C :	
			iquid pha				Solid ^b
		mass X			mol X ^a		phase
Point	(1)		(3)	(1)		(3)	•
1	-	1.06	46.55	-	0.146	10.23	A + B
2	6.24	-	48.10	1.998	-	11.69	B + C
3	18.10	-	35.50	5.673	-	8.444	C + D
4	33.26	-	10.32	8.886	-	2.093	D + E
5	2.55	45.50	-	0.770	6.551	-	E + F
6	-	39.96	1.27	-	5.189	0.263	F + B
			AUXI	LIARY IN	FORMATION	<u></u>	
The is		S/PROCEDU method w				PURITY OF	
Detail	a ar			E	STIMATED H Nothing &	CRROR:	
					N.I. Si ravnov 144, 10 2. Voronin A.S. ii 3. Karnau N.I. ii	chov, A.S.; 5. <i>Fiziko-k</i> 7. <i>v rastvor</i> 7. ma, T.N.; K 51d, <u>1970</u> ,	arnaukhov, 78, 27-31 Kosheleva, 154, 62



Editors' note: Only 10 original data points were tabulated for the solubility system in this compilation but the above diagram appears to have been constructed from more data, the original reference source of which was not stated.

											9.
(2) Co [1 (3) N(C ₃	thium pe 791-03-9 pper per 3770-18- 1), N(1) H ₈ N ₂ O; [chlorate;	Cu(ClO ₄ carbamido))2;	ORIGINAL M Bestuzhev Bestuzhe Sb. Tr. Y <u>1977</u> , 1	a, I.M.; H eva, I.L. arosl. Gos	(ind)				
VARIABL One te Compos	mperatur	e: 298 K.			PREPARED B						
EXPERIM	ENTAL VA	LUES:		I		<u></u>					
Solubi	lity sys	tem LiCl	0 ₄ -Cu(Cl	0 ₄) ₂ -NH ₂	.con(CH ₃) ₂ -1	H ₂ 0 at 25 ⁰	Pc :				
		T	iguid ph		osition			Se	1 1	ع لہ	1
		mass X		wee comb	mol X ^A				as	-	
Point	(1)	(2)		(1)		(3)				-	
1	7.81	49.27	-	2.777	7.102	-		A	+	B	
2	-	58.65	3.88	-	9.520	1.876		A	+	С	
3	-	19.17	19.69	-	1.979	6.056		C	+	D	
4	25.40	-	47.19	10.40	-	23.33		D	+	E	
5	36.79	-	22.93	12.17	-	9.157		Е	+	B	
6	7.80	48.16	2.21	2.816	7.047	0.963		A	+	B	
7	5.91	45.47	6.05	2.088	6.512	2.581	A	+	B	+	С
8	5.90	41.60	11.28	2.109					+		
9 10	8.15 8.67	36.42 32.53	$14.41 \\ 18.37$	2.884 3.066		6.158 7.843			+ +		
11	10.18	27.22	22.73	3.583		9.660			+		
12	12.21	22.68	23.26	4.116	3.099	9.468	В	+	С	÷	D
13	13.12	18.52	26.52	4.377	2.505	10.68		B	+	D	
14	15.58	13.97	28.61	5.144	1.870	11.41	В	+	D	+	E
			AUX	ILIARY I	NFORMATION	<u>u - I </u>					
The is compos were d ions i	othermal itions o letermine n soluti	S/PROCEDU method w f the lig d by the on. (3) w method; C	as used. uid phase content e as determ	es of the mined	SOURCE AND No details ESTIMATED I Nothing sp	ERROR:		rer	IA	LS	:
titrat	ion; ClO	4 gravime differen	trically	1	REFERENCES	continued	l ne:	ĸt	pa	ge)

.

								Τ						***
COMPONI	thium	Der	chlor	ate:	Licio	. :		} '				EASUREMENTS 8, I.M.; Ki		. A.P
	791-03			,	21010	4 '						eva, I.L.	ndero	,,
(2) Ca	opper 1	perc	hlora	te; C	u(C10	4)	2;	}						
-	3770-1		•						sl			arosl. Gos.	Ped.	Inst.
	(1), N			-	rbami	de	;			<u>197</u>	7, 1	64, 5-7.		
	3H8N2O Ater; 1				51									
				-								- <u></u>		<u> </u>
EXPERIN	IENTAL	VAL	UES:	(cont	inued)								
				Lia	uid p	ha		omp	083	itio	n		So	Lid ^b
			MAS	s X	•						ת			186
Point	(1)	(2)		(3)		•				2)	(3)		
	17.2	-	9.2 5.0		31.71 34.19					1.	217 657	12.49 13.17	E -	+ D + D
17	5.18		29.0	5	28.93		1.	922		4.		12.96		⊢ D
18	8.20	5	24.7	5	21.15		2.	626		3.		8.119	C I	
19 20	18.2	2	3.9	50 90	26.52		5.	135		0.	4512	9.024 10.23	B	
	20.82 17.59			3			5.	492 610				10.23		F E
22	1.78	3	51.7	6	4.44		0.	644		7.	595	1.941 1.569	A +	
23	4.1	L	48.3	3	3.73		1.	432		6.	825	1.569	A +	F C
			molal	ity ^a /	mol k	g –	1		Sc	olid	Ъ			
Poi	int	(1)	(2)		(3)		ph	1680				
	1	1.7	10	4.37	4	-			A	+ B				
	2	-		5.96	4	1.	175		A	+ C				
	3	-		1.19	5	3.	655		С	+ D				
	4	8.7	10	-	1	9.	54		D	+ E				
	5	8.5		-			461		E	+ B				
	6	1.7		4.38			600			+ B				
	7	1.3		4.07			613	A		B +				
	8 9	1.3	68	3.84 3.38	3	3.	106 987		С	+ B + B				
	.0 .1	2.0		3.06 2.60			157 470			+ B + B				
	.2	2.7		2.06			308	В		C +				
	.3	2.9		1.68			194	-		+ D	_			
	.4	3.5		1.27			761	B		D +				
	.5	3.8		0.83			593	-		+ D				
	.6	3.9		0.45			088			+ D				
	.7	1.3		3.00			913			+ D				
1	.8	1.6	34	2.05		บ.	236		C	+ D				
												(continued		

EXPERIMENTAL VALUES: (continued)

molality^a/mol kg⁻¹ Solid^b Point (1) (2) (3) phase 19 3.338 0.2933 5.866 B + E 4.375 3.769 20 0.6210 6.891 B + E 21 1.045 6.858 B + E 22 0.398 4.694 1.199 A + C 23 0.881 4.202 0.966 A + C

^a Values calculated by C.C. Ho;

^b A = $Cu(ClO_4)_2.6H_2O$; B = $LiClO_4.3H_2O$; C = $Cu(ClO_4)_2.2NH_2CON(CH_3)_2.4H_2O$;

 $D = NH_2CON(CH_3)_2$; $E = LiClo_4.3NH_2CON(CH_3)_2.H_2O$;

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Lithium perchlorate; LiClO ₄ ;	Voronina, T.N.; Karnaukhov, A.S.;
[7791-03-9]	Lepeshkov, I.N.
<pre>(2) Lithium chromate; Li₂CrO₄;</pre>	
[14307-35-8]	Zh. Neorg. Khim. <u>1971</u> , 16, 871-3;
<pre>(3) Potassium perchlorate; KClO₄;</pre>	*Russ. J. Inorg. Chem., (Engl.
[7778-74-7]	Transl.) <u>1971</u> , 16, 466-7.
(4) Potassium chromate; K ₂ CrO ₄ ;	
[7789-00-6]	
(5) Water; H ₂ O; [7732-18-5]	
VARIABLES:	PREPARED BY:
One temperature: 298 K.	C.Y. Chan
Composition.	

EXPERIMENTAL VALUES:

Solubility system $2K^+, 2Li^+$ || $2ClO_4^-, CrO_4^{2-} - H_2O$ at 25 °C :

			Solution	a composit				Sc	51 i	d	
	m	ass X		80	lute ion	mol % ^a		ph	AS	eb	
					ation)		(anion)				
(1)	(2)	(3)	(4)			$(2C10_{4}^{-})^{-}$					1
-	-					0.26		A	+	в	
-	7.02	0.74	29.82	25.71	74.29	1.27	98.73	••		••	
-	22.46	2.10	19.02	62.08	37.89	2.72	97.28	**		H	
-	32.87	-	19.43	68.95	31.05	-	100.00	B	+	с	
-	34.15	2.01	11.47	79.82	20.08	2.20	97.80	A	+	в +	с
-	44.28	-	7.91	89.43	11.57	-	100.00	С	+	D	
-	45.29	1.98	3.12	89.94	10.06	1.84	98.16	A	+	D +	C
28.90	9.59	1.93	-	96.78	3.22	65.91	34.09	A	+	D	
1.56	47.17	-	-	100.00	-	1.98	98.02	D	+	Е	
12.40	46.71	0.34	-	99.71	0.29	14.30	85.70	A	+	D +	Е
28.64	9.64	0.17	-	99.71	0.29	64.56	35.44	A	+	E	
31.66	-	0.19	-	99.54	0.46	100.00	-			**	
x_{s}^{2} n(b A D C Val	$(ClO_{\overline{4}}] =$) = amou = KClO ₄ = Li ₂ Cr([0.5n(unt ; D ₄ .2H ₂ O parenth	$Clo_{4}^{-})/{Clo_{4}^{-}}$ $B = K_{2}$ eses ()	$(CrO_4) + n(K^+)$, CrO_4 ; ; original	+ n(CrO C = Li ₂ C E = LiCl	2-)}] = { r0 ₄ .K ₂ CrC 0 ₄ .3H ₂ O	1-x _s [Cr04 04.H20		ł		

(continued next page)

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COMPONENTS:
                                         ORIGINAL MEASUREMENTS:
                                          Voronina, T.N.; Karnaukhov, A.S.;
 (1) Lithium perchlorate; LiClO<sub>4</sub>;
                                            Lepeshkov, I.N.
     [7791-03-9]
 (2) Lithium chromate; Li<sub>2</sub>CrO<sub>4</sub>;
                                          Zh. Neorg. Khim. <u>1971</u>, 16, 871-3;
     [14307-35-8]
                                           *Russ. J. Inorg. Chem., ( Engl.
 (3) Potassium perchlorate; KClO<sub>4</sub>;
                                            Transl. ) <u>1971</u>, 16, 466-7.
     [7778 - 74 - 7]
 (4) Potassium chromate; K<sub>2</sub>CrO<sub>4</sub>;
     [7789-00-6]
 (5) Water; H<sub>2</sub>O; [7732-18-5]
EXPERIMENTAL VALUES: (continued)
 Solubility system 2K^+, 2Li^+ || 2C10_4^-, Cr0_4^{2-} - H_2O at 25 °C :
                                   Solid
     Solution composition
                                   phaseb
     molality / mol kg<sup>-1</sup>
         (2) (3) (4)
  (1)
          -
               0.018 3.396
                                 A + B
                                  H H
       0.866 0.086 2.460
                                  -
       3.065 0.269 1.736
       5.306 - 2.098 B+C
       5.021 0.277 1.128
                                 A + B + C
        7.131
                       0.852
                 -
                                  C + D
   -
       7.029 0.288 0.324
                                 A + D + C
  4.559 1.239 0.234 -
                                  A + D
  0.286 7.084
                 -
                       -
                                 D + E
  2.874 8.870 0.061 -
                                 A + D + E
  4.374 1.206 0.020 -
                                 A + E
  4.367 - 0.020
                                  A + E
                         -
                           AUXILIARY INFORMATION
METHOD/APPARATUS/PROCEDURE:
Details of method of saturation not given. K<sup>+</sup> was determined gravimetri-
cally using sodium tetraphenylborate, \text{Li}^+ by the periodate method, \text{CrO}_4^{2-}
 iodometrically, and Clo_{\overline{4}} by difference. For certain data, Li<sup>+</sup> was
determined gravimetrically as lithium zinc uranyl acetate. Saturated
 solutions with compositions corresponding to the 'nodal' points of the
 quaternary reciprocal aqueous system were gradually treated with a third
 salt until a new solid phase appeared. With constant stirring, periods of
equilibrium varied from 4 - 12 days. Solid phases were examined under a
microscope.
SOURCE AND PURITY OF MATERIALS:
                                        ESTIMATED ERROR:
Not stated.
                                         Not stated.
```

COME	ONENTS:					ORTO	TNAL M	EASURE	MENTS		
		m perchl	orate	; LiClC) ₄ :				arnaukhov, A.S.;		
	[7791-		-			Lepeshkov, I.N.					
(2)) Lithiu	m chroma	te; L	i ₂ Cr0 ₄	i						
	T14307	-35-8]					-		l. Gos. Ped. Inst.		
(3)) Ammoni [7790-	lum perc) •98-9]	hlorat	e; NH4	c10 ₄ ;		<u>1970</u> , 2	79, 151	-6		
(4)) Ammoni [7788-	um chron 98-9]	nate;	(NH ₄) ₂ (Cr0 ₄ ;						
(5)) Water;	H ₂ 0; [1	7732-1	8-5]							
VARI	ABLES:					PREI	PARED E	Y:			
Ten	nperatur	e: 298 H	(N.,	A. Kozy	reva			
Con	npositio	n									
EXPE	ERIMENTA	L VALUES	5:								
				m : 2NI	H <mark>4</mark> , 2Li	+//2010	0 ₄ , cro	²⁻ -н ₂ о	at 25°C		
	<u></u>			phase	compos	ition			Solid		
Poi	int (1)	me (2)	(3)	(4)	(1)		ol % ^a (3)	(4)	phase		
	,					• - •					
1	35.77	-	3.01	-	8.942	-	0.681	-	$NH_4Clo_4 +$		
-			_						LiCl04.3H20		
2 3			2.54 2.67			0.768 2.326		-	** **		
4	18.55	19.78	2.86	-		4.213		-	H		
5	10.12	28.42	3.06	-	2.656	6.110	0.727	-	17 17		
6 7		28.27 43.94	2.80	-		5.928		-	NH4C104 +		
•	0101	10107	0.40		01110	10,30	5.301	-	LiClO ₄ .3H ₂ O +		
									$Li_2CrO_4.2H_2O$		
8	1.56	47,17	-	_	0 455	11.27	_	_	$Li_2CrO_4.2H_2O +$		
J	1.50	41121	-	-	0.400	11.21	-	-	LiClO ₄ .3H ₂ O		
9	-	47.81	1.37	2.27	-	11 02	0.377	0.483	$Li_2CrO_4.2H_2O +$		
-	-	41101			-		0.017	V. 40J	NH4C104		
10	-	43.51	1.36	4.43	-	10.50	0.363	0.913			
11	-			3.38	-				Li ₂ CrO ₄ .2H ₂ O +		
	_		~ 7 4 6		_	U. TOU	U1111		NH4C104 +		
									(NH ₄) ₂ CrO ₄		
12	-	46.60	2.99	6.93	-	12.62	0.895	1.603	Li ₂ CrO ₄ .2H ₂ O +		
									(NH ₄) ₂ CrO ₄ .		
									Li ₂ CrO ₄ .2H ₂ O +		
									(NH ₄) ₂ CrO ₄		
13	-	43.79	0.85	9.52	-	11.42	0.245	2.121	$(NH_4)_2 CrO_4 +$		
									$(NH_4)_2 CrO_4$.		
									Li ₂ CrO ₄ .2H ₂ O		
14	-	43.14				11.26	0.150	2.343	11		
15	-	42.08	-	11.27	-	10.85	-	2.481			

	NENTS:		 .					MEASURE		
<pre>(1) Lithlum perchlorate; LiClO₄; [7791-03-9]</pre>							Ganina, G.I.; Karnaukhov, A.S.; Lepeshkov, I.N.			
(2)	Lithiu	m chro	mate; L	i2Cr04;						
	[14307	-35-8]				UC			l. Gos. Ped. Inst.	
(3)	Ammoni [7790-		rchlorat	e; NH40	:10 ₄ ;		<u>1970</u> ,	79, 151	-6	
	Ammoni [7788-		omate;	(NH ₄) ₂ C	:r0 ₄ ;					
(5)	Water;	н ₂ о;	[7732-1	8-5]						
					i ⁺ //20		сг0 ²⁻ -Н	20 at 2	5 ⁰ C (cont.) 	
Poin		(mass %			mc	1 x ^a		phase	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)		
16	-	46.86	i –	7.95					$Li_2CrO_4.2H_2O + (NH_4)_2CrO_4.Li_2CrO_4.2H_2O$	
17	-	45.76	0.97	7.34	-	11.91	1.632	0.279	242-	
18 19		46.97	1.63	7.29	-	12.59	1.632 1.669 0.998	0.483 1.681	(NH4)2CrO4 +	
									NH4C104	
21 23	-	25.64	9.70 12.05	1.50	-	5.201	0.260	2.175 2.410		
24	-	11.98	12.27	1.02	-	2.120	0.260 0.139 0.154	2.400	(NH ₄) ₂ CrO ₄ +	
									$NH_4ClO_4 +$	
									NH4C104.	
									(NH ₄) ₂ CrO ₄	
25	-	7,48	12.70	1.54	-	1.274	0.224	2.391	NH_4ClO_4 +	
									NH4C104.	
		2 66					0 205	2 0 0 2	$(NH_4)_{2CrO_4}$	
27 29	-	1.78	16.87	2.61 2.82	-	0.631	0.385 0.411	3.223	"	
31	-	-	0.72			-			(NH ₄) ₂ CrO ₄ +	
									NH4C104.	
									(NH4)2Cr04	
33	-	2.99	0.78	19.24	-		2.856 0.897		т ен т н у	
	-	11.04	11.64	6.16	-		0.248		н Т	
35 37										
37			lations							

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Isothermal method. To the starting solutions corresponding to the non-variant points of the ternary systems a third salt was added until a new solid phase appeared. Details of the saturation method were not given. NH_4^+ was determined by distilling off ammonia unto 4 % boric acid solution: and then titrating with 0.2 mol L^{-1} H_2SO_4 ; CrO_4^{2-} iodimetrically; Li^+ gravimetrically as lithium zinc uranyl acetate; ClO_4^- by difference. The crystals were examined under a microscope.

OMPON	ENTS	:					ORIGIN	AL MEA	SUREMENTS:	_		
		um per -03-91		te; LiCl		Guseva, A.D.; Lepeshkov, I.N.						
				Li ₂ CrO,	. •		Uch.	Zap. Y	arosl. Gos.	Pad Inc.		
		7-35-é		212010	4,			9, 66,		rea, inst		
-				ate; NH	₄C10₄							
		-98-9			• •							
(4) Ar	nmon	ium ch	romate	; (NH ₄);	2 ^{Cr0} 4	:						
		-98-9]				ļ						
(5) W.	ater	; H ₂ 0;	(7732	-18-5]								
ARIAB	LES:					1	PREPAR	ED BY:				
Tempe	ratu	re: 30	08 K				N.A. 1	Kozyre	/a			
Compo	siti	on										
						l						
XPERI		AL VAL		tom' • ?:	งน +	21.1+11		cr0 ² -	-H ₂ O at 35°C			
			LLY SYS		4'		<u>4</u> ,	·····4 ·	-120 at 35 t			
D - i - •				phase (compo	sition mol	. a		Solid			
Point	(1)	ma (2)	(3)	(4)	(1)	(2)	(3)	(4)	phase			
,												
1	-	-	1.19	28.00	-	-	0.246	4,464	NH_4ClO_4 .			
2	-	2.90	1,56	15.70	-	0.504	0.291	2,261	(NH ₄) ₂ CrO ₄ NH ₄ ClO ₄ .			
-				10170	-	0.004	0.501		$(NH_4)_2 CrO_4$	+		
									$(NH_4)_2 CrO_4$			
3	-	5.24	2.41	12.87	-	0.885	0.450	1.857				
4				10.58								
5				6.49								
6				2.40								
7	-	13.38	10.94	1.73	-	2.389	2.159	0.264	NH ₄ C10 ₄ .			
									$(NH_4)_2 CrO_4$	•		
									$\frac{\mathrm{NH}_{4}\mathrm{ClO}_{4}}{\mathrm{(NH}_{4})_{2}\mathrm{CrO}_{4}}$			
8	-	10.48	12.11	1.85	-	1.838	2.348	0.277	NH ₄ ClO ₄ .			
				2.20			2.040		$(NH_4)_2 CrO_4$	+		
									NH4C104			
9	-	5.43	14.91	3.32	-	0.944	2.866	0.493				
10	-	2.71	19.54	3.88	-	0.484	3.856	0.592	NH4C104.			
									$(NH_4)_2 CrO_4$	+		
									NH4C104			
			20.45	3.62	-	-	3.945		NH4C104.			
11	-	-							$(NH_4)_2 CrO_4$			
	-	-										
11	-	-	8.73	2.04	-	3.022	21.751		(NH ₄) ₂ CrO ₄	+		
12									(NH ₄) ₂ CrO ₄ NH ₄ ClO ₄	+		
	-	17.78	5.60		-		21.118	0.552	NH4C104	+		

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Lithium perchlorate; LiClO₄; [7791-03-9]</pre>	Guseva, A.D.; Lepeshkov, I.N.
 (2) Lithium chromate; Li₂CrO₄; [14307-35-8] (3) Ammonium perchlorate; NH₄ClO₄; [7790-98-9] 	Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1969</u> , 66, 3-22
(4) Ammonium chromate; (NH ₄) ₂ CrO ₄ ; . [7788-98-9]	
(5) Water; H ₂ O; [7732-18-5]	

EXPERIMENTAL VALUES: (continued)

Solubility system : $2NH_4^+$, $2Li^+//2ClO_4^-$, $CrO_4^{2-}-H_2O$ at $35^{\circ}C$ (cont.)

Point	(1)	ma	88 X	phase (4)	composi	mo]	(3)	(4)	Solid phase
15	-	20.96	4.04	3.91	-	3.873	0.825	0.617	$(NH_4)_2 CrO_4 +$
16	-	22.27	2.67	5.20	-	4.176	0.553	0.833	NH_4ClO_4 (NH_4) ₂ CrO ₄ + NH_4ClO_4 + $Li_2CrO_4.2H_2O$
17	-	27.52	0.46	5.74	-	5.388	0.099	0.960	$(NH_4)_2 CrO_4 + Li_2 CrO_4 + Li_2 CrO_4 + 2H_2 O$
18	-	46.63	-	8.73	-	12.41	-	1.983	
19	-	49.37	-	1.12	-	12.11	-	0.335	Li ₂ CrO ₄ .2H ₂ O + LiClO ₄ .3H ₂ O
20	1.53	48.91	3.65		0.484	12.68	1.046	-	
21	1.38	32.07	5.73	-	0.352	6.702	1.324	-	"
22	0.77	21.28	6.58	-	0.173	3.912	1.337	-	$Li_2CrO_4 \cdot 2H_2O$ + NH ₄ ClO ₄ + LiClO ₄ \cdot 3H ₂ O
23	4.45	18.17	6.32	-	1.001	3.347	1.287	-	LiClO ₄ .3H ₂ O + NH ₄ ClO ₄
24	9.51	14.07	5.86	-	2.147	2.602	1.198	-	чч н
25	15.64	9.39	5.41	-	3.562	1.752	1.116	-	"
26	17.78	6.76	4.49	-	3.982	1.240	0.911	-	**
27 3	21.93	3.21	3.97	-	4.908	0.589	0.805	-	14
28	40.26	-	2.13	-	10.53	-	0.504	-	19

METHOD/APPARATUS/PROCEDURE:

Isothermal method. Details of saturation method were not given. Li⁺ was determined by precipitation as lithium uranyl acetate; NH_4^+ by distillation; CrO_4^{2-} iodimetrically; ClO_4^- by difference.

SOURCE AND PURITY OF MATERIALS: The chemically pure salts were further purified by recrystalliza-	ESTIMATED ERROR: Not stated.
tion. The hydrates of lithium salts	REFERENCES:
were dehydrated.	None.

02	
COMPONENTS: (1) Lithium perchlorate; LiClO ₄ ; [7791-03-9] (2) Magnesium perchlorate; Mg(ClO ₄) ₂ ; [10034-81-8] (3) Lithium chromate: Li ₂ CrO ₄ ; [14307-35-8] (4) Magnesium chromate; MgCrO ₄ ; [13423-61-5]	ORIGINAL MEASUREMENTS: Voronina. T.N. Uch. Zap. Yasosl. Gos. Ped. Inst. <u>1970</u> , 79, 3-8.

(5) Water; $H_{2}O$; [7732-18-5] VARIABLES: One temperature: 298.2 K Composition

EXPERIMENTAL VALUES:

Solubility system : Mg(ClO₄)₂-MgCrO₄-LiClO₄-Li₂CrO₄-H₂O at 25.0°C

PREPARED BY:

E.S. Gryzlova

		L	iquid p	hase Co	omposit:	lon		Solid Ph ase^b
	mas	• *			mol S	κ ^a		
(1)	(2)	້ (3)	(4)	(1)	(2)	(3)	(4)	
.03	-	46.45	-	1.269	-	7.003	-	A + B
.16	-	46.24	0.28	2.738	-	7.395	0.071	A + B
3.24	-	46.34	0.32	19.07	-		0.139	A + B
4.19	-	46.35	0.73	20.42	-	13.19	0.331	A + B + 0
-	-	49.71	-	-	-	7.389	-	B + C
2.84	-	42.10	2.94	9.727	-	8.546	0.949	B + C
6.95	-	41.50	0.99	20.65	-	11.06	0.420	
7.11		26.98	4.36	15.49	-	5.367	1.380	
7.19	-	17.61	5.04	12.98	-	2.929	1.334	+ C
37.38	-	5.68	12.47	11.97	-	0.867	3.029	+ C
7.42	17.78	-	31.38	24.14	9.394	-	15.35	
1.28	21.99	-	25.79	16.25	9.357	-	10.16	
2.12	31.11	-	12.31	3.916	8.234	-	3.016	A + C A + C

^a Editors' calculations.

^b A = LiClO₄.3H₂O ; B = Mg(ClO₄)₂.6H₂O ; C = MgCrO₄.5H₂O.

AUXILIARY INFORMATION

METHOD/PROCEDURE/APPARATUS: The isothermal method was used. Periods of equilibration were 4-6 days. CrO_4^{2-7} was determined iodimetri-	SOURCE AND PURITY OF MATERIALS: The salts were recrystallized.
cally, Mg^{2+} by titration with EDTA, Li ⁺ as lithium zinc uranyl acetate, and ClO_4^- by difference.	ESTIMATED ERROR: Temperature: <u>+</u> 0.1 [°] C.
	REFERENCES: None. (continued next page)

COMPONENTS: (1) Lithiuḿ perchlorate; LiClO ₄ ;					MEASU		NTS	:				
(2) Magne	1-03-9} sium per 34-81-8}	chlor	ate; Mg	(C10 ₄) ₂ ;			р. Ya 79,			05.	Ped	. Inst
(3) Lithi [1430	um chrom 07-35-8]											
[1342	sium chr 3-61-5] r; H ₂ O; [4:								
	TAL VALUE			•	4-LiClo	-Li20	Cr0 ₄ -H	1 ₂ 0	at 2	25.0	o°C	(cont.
<u>-**. · · · · · · · · · · · · · · · · · · </u>			Liquid	phase co	mpositio	n				lid se ^b)	
(1)	mass (2)		(4)	(1)	mol (2)		(4)					
2.45	34.40 44.27 44.52	-	4.79 4.83	0.614 0.552	10.93 10.75	-	0.161	5 A)	+ C C +		D	
2.75	46.80 47.17	-	1.76	0.833 0.455		-	0.404	•		- D		
	ors' cale LiClO ₄ .31			Cr0 ₄ .5H ₂ (D ; D =	Li ₂ C:	r0 ₄ .21	1 ₂ 0.				
				Cr04.5H2(D ; D =	Li ₂ C	r0 ₄ .21	1 ₂ 0.				
				Cr04.5H2(D ; D =	Li ₂ C	r0 ₄ . 21	1 ₂ 0.				
				Cr04.5H2(D ; D =	Li ₂ C	r04 . 2H	1 ₂ 0.				
				Cr04.5H2(D ; D =	Li ₂ C	r04 . 2H	1 ₂ 0.				

•

COMPONENTS:

 (1) Sodium perchlorate; NaClO₄; [7601-89-0]
 (2) Water; H₂O; [7732-18-5] EVALUATOR: C.Y. Chan Department of Chemistry University of Malaya Kuala Lumpur, Malaysia

CRITICAL EVALUATION

I BINARY SYSTEMS

System NaClO₄-H₂O

The original values in mass % of the solubility of sodium perchlorate in water at various temperatures reported by different groups as well as the corresponding calculated mean values are given in Table 1. Original data listed which differed by more than twice the standard deviation of the initial mean at the temperature concerned were omitted in the computation of the final mean values. Twenty-six references to the solubility of NaClO₄ in water at 298 K were found. However, it should be noted that, as seen in Table 1, certain values have been obtained from more than one compilation reference source and in such cases, it is of the evaluator's opinion that the solubility determination had been carried out only once and that these reports had referred to the same result. Only Willard and Smith (6) indicated the precision of their solubility determination (\pm 0.05 %). None of the other groups gave any indication of the precision of their experimental results and insufficient information was available for obtaining fair estimates of the error limits of their data in the compilation. The solid phase in equilibrium with the saturated solution at temperatures below 328 K is the monohydrate, NaClO₄.H₂O, but at this temperature and above, the solid phase is the anhydrous salt.

Table 1. Solubility of sodium perchlorate in water at various temperatures

<u>T/K</u>	<u>mass_%</u>	Solid Phase	Source
273	(60.14) ^a	NaClO ₄ .H ₂ O	Mikheeva and Titova (79)
-	62.54		Freeth (7)
	62.87	Ħ	Cornec and Dickely (10)
*	62.89	*	Karnaukhov and Makin (20)
Mean:	<u>62.77</u>		

^a rejected in computation of the mean value

,

Table 1 (continued)

<u>T/K</u>	mass_%	Solid Phase	Source
288	65.51	NaClO ₄ ·H ₂ O	Freeth (7)
-	65.63	*	Cornec and Dickely (10)
Ħ	64.63	-	Carlson (2)
<u>Mean</u> :	<u>65,26</u>		
293	66.84	NaClO ₄ ·H ₂ O	Karnaukhov (21)
Ħ	(67.48) ^a	Ħ	Zaitseva and Lepeshkov (50)
	67.58	-	Karnaukhov (17)
Ħ	67.60	-	Freeth (7)
"	67.63	-	Cornec and Dickely (10)
-	67.64	-	Kudryakova and Karnaukhov (57)
-	67.65	Ħ	Leboshchina and Kudryakova (85)
"	67.70	•	Molchanov (28)
298.15	67.70		Willard and Smith (6)
298	67.70	¥	Chernykh, Ivanov and Alekseeva (51)
	67.79	-	Lilich and Ovtrakht (27)
	67.80	-	Lepeshkov and Druzhinina (34)
			Druzhinina and Paraguzova (82)
			Sal'nikova, Karnaukhov and
			Lepeshkov (65); Karnaukhov and
			Sal'nilova (55)
W	67.82	-	Karnaukhov and Makin (20)
	67.84	-	Bestuzheva, Kinderov and
			Karnaukhov (87); Bestuzheva (88)
298.2	67.86		Karnaukhov and Kudryakova (32)
298	67.89	M	Karnaukhov and Tarakanov (56,64)
			Lepeshkov and Tarakanov (70)
Ħ	67.89	۳	Andronova (62); Andronova,
			Bogomolova and Gulyakova (40)
	67.89		Smirnov, Ivanov and Chechneva (78)
-	67.92	-	Andronova (84)

Table 1 (continued)							
T/K	mass %	Solid Phase	Source				
298	(68.84) ^a	NaClO ₄ .H ₂ O	Druzhinina (67)				
Mean:	<u>67.76</u>						
303			Abdukarimova, Nogoev and				
			Sulaimankulov (74)				
H	68.71		Freeth (7)				
	68.25		Caven and Bryce (11)				
Mean:	<u>68.56</u>						
308	69.8	NaClO ₄ .H ₂ O	Kudryakova and Karnaukhov (57)				
			Karnaukhov and Guseva (31)				
311	70.38	M	Cornec and Dickely (10)				
313	70.88	Ħ	Freeth (7)				
	70.87	n	Karnaukov (17)				
*	67.63	Ħ	Ivanov (44)				
Mean:	<u>70.88</u>						
323	(71.28) ^a	NaClO ₄ .H ₂ O	Carlson (2)				
323	73.26	Ħ	Cornec and Dickely (10)				
323	73.16		Freeth (7)				
323	73.15	W	Zaitseva and Lepeshkov (50)				
323	73.53	M	Andronova (62)				
323	73.75	M	Andronova (75)				
323	73.2		Molchanov (28)				
323.2	73.2	•	Lepeshkov, Druzhinina and				
			Troitskii (34); Druzhinina (30)				
Mean:	<u>73.32</u>	<u>std. dev. : 0.21</u>					
323.95	73.3	NaClO4+NaClO4.H2O	Freeth (7)				
328	73.94	NaClO ₄	Cornec and Dickely (10)				
333	74.30	•	Freeth (7)				
	74.2	*	Loseva (71)				
<u>Mean:</u>	<u>74.25</u>						
335.8	74.33	NaClO ₄	Molchanov (28)				
348	75.00	Ħ	Freeth (7)				

RITICAL EVALUATION (continued)								
Table 1 (continued)								
T/K	mass %	Solid Phase	Source					
348	75.01	NaClO ₄	Comec and Dickely (10)					
Mean	<u>75.01</u>							
363	76.27	19	Kudryakova and Lepeshkov (46)					
	75.85	**	Kudryakova and Karnaukhov (57)					
	75.85		Karnaukhov and Troitskii (33)					
Mean:	<u>75.99</u>							
373 K	76.75	-	Cornec and Dickely (10)					
416	79.08		Carlson (2)					

a rejected in computation of the mean value

Based on theoretical treatments described in ref. (76), (90) a semi-empirical equation on the form given by Equation (1) was used to fit the combined original data given in table 1, after conversion of the mass % data to mole fractions. Data were selectively rejected until all the values were fitted to within $\pm 2s$ of the calculated value at each selected temperature, s being the standard error defined by $s^2 = (x_{abs}-x_{calc})^2/(N-3)$, where N is the total number of data points.

$$F(x) = a_0 + a_1 (T/K)^{-1} + a_2 \ln (T/K)$$
(1)

where $F(x) = \ln (x^{\nu} (1-x)^n / (1+(\nu-1)x)^{(n+\nu)})$, T = temperature, x = mole fraction, $\nu = 2$ for NaClO₄ (stoichiometric number for salt), the mole ratio water : salt is n = 1 when the solid phase is NaClO₄.H₂O and n = 0 when the anhydrous salt is the solid phase.

 a_0 , a_1 and a_2 are the best-fit parameters, obtained using least-squares linear regression analysis. The results of the analysis are given in Table 2 for n = 1 and n = 0 in Eq. (1).

Table 2 Values of best-fit parameters with reference to Equation 1, pertaining to data in Table 1

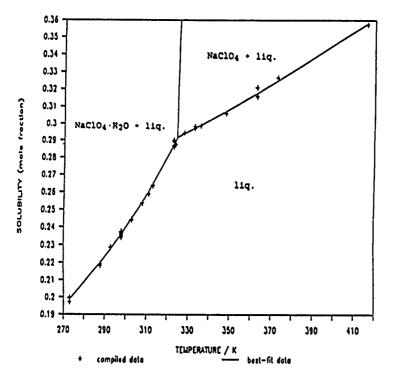
Temperature :		273 K - 3				
Solid phase :		NaClO ₄ .				
Correlation coefficient :		0.999 (31	7 dat	a poir	nts)	
Parameters	<i>a</i> ₀ = -31.828	std. e				
	$a_l = 6.3_3 \times 10^2$		Ħ	" a]	$= 1.7 \times 10^{2}$	
	$a_2 = 4.55$	-		" a ₂	= 0.57	
						(continued)

Table 2 (continued)

Temperature :	328 K - 416 K
Solid phase :	NaClO ₄
Correlation coefficient :	0.996 (11 data points)
Parameters	$a_0 = -17.854$ std. error in F(x) = 0.008
	$a_I = 4.0_9 \times 10^2$ " " $a_I = 3.4 \times 10^2$
	$a_2 = 2.35_5$ " " $a_2 = 0.94$

The average difference between calculated and observed values was 0.38 % of the observed solubility value.

Figure 1. Solubility-temperature plot for the NaClO₄-water system



Solid line represents smoothed data based on Equation 1.

The solubility-temperature plot is shown in Figure 1 and Table 3 lists recommended and tentative smoothed values of the solubility of sodium perchlorate in water, computed based on Equation 1 using the appropriate parameters at the selected temperatures. The recommended values are for the solubilities at 298.15 K and 323.15 K, where original data were (continued)

reported by more than three independent groups at each of these temperatures.

Table 3. Smoothed data calculated for the solubility of NaClO₄

Status	Solid phase	ility molality	Solub mol fraction	T/K	t/°C
tentative	NaClO ₄ .H ₂ O	13.77	0.1987	273.15	0
	*	14.36	0.2056	278.15	5
-		14.99	0.2126	283.15	10
"	*	15.66	0.2200	288.15	15
м		16.38	0.2278	293.15	20
recommende	*	17.16	0.2362	298.15	25
tentative		18.02	0.2451	303.15	30
n	*	18.95	0.2545	308.15	35
*	-	19.98	0.2647	313.15	40
	-	21.13	0.2757	318.15	45
recommende	n	22.41	0.2876	323.15	50
	NaClO ₄ .H ₂ O +	22.91	0.2922	324.95	51.8
tentative	NaClO ₄				
*	NaClO ₄	23.14	0.2942	328.15	55
	•	23.50	0.2975	333.15	60
	19	23.87	0.3008	338.15	65
	14	24.26	0.3041	343.15	70
*	14	24.65	0.3075	348.15	75
	*	25.04	0.3109	353.15	80
π	14	25.45	0.3144	358.15	85
-	м	25.87	0.3179	363.15	90
*	58	26.30	0.3215	368.15	95
	м	26.74	0.3251	373.15	100
м	м	27.19	0.3287	378.15	105
	**	27.64	0.3324	383.15	110
	"	28.11	0.3362	388.15	115

in water at selected temperatures.

t/°C	T/K	Solub	ility		Status
		mol fraction	molality	Solid phase	
120	393.15	O.3400	28.59	NaClO ₄	tentative
125	398.15	0.3438	29.08		
130	403.15	0.3477	29.59	-	
135	408.15	0.3516	30.10		•
140	413.15	0.3556	30.63		-
145	418.15	0.3596	31.17		

Table 3. (continued)

The peritectic transition from the monohydrate to anhydrous sodium perchlorate was determined to occur at 324.96 K and at this point the mole fraction of the salt in the solution at equilibrium is 0.2922, molality was 22.91 mol kg⁻¹, based on the evaluator's analysis. It should be noted that these values are slightly higher than the values of 0.2877 (mole fraction) and 22.42 mol kg⁻¹ calculated from Freeth's data (7) at 323.95 K for the saturated solution in equilibrium with both the anhydrous salt and its monohydrate. The peritectic temperature reported by Cornec and Dickely (10) was 325.90 K.

Cornec and Dickely (10) also reported solubility data in mamount concentration units and saturated solution densities (see compilation) over the temperature range 273 K - 373 K while similar data were reported by Carlson (2) at 288 K, 323 K and 416 K. Carlson's solubility values of 8.79 mol dm⁻³ at 288 K and 10.08 mol dm⁻³ at 323 K are somewhat lower than Cornec and Dickely's values of 8.91 mol dm⁻³ and 10.46 mol dm⁻³ at the corresponding temperatures. There is better agreement between Willard and Smith's value (6) of 9.301 mol dm⁻³ at 298.15 K, Corned and Dickely's value of 9.33 mol dm⁻³ and the value of 9.309 mol dm⁻³ converted from the recommended molal solubility (Table 3) using Willard and Smith's value of 1.6821 g cm⁻³ for the saturated solution density (6) at the same temperature. Table 4 compares solubility values (in mol dm⁻³) reported by Cornec and Dickely (10) and those calculated using the smoothed data given in Table 3 and Cornec and Dickely's saturated solution density values at various temperatures.

(continued)

Table 4. Comparison of data for the solubility (in mol dm⁻³) of NaClO₄ in water at selected temperatures

t/⁰C	Т/К	Solubility	/ mol dm ⁻³
		[calc. smoothed data]	[Cornec and Dickely (10)]
15	288.15	8.94	8.91
25	298.15	9.309	9.33
50	323.15	10.47	10.46
ʻ 75	348.15	10.78	10.76
100	373.15	11.00	10.86

I.2. Solubility in D20

There is only one report of the solubility of sodium perchlorate in water-d₂, D₂O, over the temperature range 298-363 K, that of Selecki and Tyminski (60), (see relevant compilation).

I.3. Solubility of sodium perchlorate in other solvents

Data have been reported for the solubility of sodium perchlorate in each of the following solvents :

T = 240-323 K ammonia (22)

T = 272 K perchloric acid (39), hydrogen peroxide (91), hydrazine (59);

T = 298 K methanol (6), ethanol (8), 1-propanol (6), 1-butanol (6), 2-methyl,1propanol (6), sulfinylbis-methane (DMSO) (23,83), 1,2-ethanediol (14), 1,2-ethanediamine (14), 2-amino-ethanol (14), hydrazine (72), ethyl acetate;

T = 308 and 318 K sulfinylbis-methane (DMSO) (23);

T = 313 K tetrahydrothiophene 1-1 dioxide (sulfolane) (73);

T = 373 K acetamide (60);

T = 283-323 K 2-butanone (methyl ethyl ketone) (69);

T = 283-323 K acetone (48).

The only data compilations for the solubility of NaClO₄ in non-aqueous solvents that have a basis for comparison were those for solubility in acetone at 298 K. Willard and Smith (6) reported that the solubility of sodium perchlorate in acetone at 298.15 K was 4.228 mol kg⁻¹ while Krumgal'z et al. (69) reported a value of 4.422 mol kg⁻¹, the solid phase being the

anhydrous salt in both reports. Information on source and purity of materials as well as details of method were available in the former's report but not in the second.

II. TERNARY SYSTEMS

Solubility in mixed solvents

Systems NaClO₄ - organic solvent - H₂O

Data for such systems were reported in which the organic omponent was one of the following

T = 298 K dimethylurea (88), thiocarbamide (64), acetamide (70), benzamide (87) and hexamethylenetetramine (65).

T = 303 K carbamide (74), thiocarbamide (74).

No critical evaluation could be carried out for lack of relevant information.

Systems NaClO₄ - alcohol - ethyl acetate

The solubility at 298 K in mixed solvent ethyl acetate -alcohols (methanol, ethanol, 1butanol has been determined by Smith (8).

Systems NaClO4 - inorganic compound - water

The data concerning isothermal sections of the ternary systems involving a second salt are summarized in the following pages and some anomalies are mentioned but a critical evaluation of data could not be carried out because of insufficient information.

Systems involving the same anion Systems $NaClO_4$ - $MClO_4$ - H_2O with M = H, Li, K, Cs, NH_4 , Tl

NaClO4-HClO4-H2O

At 298 K (51) the solid phases are NaClO₄, NaClO₄·H₂O and NaClO₄·HClO₄.

NaClO4-LiClO4-H2O

The results are presented in the critical analysis of LiClO4.

NaClO₄-KClO₄-H₂O

T = 273 K (20), the observed solid phases are NaClO₄, NaClO₄·H2O, KClO₄ and mNaClO₄·nKClO₄. The data are scattered; furthermore, the double saturation point cannot involve KClO₄ and NaClO₄

T = 298 and 323 K (34, 30) the observed solid phases are NaClO₄, NaClO₄·H2O, KClO₄.

NaClO4-CsClO4-H2O (81)

At 298 K the solid phases in equilibrium with liquid are NaClO4·H₂O, CsClO4 and two double salts 3CsClO4·NaClO4 and CsClO4·NaClO4.

At 348 K 3CsClO4·NaClO4 is no longer observed.

NaClO4-NH4ClO4-H2O (57)

Two intermediate compounds are mentioned $C=n(NH4ClO_4)\cdot m(NaClO_4\cdot H_2O)$ and $D=n(NH4ClO_4)\cdot m(NaClO_4)$; their stoichiometry is not known; their fields of existence are small and the phase diagram presents some anomalies so that the data must be considered very cautiously.

T = 298 K the observed solid phases are NaClO₄·H₂O, NH₄ClO₄ and C.

T = 308 K the solid phases are NaClO₄·H₂O, NH₄ClO₄, C and D.

T = 363 K three solid phases can crystallize NaClO₄, NH₄ClO₄ and D.

NaClO4-TlClO4-H2O (78)

At 298 K the observed solid phases are NaClO4.H2O and TlClO4.

Systems NaClO₄-M(ClO₄)₂-H₂O with M = Mg, Ca, Sr, Ba, Zn, Ni

NaClO4-Mg(ClO4)2-H2O

T = 298 K (32) the observed solid phases are NaClO₄·H₂O and Mg(ClO₄)₂·6H₂O.

T = 363 K (46) the solid phases are NaClO₄ and Mg(ClO₄)₂·6H₂O.

NaClO4-Ca(ClO4)2-H2O

T = 298 K (27) the observed solid phases are NaClO₄·H₂O and Ca(ClO₄)₂·4H₂O.

T = 313 K (44) the same phases can crystallize.

NaClO4-Sr(ClO4)2-H2O (67)

At 298 K the observed solid phases are NaClO₄·H₂O and Sr(ClO₄)₂·4H₂O.

NaClO4-Ba(ClO4)2-H2O (50)

T = 298 K the solid phases are NaClO₄·H₂O and Ba(ClO₄)₂·3H₂O.

T = 323 K two other salts can also crystallize according to the composition NaClO₄ and Ba(ClO₄)₂·2H₂O.

NaClO4-Zn(ClO4)2-H2O (85)

At 298 K the observed solid phases are NaClO₄·H₂O and Zn(ClO₄)₂·6H₂O.

CRITICAL EVALUATION (continued)

NaClO4-Ni(ClO4)2-H2O (56)

At 298 K the observed solid phases are NaClO₄·H₂O and Ni(ClO₄)₂·6H₂O.

Systems $NaClO_4$ - $M(ClO_4)_3$ - H_2O where M = Al, Ce, Tb

NaClO4-Al(ClO4)3-H2O (11)

At 303 K the solid phases are NaClO4·H2O, Al(ClO4)3·nH2O.

NaClO4-Ce(ClO4)3-H2O (82)

At 298 K three solid phases are observed NaClO4, NaClO4·H2O and Ce(ClO4)3·9H2O.

NaClO₄-Tb(ClO₄)₃-H₂O (84) At 298 K the solid phases NaClO₄, NaClO₄·H₂O and Tb(ClO₄)₃·9H₂O can be observed.

Systems involving the same cation

NaClO4-NaCl-H2O

The solubilities have been measured between 273 and 373 K (10, 21, 32, 33, 71). At low temperatures the solid phases are NaClO4·H₂O and NaCl, at higher temperatures NaClO4 and NaCl The nature of the solid perchlorate indicated on the 293 K data sheet (21) is erroneous.

NaClO4-NaNO3-H2O (62)

Two isothermal sections have been investigated, the solid phases are NaClO4·H₂O and NaNO₃.

NaClO4-NaClO3-H2O (71)

At 333 K the solubility curves of pure components, NaClO4 and NaClO3, are observed.

NaClO4-Na2SO4-H2O (7)

Two isothermal sections have been investigated. At 298 K three solid phases are observed, NaClO4·H₂O, Na₂SO4 and Na₂SO4·10H₂O. At 333 K the solid phases are the anhydrous salts NaClO4 and Na₂SO4.

NaClO₄-Na₂CrO₄-H₂O

The system has been investigated at three temperatures.

T = 298 K, Karnaukhov (31) mentions the existence of NaClO₄·H₂O and Na₂CrO₄·4H₂O while Molchanov (28) indicates also a solubility field of Na₂CrO₄.

T = 323 K (28, 30) the observed solid phases are NaClO₄·H₂O, Na₂CrO₄·4H₂O and Na₂CrO₄.

T = 335 K (28) the dehydrated salts NaClO₄ and Na₂CrO₄ are observed.

NaClO4-Na2Cr2O7-H2O (55)

At 298K the solid phases are NaClO4·H2O and Na2Cr2O7·2H2O.

NaClO4-Na3PO4-H2O (66)

At 298 K the solid phases are NaClO4.H2O, Na3PO4.12H2O and a solid solution is observed.

Systems NaClO4-inorganic compound-NH3

NaClQ4-NaCl-NH3 (22) In the range 240-323 K the solid phases are the pure components NaClO4 and NaCl.

<u>NaClO4-NH4ClO4-NH3</u> (22)

The system has been investigated between 240 and 323 K. The solid phases are the pure components NaClO4 and NH4ClO4.

III QUATERNARY SYSTEMS

Simple quaternary systems

NaClO4-Water-alcohols-ethyl acetate (8)

The solubility of NaClO4·H₂O in alcohol-methyl acetate mixtures has been determined at 298 K. The investigated alcohols were methanol, ethanol (abs. and 93 %), 1-butanol. The solid phase was NaClO4.H₂O.

NaClO4-NH4ClO4-Hexamethylenetetramine-Water (77)

At 298 K eight solubility fields were found corresponding to:

 $\label{eq:2.1} NH4ClO4, NaClO4'H20, C_{6}H_{12}N4, NH4ClO4'C_{6}H_{12}N4, NH4ClO4'2C_{6}H_{12}N4, \\ NaClO4'C_{6}H_{12}N4, n(NH4ClO4)'m(NaClO4) and 5(NaClO4)'2(C_{6}H_{12}N4)'3H_{2}O.$

NaClO4-Cu(ClO4)2-Benzamide-Water (87)

The system was investigated at 298 K. Three solid phases were observed, NaClO₄·H₂0, $C_{6}H_{5}CONH_{2}$ and $Cu(ClO_{4})_{2}$.

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NaClO₄-Ni(ClO₄)₂-Urea-Water (86)

At 298 K seven solubility fields were found corresponding to NaClO₄·H₂0, Ni(ClO₄)₂·6H₂O, CH₄N₂O, NaClO₄·2CH₄N₂O, 2NaClO₄·3CH₄N₂O, Ni(ClO₄)₂·4CH₄N₂O·2H₂O and Ni(ClO₄)₂·6CH₄N₂O.

NaClO₄-NaClO₃-NaCl-Water (41-43)

The isothermal section was investigated at two temperatures. At 313 K three compounds are observed NaClO₄·H₂0, NaClO₃, NaCl. At 333 K a solubility field of NaClO₄ is also observed

Reciprocal quaternary systems

The data concerning the reciprocal quaternary systems must be considered very cautiously, due to the incoherence of several data and to the erroneous attribution of the crystallization fields of some solid phases.

Na⁺, K⁺ // ClO₄⁻, Cl⁻ - H₂O (33)

The isothermal section 363 K was investigated. According to the composition five solid phases can crystallize : NaCl, KCl, Na ClO4, KClO4 and a double salt mKCl^onKClO4.

 Na^+ , $K^+ // ClO_4^-$, $CrO_4^{2-} - H_2O(30)$

At 323 K five salts are observed in the diagram Na ClO₄·H₂O, KClO₄, K₂CrO₄, Na₂CrO₄ and a double salt 3K₂CrO₄·Na₂CrO₄.

Na+, Cs+ // ClO4-, Ct- H2O (81)

The isothermal section was investigated at two temperatures. At 298 K the components CsCl, NaCl, CsClO₄, a solid solution $Cs_{1-x}Na_xCl$ and two double salts $3CsClO_4\cdot NaClO_4$, CsClO₄·NaClO₄ have a crystallization field. At 348 K NaClO₄·H₂O and $3CsClO_4\cdot NaClO_4$ are no longer observed and there is a solubility range for anhydrous NaClO₄·

Na⁺, NH4⁺ // ClO4⁻, Cl⁻ - H₂O (54,63)

The system has been investigated by the same authors at three temperatures. The observed solid phases are indicated in the following table by x:

	System N	Na ⁺ , NH	4 ⁺ // ClC	04 ⁻, Cl⁻	- H2O				
observed solid phases									
<i>T /</i> K	(1)	(II)	(III)	(IV)	(V)	(VI)			
298	x	x	x		x	x			
308	x	x	x		x	x			
363	x	x	x	x		x			

(I) = NH4Cl, (II) = NH4ClO4, (III)= NaCl, (IV) = NaClO4, (V) = NaClO4 \cdot H2O (VI) = mNH4ClO4 \cdot nNaClO4 \cdot H2O

Na⁺, NH4⁺ // ClO4⁻, SO4²⁻ - H₂O (7)

Two isothermal sections of the diagram have been investigated. The observed solid phases are indicated in the following table by x:

System Na ⁺ , NH ₄ ⁺ // ClO ₄ ⁻ , SO ₄ ²⁻ - H ₂ O
observed solid phases

<i>T /</i> K	Α	В	С	D	Ε	F	G
298	x	x	x	x	x	x	
333	x	x			x		x

 $A=NH_4CIO_4, B=(NH_4)_2SO_4, C=Na_2SO_4 \cdot (NH_4)_2SO_4 \cdot 10H_2O, D=Na_2SO_4 \cdot 10H_2O$ $E=Na_2SO_4, F=NaCIO_4 \cdot H_2O, G=NaCIO_4$

Na^+ , $NH4^+$ // ClO_4^- , CrO_4^{2-} - H_2O (35, 52)

Two sets of data are found in literature, at 298 and 308 K. The isothermal sections are very similar. At 298 K the solid phases shown in the corner closest to of NaClO₄ are Na₂CrO₄, NaClO₄·H₂O and a mixture represented by $n(NH_4ClO_4)\cdot m(NaClO_4\cdot H_2O)$. At 303 K the solubility surface of anhydrous NaClO₄ is no longer observed. This difference is surprising since the increase of temparature ought to favor the dehydration of NaClO₄·H₂O.

Na⁺, NH4⁺ // ClO4⁻, Cr₂O7²⁻ - H₂O (58)

The crystallization fields of mixtures are not clearly represented on the phase diagram. Furthermore, in the last column of the compilation sheet the double saturation lines are problably D+F and A+F instead of D+E and A+E.

Na⁺, Mg²⁺ // ClO₄⁻, Cl⁻ - H₂O (46)

At 363 K the diagram shows four solubility ranges corresponding to NaCl, NaClO₄, Mg(ClO₄)₂·6H₂O and MgCl₂·6H₂O

Na⁺, Ba²⁺ / ClO₄⁻, Cl⁻ - H₂O (50, 61)

The assessment of phases in the last column of the data sheets is not correct. For example, at 298 K Ba(ClO₄)₂ crystallizes from aqueous solution as a dihydrate and it is not possible to pass continuously from an hydrated salt to an anhydrous solid solution, as shown on the diagram.

Na⁺, Ni²⁺ // ClO₄⁻, NO₃⁻ - H₂O (68)

At 363 K the diagram shows four solubility ranges corresponding to NaNO3, NaClO4·H₂O, Ni(ClO4)₂·6H₂O and Ni(NO3)₂·6H₂O

 Na^+ , Zn^{2+} // ClO_4^- , SO_4^{2-} - H_2O (89)

ZnSO4·H2O mentioned in the data sheet is not observed on the phase diagram

Na⁺, NH4⁺ // ClO4⁻, Cl⁻ - NH3 (22) At 240 and 323 K only the pure components are observed.

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COMPONENTS: (1) Sodium perchlorate; NaClO ₄ ;	ORIGINAL MEASUREMENTS: Willard, H.H.; Smith, G.F.
[7601-89-0] (2) Water; H ₂ O; [7732-18-5]	J. Am. Chem. Soc. <u>1923</u> , 45, 286-96.
VARIABLES: One temperature: 298.15 K	PREPARED BY: C.Y. Chan
EXPERIMENTAL VALUES:	l
Solubility ^a of sodium perchlorate in	water at 25.00°C :
mass % g/100 cm ⁻³ sln mol %	moldm ⁻³ molkg ⁻¹ satd sln. Mi density/g cm ⁻³
67.70 113.88 23.57 ^b	9.301 ^b 17.118 ^b 1.6821
^A The solid phase was mixture of the from the sat. sln (probably NaClO ₄ .H ^b Compiler's calculations.	
from the sat. sln (probably NaClO ₄ .H	
from the sat. sln (probably NaClO ₄ .H	2 ⁰). FORMATION SOURCE AND PURITY OF MATERIALS: Anhyd. NaClO ₄ was prepared from pure sodium carbonate and slight

COMPONENTS :			ORIGINAL	ORIGINAL MEASUREMENTS:			
<pre>(1) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>				Freeth, F.A.			
(2) Wate	r; H ₂ O; [773	2-18-5]	Rec. Ti	Rec. Trav. Chim. Pays-Bas 1924			
			43, 47	43, 475-507.			
ARIABLES	;:		PREPARED	PREPARED BY:			
Temperature: 241 - 348 K. Composition.			C.Y. Cha	C.Y. Chan			
	TAL VALUES:						
		AC10 ₄ -H ₂ 0 at var	<u></u>	ures :			
•		olubility of Na	•	Solid			
	mass X		nolality ^a / mol				
75 60	75.0 74.3	30.62 29.84	24.50 23.61	NaClO ₄			
50.8	73.3	28.77	22.42	$NaClO_4 + NaClO_4 \cdot H_2O$			
50	73.16	28.63	22.26	NaClO4.H20			
40 30	70.88 68.71	26.37 24.42	19.88 17.94				
15	65.51	24.42	15.51	"			
0	62.54	19.72	13.64	"			
-0.3	10	1.6	0.91	ice			
-6.8 -11.1	20 30	3.5 5.9	2.0 3.5	**			
-17.8	40	8.9	5.5	**			
-22	45	10.7	6.7	11			
-32	56		10.4	$NaClO_4.H_2O + ice$			
- Compil	er's calcula	LIONS.					
		AUXILIARY	INFORMATION				
	PARATUS/PROC			PURITY OF MATERIALS:			
		atus was simila	· ·	s prepared from very put			
	-	't Hoff (ref.1		ammonium perchlorate (% purity no			
and samples of clear satd sln were			. 1	nd an aqueous sln of pur			
	ising a weigh		· . · · · · · · · ·	NaOH. Source and other detail			
taken · u			1				
taken – u was dete		2SO4 by additio		•			
taken u was dete of pure	sulphuric ac	id to the sln i	in	•			
taken u was dete of pure silica	sulphuric ac basins and e	id to the sln is vaporating at	a				
taken u was dete of pure silica low red	sulphuric ac basins and e heat. All	id to the sln i evaporating at analyses wer	a e ESTIMATED	ERROR :			
taken u was dete of pure silica low red carried	sulphuric ac basins and e heat. All out in dupli	id to the sln i vaporating at analyses wer cate.	a e ESTIMATED No estima	ERROR :			
taken u was dete of pure silica low red carried Solid ph	sulphuric ac basins and e heat. All out in dupli mase composit	id to the sln i vaporating at analyses wer cate. tions were deter	a e ESTIMATED No estima	ERROR :			
taken u was dete of pure silica low red carried Solid ph mined u	sulphuric ac basins and e heat. All out in dupli mase composit masing Schrein	id to the sln i vaporating at analyses wer cate. ions were deter memakers' method	a e ESTIMATED No estima i.	ERROR: tion.			
taken u was dete of pure silica low red carried Solid ph mined u Gas-heat	sulphuric ac basins and e heat. All out in dupli hase composit using Schrein ced thermosta	id to the sln i evaporating at analyses wer cate. tions were deter memakers' method its were used ar	a e ESTIMATED No estima r- d REFERENCES	ERROR: tion.			
taken u was dete of pure silica low red carried Solid ph mined u Gas-heat thermome	sulphuric ac basins and e heat. All out in dupli mase composit using Schrein ted thermosta eters were	id to the sln i vaporating at analyses wer cate. ions were deter memakers' method	a e ESTIMATED No estima c- d. REFERENCES st 1. Van't	ERROR: tion. : Hoff, J.H. Zur Bildung			
taken u was dete of pure silica low red carried Solid ph mined u Gas-heat thermome	sulphuric ac basins and e heat. All out in dupli hase composit using Schrein ced thermosta	id to the sln i evaporating at analyses wer cate. tions were deter memakers' method its were used ar	a e ESTIMATED No estima d REFERENCES at 1. Van't der Os	ERROR: tion. : Hoff, J.H. Zur Bildung reanischen Salzablagerun			
taken u was dete of pure silica low red carried Solid ph mined u Gas-heat thermome	sulphuric ac basins and e heat. All out in dupli mase composit using Schrein ted thermosta eters were	id to the sln i evaporating at analyses wer cate. tions were deter memakers' method its were used ar	a e ESTIMATED No estima d REFERENCES at 1. Van't der Os	ERROR: tion. ; Hoff, J.H. Zur Bildung zeanischen Salzablagerun zeweg, Braunschweig <u>190</u>			

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COMPONENTS:

(1) Sodium perchlorate; NaClO<sub>4</sub>;

[7601-89-0]

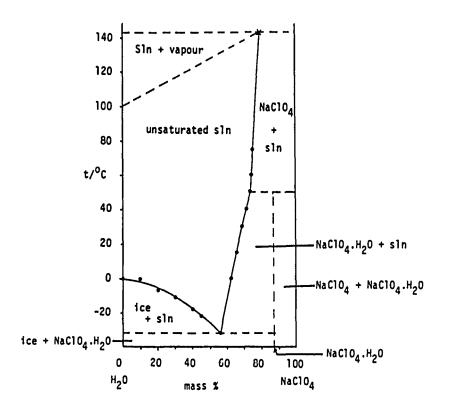
(2) Water; H<sub>2</sub>O; [7732-18-5]
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Recl. Trav. Chim. Pays-Bas <u>1924</u>, 43, 475-507.

EXPERIMENTAL VALUES:(continued)

COMMENTS AND/OR ADDITION DATA:

The temperature-composition phase diagram for the system $NaClO_4-H_2O$ (Pressure = 101325 Pa) is given below.



x - ref. B. Carlson

COMPONENTS:			ORIGINAL MEASUREMENTS:										
<pre>(1) Sodium perchlorate; NaClO₄; [7601-89-0] (2) Water; H₂O; [7732-18-5] VARIABLES: Temperature: 273 - 373 K</pre>			Cornec, E.; Dickely, J.										
			Bul. Soc. Chim. (France) <u>1927</u> , 41, 1017-27. PREPARED BY: C.Y. Chan										
								NTAL VALU		lorate in v	Vater at va	rious tempe	ratures :
										ity of NaC		density/	Solid
t/ °C	-	mass X		mol dm ⁻³	-	phase							
100	1330	76.75	32.69		1.758	NaClO4							
75	1318	75.01	30.63	10.76	1.757	H							
55	1298	73.94	29.45	10.60	1.756	"							
50	1281	73.26	28.73	10.46	1.749	NaClO4.H20							
38	1206		25.90	9.85	1.713	**							
25	1142	67.63		9.33	1.683								
15	1091	65.63	21.93	8.91	1.663	••							
0 a Compil	ler's cale	62.87 culations.	19.94	-	-	·							
			AUXILIARY	INFORMATION									
No deta	ils of sa ted in a and weight	water-bath ed in stop rature det	n and the s pered flas)	solids dri Ks.	ied in an o t 40g) of 1	solutions wer ven at 110 ^G hydrated sodiu							
cooled a Transit: perchlor placed thermost Then so which r	inside a tated over me crysta remained s	wider tu n set at a ls of the	few degree salt were <u>+</u> 0.03 ^o C	e whole ap es under th added.	oparatus wa e transiti The transit:	s placed in on temperature ion temperatur							
cooled a Transit: perchlor placed thermost Then so which r using a	inside a tated over me crysta remained s Baudin th ND PURITY	wider tul n set at a ls of the steady to hermometer OF MATERI	few degree salt were <u>+</u> 0.03 ^O C	e whole ap es under th added. 7 for at le rcial sodiu	paratus wa e transiti The transit: east 20 min	s placed in on temperature ion temperatur . was measure							
cooled a Transit: perchlor placed thermost Then so which r using a SOURCE AN by seve:	inside a tated over me crysta emained a Baudin th ND PURITY ral recry:	wider tul n set at a ls of the steady to hermometer OF MATERI	ALS: Commer ons before	e whole ap es under th added. 7 for at le rcial sodiu	paratus wa e transiti The transit: ast 20 min m perchlora	wide test-tub s placed in on temperature ion temperatur . was measure te was purifie							

COMPONENT	rs:			ORIGINAL	MEASUREMEN	TS:
	ium perch. 01-89-0]	lorate; Na	c10 ₄ ;	Cornec,	E.; Dickel	y, J.
(2) Wate	er; H ₂ O;	(7732-18-5	1		oc. Chim. (017-27.	France) <u>1927</u> ,
EXPERIMEN	NTAL VALU	ES: (conti	nued)			
COMMENTS	AND/OR A	DDITIONAL	DATA			
The tran		emperature		ransformati	on NaClO ₄	$.H_2O = NaClO_4$
Composit	tions of	super-satu	rated aquec	ous NaClO ₄	solutions (solid phase
was the			e as follow			
			X (1)) ^a	
	38	72.		28.28		
	25 15	72. 71.		27.66 27.14		
a Compi		/1. lculations		61.14		
COMPONENT	rs:		<u></u>	ORTGINAL	MEASUREMEN	
		lorate; Na	C104:	Carlson		
	01-89-0]		4,		,	
(2) Wate	er; H ₂ O;	[7732-18-5]			on, P., holm, <u>1910</u>),
			<u></u>	DREDARED	BV.	
	2.	VARIABLES: Temperature: 288 K, 323 K and 416 K.			PREPARED BY:	
		к, 323 к	and 416 K.	C.Y. Ch	an	
		К, 323 К	and 416 K.	C.Y. Ch	an	
Temperat EXPERIMEN	ture: 288	ES:	and 416 K. ₂ 0 at vario			
Temperat EXPERIMEN Solubili	ture: 288 NTAL VALU ity system	ES: m NaClO ₄ -H Solubil	20 at vario	ous tempera	tures : density/	Solid
Temperat EXPERIMEN Solubili t/ °C	NTAL VALU ity system g dm ⁻³	ES: m NaClO ₄ -H Solubil mass %	2 ⁰ at vario ity of NaCl mol % ^a	.04 mol dm ⁻³	tures : density/ g cm ⁻³	phase
Temperat EXPERIMEN Solubili t/ °C 15	ture: 288 NTAL VALUI ity system g dm ⁻³ 1076	ES: m NaClO ₄ -H Solubil mass % 64.63	2 ⁰ at vario ity of NaCl mol % ^a 21.19	ous tempera .04 mol dm ⁻³ 8.79	tures : density/ g cm ⁻³ 1.666	
Temperat EXPERIMEN Solubili t/ °C 15 50	ture: 288 NTAL VALUE ity system g dm ⁻³ 1076 1234	ES: m NaClO ₄ -H Solubil mass % 64.63 71.28	2 ⁰ at vario ity of NaCl mol % ^a 21.19 26.75	04 mol dm ⁻³ 8.79 10.08	tures : density/ g cm ⁻³ 1.666 1.731	ph ase NaClO ₄ .H ₂ O "
Temperat EXPERIMEN Solubili t/ °C 15 50	ture: 288 NTAL VALUE ity system g dm ⁻³ 1076 1234	ES: m NaClO ₄ -H Solubil mass % 64.63 71.28	2 ⁰ at vario ity of NaCl mol % ^a 21.19	04 mol dm ⁻³ 8.79 10.08	tures : density/ g cm ⁻³ 1.666 1.731	phase
Temperat EXPERIMEN Solubili t/ °C 15 50 143	ture: 288 NTAL VALUE ity system g dm ⁻³ 1076 1234 1414	ES: m NaClO ₄ -H Solubil mass % 64.63 71.28	20 at vario ity of NaCl mol % ^a 21.19 26.75 35.74	04 mol dm ⁻³ 8.79 10.08	tures : density/ g cm ⁻³ 1.666 1.731	ph ase NaClO ₄ .H ₂ O "
Temperat EXPERIMEN Solubili t/ °C 15 50 143	ture: 288 NTAL VALUE ity system g dm ⁻³ 1076 1234 1414	ES: m NaClO ₄ -H Solubil mass % 64.63 71.28 79.08 culations.	20 at vario ity of NaCl mol % ^a 21.19 26.75 35.74	04 mol dm ⁻³ 8.79 10.08 11.55	tures : density/ g cm ⁻³ 1.666 1.731 1.789	ph ase NaClO ₄ .H ₂ O "
Temperat EXPERIMEN Solubili t/ °C 15 50 143 a Compil	ture: 288 NTAL VALUE ity system g dm ⁻³ 1076 1234 1414 ler's calo	ES: m NaClO ₄ -H Solubil mass % 64.63 71.28 79.08 culations.	2 ⁰ at vario ity of NaCl mol % ^a 21.19 26.75 35.74 AUXILIARY I	04 mol dm ⁻³ 8.79 10.08 11.55	tures : density/ g cm ⁻³ 1.666 1.731 1.789	phase NaClO ₄ .H ₂ O " NaClO ₄
Temperat EXPERIMEN Solubili t/ °C 15 50 143 a Compil	ture: 288 NTAL VALUE ity system g dm ⁻³ 1076 1234 1414 ler's calo	ES: m NaClO ₄ -H Solubil mass % 64.63 71.28 79.08 culations.	2 ⁰ at vario ity of NaCl mol % ^a 21.19 26.75 35.74 AUXILIARY I	04 mol dm ⁻³ 8.79 10.08 11.55	tures : density/ g cm ⁻³ 1.666 1.731 1.789 D PURITY OF	phase NaClO ₄ .H ₂ O " NaClO ₄
Temperat EXPERIMEN Solubili t/ °C 15 50 143 a Compil	ture: 288 NTAL VALU ity system g dm ⁻³ 1076 1234 1414 ler's calo PPARATUS/ ils given	ES: m NaClO ₄ -H Solubil mass % 64.63 71.28 79.08 culations.	2 ⁰ at vario ity of NaCl mol % ^a 21.19 26.75 35.74 AUXILIARY I	OUS tempera O4 mol dm ⁻³ 8.79 10.08 11.55 (NFORMATION SOURCE AN	tures : density/ g cm ⁻³ 1.666 1.731 1.789 D PURITY OF ed.	phase NaClO ₄ .H ₂ O " NaClO ₄

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128 **COMPONENTS: ORIGINAL MEASUREMENTS:** (1) Sodium perchlorate; NaClO_A Selecki, A.; Tyminski, B.; [7601-89-0] Mariankowska, B. (2) Water-d₂; D₂O; [7789-20-0] J. Chem. Eng. Data 1970, 15, 130-4. VARIABLES: PREPARED BY: C.Y. Chan One temperature: 298 - 363 K. **EXPERIMENTAL VALUES:** Solubility of $NaClO_4$ in D_2O at various temperatures : t/ °C molality/ mol kg⁻¹ a mol 🗙 Refractive Index 23.38 <u>+</u> 0.04 1.3892 25 15.24 30 25.1 ± 0.1 16.7 1.3896 45 27.2 <u>+</u> 0.2 1.3903 18.7 60 29.4 ± 0.2 1.3903 20.8 75 30.1 ± 0.3 21.5 1.3883 90 30.8 ± 0.2 22.2 1.3862 ^a Compiler's calculations. AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: Method of saturation not given. Heavy water, purity 99.8 mol %, Solubility was determined by plotwas of Russian manufacture. ting refractive indexes of standard The salt was analytical grade and and equilibrated solutions versus was used without further purificconcentrations at each temperature, ation. the saturation point being the concentration at which a break occurred in the curve, followed by obser-ESTIMATED ERROR: Errors as tabulated were maximum vation of constant values of the refractive index. Refractive index deviations from mean values. measurements were made using a RL Temperature precision not stated. refractometer (PZO, Warsaw). **REFERENCES:** Accuracy of measurements was difficult to estimate because of indeterminate errors arising from solvent evaporation from the refractometer prisms.

COMPONENTS: (1) Sodium perchl					
(1) Sodium perchl	COMPONENTS :				
	210 ₄ ;	Willard, H.H.; Smith, G.F.			
[7601-89-0]					
(2) Alcohols:		J. Am. Ch	em. Soc. <u>192</u>	23, 45,	
(A) Methanol	•	lcohol);	286-96.		
CH ₄ 0; [67					
(B) Ethanol (ohol);			
с ₂ н ₆ о; (е					
(C) 1-Propand		<pre>vl alcohol);</pre>			
С ₃ н ₈ 0; [7					
(D) 1-Butanol		alcohol);			
C ₄ H ₁₀ O; (1			
(E) 2-Methyl-					
[78-83-1]	c <i>ohol</i>); C ₄ H 1	100;			
[/0-03-1]	l 				
VARIABLES:			PREPARED BY	:	
One temperature:	298.15 K		C.Y. Chan		
	-		l		
the solid phase t soly in :				1-butanol	2-methyl-
	·				1-propanol
mass X	33.93	12.82	4.66	1.83	0.7å
$g/100 \text{ cm}^{-3} \text{ sln}$	35.833	11.134	3.871	1.495	0.6264
mol % ^a	11.85	5.243	2.34	1.12	0.47
mol dm ⁻³ a	2.927	0.9093	0.3162	0.1221	0.05116
mol kg ⁻¹ a	4.194	1.201	0.399	0.152	0.064
^a Compiler's calc					
	A	UXILIARY IN	FORMATION		
METHOD/APPARATUS/F	PROCEDURE:		SOURCE AND	PURITY OF MA	TERIALS:
METHOD/APPARATUS/F A satd sln of th		s prepared		PURITY OF MA	
	ne salt wa	· · ·	Anhydrous		prepared by
A satd sln of th	ne salt wa slightly a	bove 25°C	Anhydrous neutralizi	(1) was p	orepared by .um carbon-
A satd sln of th at a temperature and sealed togeth the anhydrous sal	ne salt wa slightly a ner with at lt in a	bove 25 ^o C bout 1 g of solubility	Anhydrous neutralizi ate with a lute sln c	(1) was p ng pure sodi slight exce of purified	prepared by um carbon- ess of a di- HClO ₄ and
A satd sln of th at a temperature and sealed togeth the anhydrous sal tube, capacity 18	ne salt was slightly a ner with ab lt in a 3-20 cm ³ .	bove 25 ^o C bout 1 g of solubility This tube	Anhydrous neutralizi ate with a lute sln c	(1) was p ng pure sodi slight exce	prepared by um carbon- ess of a di- HClO ₄ and
A satd sln of th at a temperature and sealed togeth the anhydrous sal tube, capacity 18 was then rotated	he salt was slightly a her with ab lt in a 3-20 cm ³ . end-over-e	bove 25 ^o C bout 1 g of solubility This tube end in the	Anhydrous neutralizi ate with a lute sln c crystalliz After cent	<pre>(1) was p ing pure sodi a slight exce of purified cation above crifugal separation</pre>	prepared by sum carbon- ess of a di- $HClO_4$ and 50 ^O C. Aration, the
A satd sln of th at a temperature and sealed togeth the anhydrous sal tube, capacity 18 was then rotated thermostat bath a	ne salt was slightly a ner with at lt in a 3-20 cm ³ . end-over-e at 25.00°C	above 25°C pout 1 g of solubility This tube and in the for 24-48h	Anhydrous neutralizi ate with a lute sln c crystalliz After cent	(1) was pure sodi a slight exce of purified sation above	prepared by sum carbon- ess of a di- $HClO_4$ and 50 ^O C. Aration, the
A satd sln of th at a temperature and sealed togeth the anhydrous sal tube, capacity 18 was then rotated	ne salt was slightly a ner with at lt in a 3-20 cm ³ . end-over-e at 25.00°C	above 25°C pout 1 g of solubility This tube and in the for 24-48h	Anhydrous neutralizi ate with a lute sln c crystalliz After cent solid was	<pre>(1) was p ing pure sodi a slight exce of purified cation above crifugal separation</pre>	prepared by cum carbon- ess of a di- $HClO_4$ and ess 50 °C. C.
A satd sln of th at a temperature and sealed togeth the anhydrous sal tube, capacity 18 was then rotated thermostat bath a	ne salt was slightly a ner with at lt in a 3-20 cm ³ . end-over-e at 25.00°C	above 25°C pout 1 g of solubility This tube and in the for 24-48h	Anhydrous neutralizi ate with a lute sln c crystalliz After cent solid was	(1) was pure sodi a slight exce of purified sation above crifugal sepa dried at 250 ent of dry ai	prepared by cum carbon- ess of a di- $HClO_4$ and ess 50 °C. C.

COMPONENTS: ORIGINAL MEASUREMENTS: Willard, H.H.; Smith, G.F. (1) Sodium perchlorate; NaClO₄; [7601-89-0] (2) Alcohols: J. Am. Chem. Soc. 1923, 45, (A) Methanol (methyl alcohol); 286-96. CH₄O; [67-56-1] (B) Ethanol (ethyl alcohol); $C_2H_6O; [64-17-5]$ (C) 1-Propanol (n-propyl alcohol); C₃H₈O; [71-23-8] (D) 1-Butanol (n-butyl alcohol); $C_4H_{10}O; [71-36-3]$ (E) 2-Methyl-1-propanol (isobutyl alcohol); C₄H₁₀O; [78-83-1] EXPERIMENTAL VALUES: (continued) methanol ethanol 1-propanol 1-butanol 2-methyl-1-propanol satd sln density/g cm⁻³ 1.0561 0.8685 0.8308 0.8167 0.8031 pure solvent 0.78705 density/g cm⁻³ 0.8059 0.78515 0.8026 0.7981 AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE:(continued) SOURCE AND PURITY OF MATERIALS: solids to settle. Samples of the Alcohols were purified by refluxclear satd sln were then analysed ing with calcium and fractional distillation. for solute content by an evaporationto-dryness method using Pt crucibles, making sure that organic solvent was completely removed before the salt was dried to constant weight at 250°C in a current of air dried with P_2O_5 . ESTIMATED ERROR: Duplicate soly determinations were Precision in temp. was $\pm 0.01^{\circ}$ C. made, those analyses in which chloride (from thermal decomposition) was found present being rejected. **REFERENCES:** 1. Willard, H.H.; Smith, G.F. J. Am. Chem.Soc. <u>1922</u>, 44, 2816.

COMPONENTS :	ORIGINAL MEASUREMENTS :
 (1) Sodium Perchlorate ; NaClO₄ : [7601-89-0] (2) a) 1,2-ethanediol (ethylene- glycol) ; C2H6O2 ; [107-21-1] b) 2-amino-ethanol (monoethanol- amine) ; C2H7NO ; [141-43-5] 	Isbin, H.S. ; Kobe, K.A. J. Am. Chem. Soc. <u>1945</u> , 67, 46
VARIABLES	PREPARED BY :
one temperature 298 K	С.С. Но
EXPERIMENTAL VALUES :	
g_salt/100g_solventam	olality ^b /mol kg ⁻¹
1,2-ethanediol 75.5	6.166
2-amino-ethanol 90.8	7.416
a Solid phase at equilibrium not specified	
b Compiler's calculation	
AUXILIARY INFO	PRMATION
METHOD/APPARATUS/PROCEDURE: The solvent and excess solid phase were sealed in soft-glass test-tubes and rotated for at least 7 days in a water thermostat at 25°C. Analyses of a series of tubes were made at regular intervals until values became consistent. All analyses were made on a weight basis by use of weighing pipets. The perchlorate was first reduced to the halide by fusing with sodium carbonate in a platinum crucible and determined with both the standard gravimetric detn of halide and the volumetric method, using dichlorofluorescein as indi- cator. The presence of (2) did not affect the accuracy of the detns. The solid phase was analysed by dry- ing the excess solute on filter pa- per, weighing, titrating with HNO ₃ to the methyl orange end-point and determining the halide with AgNO ₃ to the dichlorofluorescein end-point.	SOURCE AND PURITY OF MATERIALS: (1) was purified by recrystalli zation from water above 50°C an dehydrated at 250°C. (2) was technical grade chemical and purified by careful fractiona- tion (ref. 1). ESTIMATED ERROR: Temperature: ± 0.08°C. Solubility : Insufficient infor mation for reliable estimates. REFERENCES : 1. Reitmeier, R.E. ; Sivertz, V. Tartar, H.V. J. Am. Chem. So 1940, 62, 1943-4

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COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Sodium perchlorate; NaClO₄;</pre>	Isbin, H.S.; Kobe, K.A.
(2) 1,2-ethanediamine (ethylene-	J. Am. Chem. Soc. <u>1945</u> , 67,
diamine); C ₂ H ₈ N ₂ ; [107~15-3]	464~5
VARIABLES:	PREPARED BY:
One temperature: 298 K	С.С. Но
EXPERIMENTAL VALUES:	
Solubility of (1) in (2) at $25^{\circ}C$:	
g salt/100g solvent ^a	molality ^b /mol kg ⁻¹
30.1	2.458
^a Solid phase at equilibrium ^b Compiler's calculation.	is the solvate $NaClO_4.3C_2H_8N_2$.
AUXILIARY IN	FORMATION
METHOD/APPARATUS/PROCEDURE: The solvent and excess solid phase were sealed in soft-glass test-tubes and rotated for at least 7 days in a water thermostat at $25^{\circ}C$. Analyses of a series of tubes were made at regular intervals until values were obtained which were within 0.5%. All analyses were made on a weight basis by use of weighing pipets. The per- chlorate was first reduced to the halide by fusing with sodium carbon- ate in a platinum crucible and deter- mined with both the standard gravime- tric detn of halide and the volumet- ric method, using dichlorofluorescein as indicator. The presence of (2) after being neutralised with HNO ₃ , did not affect the accuracy of the detns. The solid phase was analysed by drying the excess solute on filter paper, weighing, titrating with HNO ₃ to the methyl orange end-point and determining the halide with AgNO ₃ to the dichlorofluorescein end-point.	SOURCE AND PURITY OF MATERIALS: (1) was purified by recrystalli- zation from water above 50°C and dehydrated at 250°C. (2) was dehydrated and purified by the method given in ref. 1. ESTIMATED ERROR: Temperature: ± 0.08°C. Solubility : insufficient infor- mation for reliable estimates. REFERENCES: 1. Putnam, G.L.; Kobe, K.A. Trans. Electrochem. Soc. 1938, 74, 609-24.

COMPONENTS: (1) Sodium perchlorate; NaClO ₄	ORIGINAL MEASUREMENTS: Willard, H.H.; Smith, G.F.
[7601-89-0] (2) Acetone; C ₃ H ₆ O; [67-64-1]	J. Am. Chem. Soc. <u>1923</u> , 45, 286-96.
VARIABLES: One temperature: 298.15 K	PREPARED BY: C.Y. Chan
EXPERIMENTAL VALUES:	L <u></u>
Solubility ^a of sodium perchlorate in mass % g/100 cm ⁻³ sln mol % mol	
34.10 36.596 19.71 ^b 2.9	9889 ^b 4.226 ^c 1.0732
^a The solid phase was the anhydrous sa ^b Compiler's calculations.	lt.
AUXILIARY IN	FORMATION
METHOD/APPARATUS/PROCEDURE: A satd sln of the salt was prepared at a temperature slightly above 25° C and sealed together with about 1 g of the anhydrous salt in a solubility tube, capacity 18-20 cm ³ . This tube was then rotated end-over-end in the thermostat bath at 25.00°C for 24-48h and stood vertically to allow the solids to settle. Samples of the clear satd sln were then analysed for solute content by an evaporation-to- dryness method using Pt crucibles. The salt was dried to constant wt. at 250°C in a current of air dried with P ₂ O ₅ , after ensuring that organic solvent was removed completely enough to avoid any danger of explosions. Duplicate soly determinations were made, those analyses in which chlo- ride (from thermal decomposition) was found present being rejected.	

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COMPONEN	TS:		ORIGIN	IAL MEASUREME	NTS:
	ium perchlorate; 1	NaClO4		rd, H.H.; Sm	
	01-89-0]	-			
(2) Eth	yl acetate; C ₄ H ₈ O	2;	J. A.	n. Chem. Soc.	<u>1923, 45,</u>
[14	1-78-6]		286	5-96.	
ARIABLE	S:		PREPAR	ED BY:	····
One tem	perature: 298.15	К	C.Y.	Chan	
EXPERIME	NTAL VALUES:			 	
	ity ^a of sodium p g/100 cm ⁻³ sln		-		
8.80	8.425	6.49 ^b	0.6881 ^b	0.788 ^b	0.9574
	ler's calculation:		Y INFORMATI	ON	
	ler's calculation	Β,			·····
1ETHOD/A	PPARATUS/PROCEDUR	AUXILIAR	SOURCE	AND PURITY	OF MATERIALS:
4ETHOD/A: A satd at a te and sea the anh tube, c. was the thermost and sta solids clear sat solute of dryness The salt $250^{\circ}C$ is P_2O_5 , a	PPARATUS/PROCEDUR sln of the salt mperature slightl led together with ydrous salt in apacity 18-20 cm ³ n rotated end-ove tat bath at 25.00 bod vertically	AUXILIAR AUXILIAR E: was prepar y above 22 about 1 g a solubil: . This tu r-end in to OC for 24-4 to allow to analysed for aporation-to crucibles. Instant wt. ir dried withat organ	SOURCE red Sodiu 5°C by ne of purific ity droug ube talling the centra isthe (ref. fied for fract co- sity and at ESTIM hic Prec	AND PURITY am perchlorat autralizing ded HClO ₄ (r salt was ob- zation above ifugal separ- current of d 2). Ethyl ac- by re-fluxing ional distill at 25°C was b.p. 77.14 -	e was prepared pure Na ₂ CO ₃ with ef.1). The anhy- tained by crys- 50° C and after ation, dried in ry air at 250°C cetate was puri- ng with P ₂ O ₅ and lation. Its den- 0.8945 g cm ⁻³ ;

COMPONENTS: (1) Sodium perchlorate; NaClO ₄ ; [7601-89-0] (2) 2-butanone (methyl ethyl ketone); C ₄ H ₈ O; [78-93-3] VARIABLES:	ORIGINAL MEASUREMENTS: Krumgal'z, B.S.; Smirnova, V.A.; Gerzhvert, Yu. I. <i>Zh. Neorg. Khim.</i> <u>1972</u> , <i>17</i> , 1778- 80; <i>*Russ. J. Inorg. Chem.</i> (Engl. <i>Transl.</i>) <u>1972</u> , <i>17</i> , 924. PREPARED BY:
One temperature: 283-323 K	С.С. Но
EXPERIMENTAL VALUES:	
Solubility of (1) in (2) at various to	emperatures:
Liquid phase co	omposition ^a
t/ ^o C molality/mol kg	
10 1,944 20 1.836	
25 1.790	
30 1.749 40 1.682	
50 1.630	
^a Solid phase at equilibrium wa	NeClo over the temperature
range investigated.	as nacio ₄ over the temperature
Tange Investigated.	
AUXILIARY IN	FORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The method and apparatus were as	No details given.
described in ref. 1.	
	ESTIMATED ERROR:
	Nothing specified.
	REFERENCES:
	1. Krumgal'z, B.S.; Gerzhvert, Yu.
	I; Nikitina, I.P.; Derevskaya,
	V.I.; Fedotova, G.F.; Traber,
	D.G. Zh. & Prikl. Khim. 1969,
	42, 1414.
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COMPONENTS: (1) Sodium perchlorate; NaClO ₄ ; [7601-89-0] (2) Acetone; C ₃ H ₆ O; [67-64-1]	ORIGINAL MEASUREMENTS: Krumgal'z, B.S.; Smirnova, V.A.; Gerzhvert, Yu. I. Zh. Neorg. Khim. <u>1972</u> , 17, 1778- 80; *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1972</u> , 17, 924.
VARIABLES: One temperature: 283-323 K	PREPARED BY: C.C. Ho
EXPERIMENTAL VALUES:	
Solubility of (1) in acetone at var:	ious temperatures:
Liquid phase t/ ^o C molality/mol	composition ^a kg ⁻¹
10 4.242 20 4.346 25 4.422 30 4.508 40 4.604 50 4.666 a Solid phase at equilibrium range investigated.	was NaClO ₄ over the temperature
AUXILIARY	INFORMATION
METHOD/APPARATUS/PROCEDURE: The method and apparatus were as described in ref. 1.	SOURCE AND PURITY OF MATERIALS: No details given. ESTIMATED ERROR:
	Nothing specified. REFERENCES: 1. Krumgal'z, B.S.; Gerzhvert, Yu. I; Nikitina, I.P.; Derevskaya, V.I.; Fedotova, G.F.; Traber, D.G. Zh. Prikl. Khim. <u>1969</u> , 42, 1414.

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Sodium perchlorate; NaClO₄;</pre>	Paul, R.C.; Dev, R.
[7601-89-0]	
(2) Acetamide; C ₂ H ₅ NO;	Res. Bulletin Panjab Univ.
[60-35-5]	<u>1969</u> , 20, 139-48.
VARIABLES:	PREPARED BY:
One temperature: 373 K.	С.С. Но
EXPERIMENTAL VALUES:	
Solubility of (1) in (2) at $100^{\circ}C$:	
g salt/100g solvent m	olality ^a /mol kg ⁻¹
12.46	1.018
^a Compiler's calculations.	
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of	igh dielectric constant of acetamid
The solubility of sodium perchlorate similar to that in water. A fairly h	igh dielectric constant of acetamid the salt dissolved in it. The ions
similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to	igh dielectric constant of acetamid the salt dissolved in it. The ions
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR	igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE:	igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS:
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by	igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE:	igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS:
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution	igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes	igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2.
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in	igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified.
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and	igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES:
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and anion estimated using standard	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J.</pre>
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR AUXILIAR AUXILIAR AETHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J. Chem. 1965, 3, 315.</pre>
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and anion estimated using standard	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J. Chem. 1965, 3, 315. 2. Paul, R.C.; Dev, R. Ind. J.</pre>
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and anion estimated using standard	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J. Chem. 1965, 3, 315.</pre>
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and anion estimated using standard	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J. Chem. 1965, 3, 315. 2. Paul, R.C.; Dev, R. Ind. J.</pre>
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and anion estimated using standard	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J. Chem. 1965, 3, 315. 2. Paul, R.C.; Dev, R. Ind. J.</pre>
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and anion estimated using standard	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J. Chem. 1965, 3, 315. 2. Paul, R.C.; Dev, R. Ind. J.</pre>
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and anion estimated using standard	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J. Chem. 1965, 3, 315. 2. Paul, R.C.; Dev, R. Ind. J.</pre>
The solubility of sodium perchlorate similar to that in water. A fairly h is responsible for the ionization of formed are assumed to be similar to AUXILIAR METHOD/APPARATUS/PROCEDURE: Solubility was determined by preparing the saturated solution in molten acetamide. The tubes containing the solvent and the solute were sealed and shaken continuously for several hours in a bath at 100°C. The cation and anion estimated using standard	<pre>igh dielectric constant of acetamid the salt dissolved in it. The ions those obtained in aqueous solution. Y INFORMATION SOURCE AND PURITY OF MATERIALS: (1) and (2) were purified as described in ref. 1 and 2. ESTIMATED ERROR: Nothing specified. REFERENCES: 1. Paul, R.C.; Dev, R. Ind. J. Chem. 1965, 3, 315. 2. Paul, R.C.; Dev, R. Ind. J.</pre>

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COMPONENTS: (1) Sodium perchlorate; NaClO₄; [7601-89-0] (2) Sulfinylbis-methane (dimethyl sulphoxide, DMSO); C₂H₆OS; [67-68-5] VARIABLES: Temperature: 298, 308 and 318 K. ORIGINAL MEASUREMENTS: Kenttamaa, J. Suomen Chemist 1960, 33, 179-82. PREPARED BY: C.Y. Chan

EXPERIMENTAL VALUES:

Solubility of sodium perchlorate in DMSO at various temperatures :

t /	(Solid phase was the anhyc ^o C mol/100 g(2)	lrous salt.) mol kg ⁻¹
25	0.18	1.8
35	0.17	1.7
45	0.21	2.1

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The soly measurements and the preparation of solvates was carried out in glass-stoppered flasks immersed in a thermostat at an initial temperature of 50 $^{\circ}$ C. The flasks were shaken from time to time to mix the contents. About 2 weeks were allowed for the attainment of equilibrium, after which the temperature was lowered to 45, 35, or 25 $^{\circ}$ C as required. After one more week of equilibration, the solutions were analysed. After the soly measurements at 25 $^{\circ}$ C, the solids in the flasks were filtered and washed with pure DMSO. Excess DMSO was removed from the solids in a vacuum of about 0.05 torr and trapped in a U-tube immersed in a dry ice-acetone mixture, care being taken to isolate the solvates from atmospheric moisture. The solutions were analysed for sodium by flame photometry, using a Beckman 4100 flame photometer. All analyses were carried out in duplicate or triplicate to an accuracy of about \pm 5 %. The solvates were also analysed using flame photometry and ion exchange methods (no details).

SOURCE AND PURITY OF MATERIALS:

DMSO of "practical quality" was purified by repeated recrystallization. The melting point of the final product was 18.5 ^oC. The salt was dried in a heating cabinet for a few days at a temperature high enough to remove any moisture. No details of salt purity.

ESTIMATED ERROR: Soly precision: about \pm 5 % .

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>	Starkovich, J.A.; Janghorbani, M.
<pre>(2) Tetrahydrothiophene 1,1-dioxide (sulfolane); C₄H₈O₂S; [126-33-0]</pre>	J. Inorg. Nucl. Chem. <u>1972</u> , 34, 789-91.
VARIABLES:	PREPARED BY:
One temperature: 313 K	С.С. Но

EXPERIMENTAL VALUES:

The solubility of (1) in sulfolane at 40° C was 0.981 mol dm⁻³.

METHOD/APPARATUS/PROCEDURE: A small amount of (1) sufficient to saturate 3 cm³ of the solvent was placed in 5 cm³ glass ampoules and (2) added. The ampoules were sealed and placed in a water bath maintained at 40.0 \pm 0.5°C. The soln was allowed to equilibrate for 250-300h with periodic shaking. At the end of the equilibration period, the ampoules were opened and a 1 cm^3 aliquot of each supernatant soln was transferred in the open atmosphere to a clean 1/2dram polyvial. The 1/2 dram polyvials were sealed and placed inside 2 dram polyvials for activation. Solubility was determined by subjecting the perchlorate sample to neutron irradiation and subsequently measuring the amount of induced ³⁸Cl activity. Samples were activated twice for 30 min. each time at thermal neutron fluxes of 2.8×10^{10} and 5.6×10^{9} neutrons $cm^{-2} s^{-1}$ in the Oregon State University Triga reactor. A set of 3 NH₄Cl standards was used to obtain a calibration plot of ³⁸Cl activity vs. perchlorate concentration. After each

AUXILIARY INFORMATION

SOURCE AND PURITY OF MATERIALS: Sulfolane (Shell Chem.) was twice distilled below 100° C in vacuo. The solvent prepared in this way, was found to contain <0.02% by wt water as determined by a Fisher titration (ref. 1). The salt used was of reagent grade quality or purified according to published procedures (ref. 2).

ESTIMATED ERROR:

Temperature: ± 0.5°C. Solubility : relative standard deviations range between 2 and 6% which is what may be expected from INNA techniques without elaborate

sample handling.

REFERENCES:

- Mitchell, J.; Smith, D.M. Aquametry, Interscience, N.Y., 1948, 65-78.
- Mann, C.K. Electroanalytical Chemistry, Marcel Dekker, N.Y., 1969, 132-4.

(continued next page)

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>	Starkovich, J.A.; Janghorbani, M.
<pre>(2) Tetrahydrothiophene 1,1-dioxide (sulfolane); C₄H₈O₂S; [126-33-0]</pre>	J. Inorg. Nucl. Chem. <u>1972</u> , 34, 789-91.

METHOD/APPARATUS/PROCEDURE: (continued)

activation the 1/2 dram polyvials were placed in new 2 dram polyvials and counted with a 3 in x 3 in NaI(T1) well detector coupled to a 400 channel analyzer. The 1.64 and 2.16 MeV photopeak areas of 37-min 38 Cl were corrected for Compton scattering and decay and both peaks were used generally for analysis. Where interferences were noted, only one γ -ray was used. The number of perchlorate ions per formula unit was taken into consideration in calculating the salt solubilities.

VARIABLES: One temperature: 273.2 K	PREPARED BY: C.Y. Chan				
(2) Hydrazine; N ₂ H ₄ ; [302-01-2]	Zh. Neorg. Khim. <u>1970</u> , 15, 2262-4 *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1970</u> , 15, 1169-70.				
(1) Sodium perchlorate; NaClO ₄ [13454-84-7]	Rosolovskii, V.Ya.; Sakk, Zh.G.				
COMPONENTS:	ORIGINAL MEASUREMENTS:				

EXPERIMENTAL VALUES:

Solubility of sodium perchlorate in hydrazine at 0.0 $^{\circ}$ C was reported as 74.3 g(1)/100 g(2). The corresponding mol % and molality values are 16.3 % and 6.07 mol kg⁻¹, respectively (calculated by compiler). The solid phase was reported to be NaClO₄.N₂H₄ [22475-89-4].

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: A sin of sodium perchlorate in hydrazine with the solid phase present was stirred for 2 h continuously in a thermostat at 0 $^{\circ}$ C. The liquid and solid phases were separated and analysed for ClO₄ by precipitation as nitron perchlorate. Hydrazine in both phases was analysed by titration with satd iodine solution in the presence of excess sodium bicarbonate.

SOURCE AND PURITY OF MATERIALS: Sodium perchlorate was obtained by reacting 70 % $HClO_4$ aq. sln with sodium carbonate and recrystallized twice. It was dried to constant wt. in a vacuum at 200 -250 °C. Hydrazine was 99.5 -98.8 % pure.

ESTIMATED ERROR: Temperature precision: \pm 0.1 °C. Insufficient details for soly error estimation.

REFERENCES:

COMPONENTS: (1) Sodium perchlorate; NaClO ₄ [13454-84-7] (2) Hydrazine; N ₂ H ₄ ; [302-01-2]	ORIGINAL MEASUREMENTS: Sakk, Zh.G.; Rosolovskii, V.Ya. Zh. Neorg. Khim. <u>1972</u> , 17, 1783-4; *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1972</u> , 17, 927-8.
VARIABLES: One temperature: 298.2 K	PREPARED BY: C.Y. Chan
EXPERIMENTAL VALUES: Solubility of sodium perchlorate in hy 85.1 g(1)/100 g(2). The correspondi 18.22 % and 6.95 mol kg ⁻¹ , respectiv	ing mol % and molality values are
AUXILIARY IN	IFORMATION
METHOD/APPARATUS/PROCEDURE: 4-6 g of the salt and 8-11 cm ³ of hydrazine were thermostated at 25° C for 7-8h with continuous stirring in a vessel isolated from atmospheric moisture. Samples for analysis were removed by withdrawing solution and	SOURCE AND PURITY OF MATERIALS: The methods of purification of the perchlorate and of the preparation of anhydrous hydrazine were as described in ref. 1. Salt purity was about 99.5-99.9 %.
part of the solid phase into another vessel fitted with a porosity no. 4 filter at reduced pressure. After separating the phases, the solution was analysed for hydrazine using the procedure given in ref. 1. Replicate solubility determinations were carried out.	ESTIMATED ERROR: Absolute error in soly value was 0.4 X. Precision in temp. was ± 0.1 °C .
• • • •	REFERENCES: 1. Rosolovskii, V.Ya.; Sakk, Zh.G. <i>Zh. Neorg. Khim.</i> <u>1970</u> , 15, 2262.

	14				
COMPONENTS: (1) Sodium perchlorate; NaClO ₄ ; [7601-89-0] (2) Perchloric acid; HClO ₄ ; [7601-90-3]	ORIGINAL MEASUREMENTS: Rosolovskii, V.Ya.; Kristov, N.V.; Lemesheva, D.G. Zh. Neorg. Khim. <u>1968</u> , 13, 1115-8; *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1968</u> , 13, 582-4.				
VARIABLES: Temperature: 273 K.	PREPARED BY: C.Y. Chan				
EXPERIMENTAL VALUES:	L				
	alt:				
AUXILIARY I	NFORMATION				
METHOD/APPARATUS/PROCEDURE: Mixtures of 5-6 g of the salt with 10-12 g of the acid were kept in a thermostat at 0 $^{\circ}$ C (melting ice) for 10-15 h with continuous stir- ring in tubes isolated from atmos- pheric moisture. After equilibrium has been reached, the solid and liquid phases were separated on a glass filter. Perchlorate was de- termined gravimetrically as nitron perchlorate. The purity of the acid before and after saturation was determined by acid-base titrat- ion. Concentration of the salt in the satd sln was determined by first diluting a weighed sample of the sln (5-8 g) in water and then	SOURCE AND PURITY OF MATERIALS: NaClO ₄ was prepared by dissolving Na ₂ CO ₃ in 70 \times HClO ₄ , recrystalling twice from water, and drying to constant weight under vacuum at 200-250 °C. Analysis : Na 18.81 \times , ClO ₄ 81.45 \times . Anhydrous HClO ₄ was distilled from a mixture of oleum and perchloric acid dihydrate at 100 °C under va- cuum (ref. 1). Acid purity was 99.79 \pm 0.01 \times (w/w). ESTIMATED ERROR: Precision in soly value : \pm 0.3 \times . Temperature precision not stated.				
evaporating to dryness. The dry residue was then dissolved in concentrated sulphuric acid, evap- orated to dryness and the resulting sulfate heated to constant weight at 600 °C. Triplicate determinat- ions were made.	REFERENCES: (1) Rosolovskii, Y. Ya. Khimiya Bezvodnoi Khlornoi Kisloty, (Moscow, <u>1966</u>).				

,

COMPONENTS: (1) Sodium perchlorate; NaClO ₄ ; [7601-89-0] (2) Hydrogen peroxide; H ₂ O ₂ ; [7722-84-1] VARIABLES: One temperature: 273 K	ORIGINAL MEASUREMENTS: Titova, K.V.; Kolmakova, E.I.; Rosolovskii, V.Ya. Zh. Neorg. Khim. <u>1986</u> , 31, 3213-5; *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1986</u> , 31, 1846-7. PREPARED BY: C.Y. Chan
EXPERIMENTAL VALUES: The solubility ^a of sodium perchlorate	in hydrogen peroxide at 0 ^o C :
g(1)/100 g(2) mass X mol 42.12 29.64 10.4 ^a MassX, molX and molality values calc The solid phase was an unstable solv	8 3.440 ulated by compiler.
AUXILIARY IN	FORMATION
METHOD/APPARATUS/PROCEDURE: No details of saturation method was given. Solubility equilibrium was established in 1-1.5 h. The concen- centration of the solutions did not change noticeably during the next 3h but after that slow decomposition of peroxide began. The concentration of perchlorate in the satd solution was determined from the mass of the	SOURCE AND PURITY OF MATERIALS: Sources not given. The H_2O_2 was 99.8% \pm 0.2% pure. No information on purity of salt.
solid residue left after removal of the solvent from a sample of the solution under vacuum.	ESTIMATED ERROR: Not stated.
	REFERENCES :

COMPONENTS:			ORIGINAL MEASUREMENTS:		
(1) Sodium [7601-3	<pre>perchlorate; NaCl 89-0]</pre>	Marshall, P.R.; Hunt, H.			
(2) Ammonia	a; NH ₃ ; [7664-41-7]	J. Chem. Eng. Data <u>1959</u> , 4, 217-22.		
ARIABLES:	<u></u>		PREPARED BY:		
Temperature: 240 - 323 K.			C.Y. Chan		
XPERIMENTA	L VALUES:	at various	temperatures, the solid phase		
EXPERIMENTAL Solubility being the	L VALUES: of NaClO ₄ in NH ₃ anhydrous salt :		temperatures, the solid phase		
Solubility being the	L VALUES: of NaClO ₄ in NH ₃ anhydrous salt :		L		
XPERIMENTA Solubility being the	L VALUES: of NaClO ₄ in NH ₃ anhydrous salt : g(1)/ 100g(2) 278.3		temperatures, the solid phase		
XPERIMENTAL Solubility being the t/ °C	L VALUES: of NaClO ₄ in NH ₃ anhydrous salt : g(1)/ 100g(2) 278.3	mol % ^a	molality/ mol kg ⁻¹ 22.7 24.8		
t/ °C -33 0 25	L VALUES: of NaClO ₄ in NH ₃ anhydrous salt : g(1)/ 100g(2) 278.3 304.3 318.3	mol X ^a 27.91 29.74 30.69	molality/ mol kg ⁻¹ 22.7 24.8 26.0		
EXPERIMENTAL Solubility being the d t/ °C -33 0 25 50	L VALUES: of NaClO ₄ in NH ₃ anhydrous salt : g(1)/100g(2) 278.3 304.3	mol % ^a 27.91 29.74	molality/ mol kg ⁻¹ 22.7 24.8		

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The solubility determinations were carried out using a specially constructed apparatus (diagram given in original paper), involving a gas line connected to the saturation cell. The cell consisted of two compartments separated by a sintered glass partition, the larger one of which was connected to the gas line in such a way that the cell could be inverted, with either one of the compartments vertically above the other. Weighed amts of the salt were sealed in the smaller compartment of the cell which was then connected to the gas line via the larger compartment. Excess of dry ammonia was condensed in the cell until the salt had completely dissolved at the set temperature. Coolants used were dry ice and CCl_4 . The cell was thermostated in a liquid NH₃ bath for -33 ^{O}C determinations, in an ice + water bath for 0 $^{\rm O}$ C, and in a water bath for the other temperatures. Ammonia was bled from the solution until salt crystals were formed, and the cell inverted so that the solution filtered through the partition into the larger compartment. After filtration the ammonia in the solution was all removed by condensation into a reservoir in the apparatus and determined quantitatively by absorption in std. HCl sln and back-titrated with std. base. The cell was then opened and the solids removed for analysis.

SOURCE AND PURITY OF MATERIALS: Not stated. Ammonia was dried with sodium.

ESTIMATED ERROR: Reproducibility (3 detn) is within \pm 2 % of the mean value in most cases.

COMPONENTS:			0	ORIGINAL MEASUREMENTS:			
(1) Sodium pe		e; NaClO ₄ ;		Abdukarimova, F.M.; Nogoev, K;			
[7601-89-	-			Sulaiman	kulov, K.		
(2) Carbamide		CH4N20;		-			
[57-13-6]					Khim. <u>1973</u> ,		
(3) Water; H ₂	0; [7732	-18-5]			. J. Inorg.		
				Transl.)	<u>1973</u> , 18, 1	651-3.	
VARIABLES:			I	PREPARED BY	:		
One temperatu	re: 303	к		C.C. Ho			
Composition							
EXPERIMENTAL V	ALUES:						
Solubility sy	stem Nø	.c104-c0(NH ⁵) ₂ -H ₂ O a	at 30°C:			
	Liqu	id phase co				Solid	
ma	33 X	mol	x	molality	^a /mol kg ⁻¹	phaseb	
(1)	(2)	(1)	(2)	(1)	(2)		
	57.50	-	28.87	-	22.53 23.67	A	
	54.09	$(2.09)^{C}$	28.61 (29.27)			A	
14.00	51.61	3.80 (3.97)	29.74 (29.81)	3.325	24.99	A	
17.91	50.64	5.18	30.98	4.651	26.81	A	
24.04	49.10	(5.35) 7.60	(30.83) 32.79	7.310	30.44	A	
		(7.84)	(32.64)	•			
	49.60	11.71 (12.06)	38.96 (38.73)		43.68	A	
37.50	52.29	17.63	50.00	30.00	85.28	A	
		(17.56)	(49.93)	,			
37.57	52.46	17.80 (17.70)	50.82 (50.38)		87.62	A + B	
						_	
37.77	51.96	17.75 (17.69)	49.47		84.25	B	
39.13	43.81	16.07	36.62	18.73	42.76	В	
42.44	37.48	(16.01) 16.61	(36.55) 30.00	17.26	31.08	в	
		(16.62)	(29.93)				
46.52	31.19	17.80 (17.78)	24.38 (24.31)		23.30	B	
		AUXILI	ARY INFO	RMATION			
METHOD/APPARAT No details we	•			SOURCE AND PURITY OF MATERIALS: Nothing specified.			
			E	STIMATED EN	RROR:		
				Nothing spe	cified.		
			F	REFERENCES :			
			1		(continued	next page)	

COMPONENTS:	ORIGINAL MEASUREMENTS:
 Sadium perchlorate; NaClO₄; 	Abdukarimova, F.M.; Nogoev, K;
[7601-89-0]	Sulaimankulov, K.
(2) Carbamide (<i>urea</i>); CH ₄ N ₂ O;	
[57-13-6]	Zh. Neorg. Khim. <u>1973</u> , 18, 3102-
(3) Water; H ₂ O; [7732-18-5]	6; *Russ. J. Inorg. Chem. (Engl. Transl.) 1973, 18, 1651-3.

EXPERIMENTAL VALUES: (continued)

phase	a1		-		-	
pnase	^a /mol kg ⁻¹	molality	L X	mo.	88 X	ma
	(2)	(1)	(2)	(1)	(2)	(1)
В	19.60	19.60	20.76	20.61	25.72	52.43
				(20.69) ^C		
В	17.05	27.43	23.50	37.62	19.02	62.40
			(17.05)	(27.43)		
B + 0	17.99	28.64	16.90	28.30	19.34	62.76
			(17.61)	(28.04)		
B + C	17.48	27.72	17.30	27.40	19.28	52.35
_			(17.35)	(27.53)		
с	17.82	28.24	16.87	28.00	19.36	52.55
_			(17.54)	(27.80)		
С	6.43	20.36	7.86	24.83	9.96	64.26
-			(7.82)	(24.74)		
С	2.12	17.97	2.83	23.88	3.83	66.12
•			(2.81)	(23.77)	0.00	
С	-	17.94	-	24.4	-	68.71

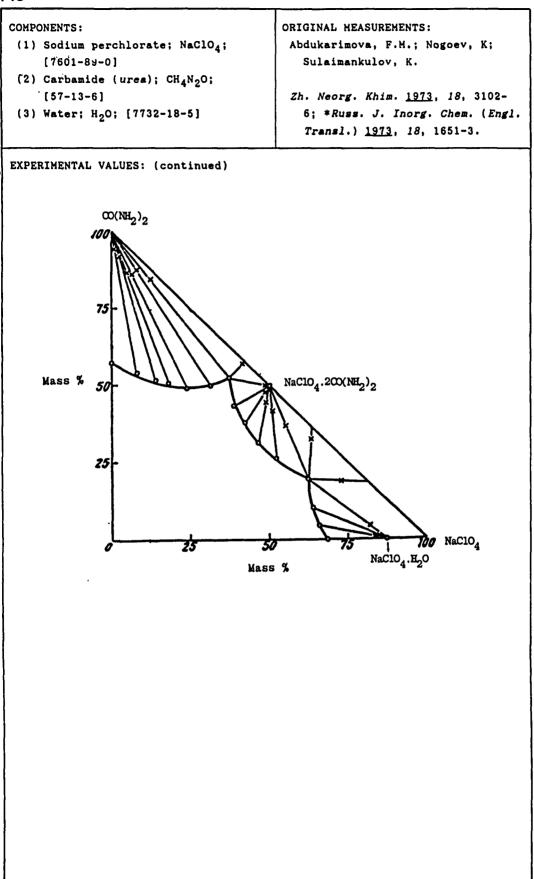
a Compiler's calculations. b A = CO(NH₂)₂; B = NaClO₄.2CO(NH₂)₂; C = NaClO₄.H₂O. ^c Values in brackets are compiler's calculations.

.

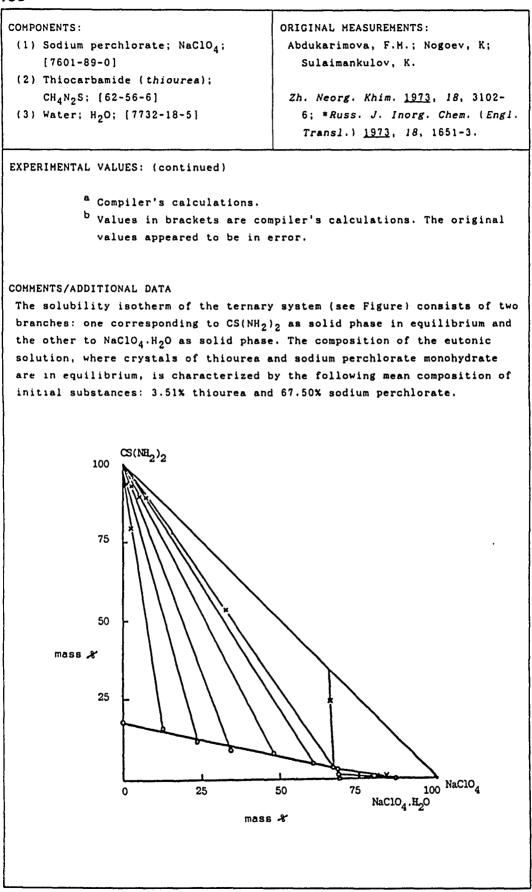
COMMENTS/ADDITIONAL DATA

The solubility curve of the ternary system (see Figure) shows that in addition to the initial components, an anhydrous compound with sodium perchlorate:urea ratio of 1:2 crystallises out. The branch of the curve which belongs to this compound occupies a large part of the diagram and extends in the range 19.02- 51.96% urea and 37.77-62.40% sodium perchlorate. The straight line rays which run from this branch of the solubility curve meet at a single point of the diagram corresponding to a solid phase with the composition NaClO₄.2CO(NH₂)₂.

(continued next page)



			No	FIMATED ER			
ETHOD/APPARAT No details we				JRCE AND P othing spe	URITY OF MA	ATERIALS:	
		AUXIL	IARY INFORM	ATION			
68.71	-	(24.40 (24.42)		17.94	-	n	
68.45		(25.15) 24.73 (24.76)	(1.66) 0.75 (0.72)			"	
68.06	2.80	(24.98) 25.11	(2.09)	19.08	1.262	$NaClO_4 \cdot H_2O$ $NaClO_4 \cdot H_2O$	
67.50	3.51	25.06	2.21	19.02	1.591	CS(NH2)2 +	
67.02	3.60	(20.03) 24.54 (24.60)	(2.70) 2.25 (2.13)	18.63	1.610		
	5.07	(13.28) 19.97	(3.57) 2.83	14.39	1.938	**	
	8.01	(7.73)	(3.34) 3.76	8.869		"	
	9.06	(4.89) 7.71	(4.02) 3.51		2.082	**	
	12.03	(2.42) (2.43) 4.87	(5.04)		2.452	11	
	18.20		(5.00) ^b 5.31	- 1.458		CS(NH ₂) ₂ "	
	(2) 18.20		(2) 5.27	(1)	(2) 2,923	CE (NU)	
ma	.88 %	id phase co mo	1 X	molality ^a	/mol kg ⁻¹	phase	
Solubility sy				80°C:		Solid	
XPERIMENTAL V	ALUES:						
One temperatu Composition	re: 303	Γ					
ARIABLES:	202	v		EPARED BY:			
(2) Thiocarba CH ₄ N ₂ S; [(3) Water; H ₂	62-56-6	}	21	Zh. Neorg. Khim. <u>1973</u> , 18, 3102- 6; *Russ. J. Inorg. Chem. (Engl Transl.) <u>1973</u> , 18, 1651-3.			
(1) Sodium pe [7601-89-	0]			Abdukarimova, F.M.; Nogoev, K; Sulaimankulov, K.			



				······					
COMPONENTS	:				ORIG	INAL N	IEASUREMENTS :		
(1) Sodiu	<pre>1) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>						ov, A.S.; Tarakanov, V.F.		
) Thiocarbamide; CS(NH ₂) ₂ ;						Uch. Zap. Yarosl. Gos. Ped. Inst.		
(62-5							95, 109-12.		
Ŧ	(62-56-6) 3) Water; H ₂ O; [7732-18-5]								
VARIABLES:	LIABLES:						3Y:		
One tempe	rature:	298 K			N . A	. Kozy	reva		
Compositi	on								
EXPERIMENT	AL VALUE	S :							
Solubilit	y system	NaCl04-0	CS(NH ₂)	2-H20 a	t 29	В К:			
	Liquid	phase co	mposit	ion			Solid phase		
ma		mol			ity/	nol k	-		
(1)		(1)					-		
		0.00					CS(NH ₂) ₂		
21.79	11.44	4.41	3.72	2.66	5 2	.251			
47.93	8.20	13.34 20.29	3.67	8,92	3 2	.400 .715	••		
		22.80					$CS(NH_2)_2 + NaClO_4.H_2O$		
		23.73					NaClO ₄ .H ₂ O		
							saturation point		
		NaClO4.H	-						
64.7	9 mass %	NaClO ₄ ,	3.84 1	nass X	CS(N)	12)21	and 31.37 mass $%$ H ₂ O.		
a Compil	er's cal	culation							
		÷							
			AUXILI	ARY INF	ORMA	TION			
METHOD/APP	ARATUS/P	ROCEDURE	:		sou	RCE AI	ND PURITY OF MATERIALS:		
Isotherma	l method	. Detai	ls of s	atura-					
tion tec	-		-				······································		
compositi							D ERROR:		
	mined by Schreinemakers' method of					t sta	ted.		
"residues									
mined by				-	REF	ERENC	E9 :		
gravimetr	ically,	by nitro	on prec	ipita-					
tion.									
					ł				
					1				
L									

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COMPONENTS :		ORIGINAL MEASUREMENTS:		
(1) Sodium perchlorate; 1	ACLOA:	Lepeshkov, I.N.; Tarakanov, V.F.		
[7601-89-0]	·			
(2) Acetamide; C ₂ H ₅ NO; [(Uch. Zap. Yarosl. Gos. Ped. Inst.		
(3) Water; H ₂ O; (7732-18.	•5]	<u>1972</u> , <i>103</i> , 78-82.		
VARIABLES:		PREPARED BY:		
One temperature: 298 K		I.S. Bodnya		
Composition				
EXPERIMENTAL VALUES:				
Solubility system NaCle	O4-CH3CONH2-H2	O at 298 K:		
Liquid phase compo	sition	Solid phase		
mass X	mol X			
(1) (2) (1) (2)			
	13 -	NaClO ₄ .H ₂ O		
	58 7.34			
	75 17.39 50 29.23	69 94		
	30 29.23	NaClO4		
	7 60.31	"		
	3 74.37	CH ₃ CONH ₂		
	4 57.67	- U		
	75 48.35 43.03			
A Compiler's calculat				
	·····			
	AUXILIARY IN	FORMATION		
METHOD/APPARATUS/PROCEDURI	5:	SOURCE AND PURITY OF MATERIALS:		
The soly was studied by	the method of	Not stated.		
isothermal recrystallizat	ion. Addition			
of sodium perchlorate mo	onohydrate to			
the saturated solution	of acetamide	ESTIMATED ERROR:		
resulted in dissolution	of the solid	Not stated.		
phase. To avoid this, di	ried acetamide			
was taken or anhydrous so	dium perchlo-	· · · · · · · · · · · · · · · · · · ·		
rate was added. Acetamic	le was deter-	REFERENCES:		
mined by the Kjeldahl met	hod; perchlo-			
rate ion by the gravin	metric method			
with nitron. The densit	• • • •			
and electric conductivit;				
rated solutions were mean	sured.			
		(

COMPONENTS:	ORIGINAL MEA	SUREMENTS :			
(1) Sodium perchlorate; NaClO ₄ ;		; Villetard, M.			
[7601-89-0]					
(2) Sulfinylbis-methane (dimethyl	Ann. Chim. <u>1975</u> , 10, 33-5.				
<pre>sulphoxide, DMSO); C2H60S;</pre>					
[67-68-5]					
(3) Water; H ₂ O; [7732-18-5]					
VARIABLES:	PREPARED BY:				
Temperature: 298.2 K .	C.Y. Chan				
Composition.		······································			
EXPERIMENTAL VALUES:					
Solubility of sodium perchlorate in m	nixtures of wat	er and DMSO at			
25.0 $^{\circ}$ C, the solid phase being NaClO ₄					
Solvent composition	Solubi	lity			
mol ratio, DMSO:H ₂ O	$g/100 \text{ cm}^3$	mol dm ⁻³			
2:1	23.27	1.90			
1:1	25.59	2.09			
1:2	34.53	2.82			
1:5	60.12	4.91			
1:10	82.12	6.71			
pure DMSO	22.41	1.83			
pure H ₂ O	181.22	14.8			
AUXILIARY I	NFORMATION				
	ſ				
METHOD/APPARATUS/PROCEDURE:		RITY OF MATERIALS:			
No details of saturation method.					
Excess of the salt was allowed to	heating the monohydrate (Herck				
saturate in 50 cm^3 of solvent for 8	-	dually, then by fusing			
days at 25 °C. The saturated slns		ter of crystallization			
were first eluted through acidic cation exchange resins and the		dried at 120 °C.			
cation exchange resins and the eluants analysed by potentiometric		rade DMSO was further f. 1) before use.			
titration (glass electrode used)	harrian (Le	T. T. DETOLE MOE!			
with NaOH sln.					
	ESTIMATED ERR	OR :			
		precision: \pm 0.1 °C.			
	-	soly detn not stated.			
	REFERENCES:				
		.N. J. Electroanaly-			
		ет. <u>1967</u> , <i>14</i> , 89.			
	<u> </u>	·····			

COMPONENTS :	ORIGINAL MEASUREMENTS:			
 Sodium perchlorate; NaClO₄; 	Bestuzheva, M.M.			
[7601-89-0]				
(2) Dimethylurea; C ₃ H ₈ ON ₂ ;	Sb. Tr.Yarosl. Gos. Ped. Inst.			
[1320-50-9]	<u>1979, 178, 67-9.</u>			
(3) Water; $H_{2}O$; [7732-18-5]				
VARIABLES:	PREPARED BY:			
One temperature: 298 K	I.S. Bodnya			
Composition	1.5. Dodnýa			
EXPERIMENTAL VALUES:				
	A 200 K.			
Solubility system $NaClO_4-C_3H_8ON_2-H_2O_3$	at 298 K:			
	b			
Liquid phase compositio				
	lality ^a /mol kg ⁻¹			
(1) (2) (1) (2) (1) (2)			
67.84 - 23.69 - 17.	228 - A			
67.24 1.89 24.04 0.94 17.	790 0.695 "			
65.27 3.81 23.25 1.89 17. 65.19 3.85 23.20 1.90 17.	240 1.398 A + B 197 1.411 "			
65.04 4.16 23.22 2.06 17.	247 1.533 B			
55.99 6.89 17.62 3.01 12. 49.50 10.50 14.73 4.34 10.	319 2.107 " 107 2.979 "			
43.29 14.38 12.33 5.69 8.	352 3.855 "			
43.29 14.38 12.33 5.69 8. 39.43 16.51 10.90 6.34 7.	309 4.253 " 522 6.788 "			
	682 6.788 " 678 6.764 B + C			
37.01 23.42 10.93 9.61 7.	639 6.717 C			
28.08 22.83 7.14 8.06 4.	672 5.278 " 740 4.831 "			
16.64 22.42 3.60 6.74 2.54	230 4.175 "			
12.94 22.30 2.67 6.40 1.	632 3.908 "			
9.90 21.71 1.90 5.98 1.	182 3.603 C 512 3.473 "			
- 23.55 - 5.92 -	3.496 "			
a Compiler's calculations.				
b A = NaClO ₄ .H ₂ O; B = NaClO ₄ .2C	$H_{\rm ON}$, $H_{\rm O}$, $C = C_{\rm e}H_{\rm ON}$			
$A = Macio_4.R_20; B = Macio_4.20$	3 ⁿ 8 ⁰ ⁿ 2 ⁿ 2 ⁰ ; c - 0 ³ ⁿ 8 ⁰ ⁿ 2			
AUXILIARY IN	FORMATION			
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
Isothermal recrystallization was used.	Not stated.			
Periods of equilibration vary from 2				
to 3 days. Perchlorate ion was deter-				
mined gravimetrically with nitron, di-	ESTIMATED ERROR:			
methylurea by Kjeldahl's method. The	Not stated.			
density and viscosity of saturated				
solutions were determined.				
•	l			
REFERENCES:				

ORIGINAL MEASUREMENTS:
Sal'nikova, L.N.; Karnaukhov,
A.S.; Lepeshkov, I.N.
Zh. Neorg. Khim. <u>1971</u> , 16, 2840-
4; *Russ. J. Inorg. Chem. (Engl.
Transl.) <u>1971</u> , 16, 1511-3.
PREPARED BY:
С.С. Но

EXPERIMENTAL VALUES:

Solubility system NaClO₄-C₆H₁₂N₄-H₂O at 25°C:

		Liquid phase	composi	tion			So	11	d ^C
ma	.88 %	mol	Xª	molality ⁸	/mol kg ⁻¹	density ^b	ph	8.3	e
(1)	(2)	(1)	(2)	(1)	(2)				
-	46.52	-	10.05	-	6.205	1.1126		A	
2.29	46.20	0.583	10.28	0.363	6.398	1.1250	-	A A A A	
6.83	45.18	1.834	10.60	1.162	6.716	1.1480	,	A	
9.95	44.10	2.758	10.68	1.769	6.846	1.1832		A	
16.35	43.46	4.993	11.59	3.323	7.714	1.3217	A	+	в
19.67	39.78	5.960	10.53	3.962	6.998	1.2510	•	в	
21.43	38.70	6.569	10.36		6.924	-	1	B	
22.94	37.02	7.007	9.88	4.679	6.595	1.2764		B B B B B B B B B B B B	
30.34	28.53	9.062	7.443	6.025	4.948	1.3241		в	
36.63	23.97	11.26	6.435	7.593	4.340	-		В	
38.44	21.86	11.74	5.83	7.908	3.928	1.3810		В	
43.99	17.75	13.77	4.85	9.390	3.309	-		B	
47.71	15.74	15.40	4.44	10.66	3.072	1.8382		В	
52.72	13.50	17.93	4.01	12.75	2.851	-		B	
54.47	13.67	19.25	4.22	13.96	3.061	2.2410	B	+	С
56.28	12.04	19.95	3.73	14.51	2.711	1.6005	(c	
59.50	9.37	21.31	2.93	15.61	2.147	1.5907	(C	

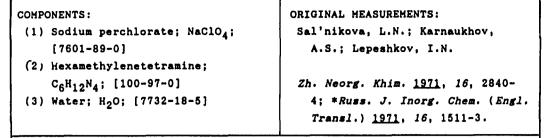
AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: The isothermal method was used. Eq-Nothing specified. uilibrium was reached after 20 days. The solid phases were analysed for **ESTIMATED ERROR:** Clo_4^{-} ion (determined as nitron Nothing specified. perchlorate) and $C_6H_{12}N_4$, by acid hydrolysis followed by distillation **REFERENCES:** of the ammonia into saturated boric acid soln and titration with H_2SO_4 . The density was measured pyknometrically in benzene. (continued next page)

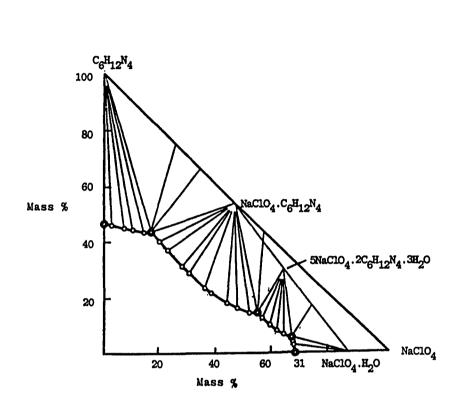
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COMPONENTS:
                                             ORIGINAL MEASUREMENTS:

    Sodium perchlorate; NaClO<sub>4</sub>;

                                              Sal'nikova, L.N.; Karnaukhov,
     [7601-89-0]
                                                A.S.; Lepeshkov, I.N.
 (2) Hexamethylenetetramine;
     C_6H_{12}N_4; [100-97-0]
                                              Zh. Neorg. Khim. 1971, 16, 2840-
 (3) Water; H_2O; [7732-18-5]
                                                4; *Russ. J. Inorg. Chem. (Engl.
                                                Transl.) 1971, 16, 1511-3.
EXPERIMENTAL VALUES: (continued)
                                                                            Solid<sup>C</sup>
                    Liquid phase composition
                                           molality<sup>a</sup>/mol kg<sup>-1</sup> density<sup>b</sup> phase
                              mol %<sup>a</sup>
          mass X
                                               (1)
       (1) (2)
                           (1)
                                  (2)
                                                         (2)
     61.72 7.97
                    22.47
                                  2.63 16.63
                                                        1.876
                                                                  1.6127
                                                                              С
                                   1.79 17.98
     64.95 5.55 24.03
                                                        1.342
                                                                    -
                                                                               С
     67.11 5.44 25.97
                                           19.97
                                                        1.414 1.7310 C + D
                                  1.84
     67.02 4.27 25.21
                                  1.40 19.07
                                                        1.061
                                                                              D
     66.86 3.50 24.64
                                  1.13 18.42
                                                        0.842
                                                                              D
     67.80
                                            17.20
              -
                       23.65
                                    -
                                                         -
                                                                1.6840
                                                                              D
      <sup>a</sup> Compiler's calculation. <sup>b</sup> in 10^3 kg m<sup>-3</sup>
      <sup>c</sup> A = C_6H_{12}N_4; B = NaClO<sub>4</sub>.C_6H_{12}N_4; C = 5NaClO<sub>4</sub>.2C_6H_{12}N_4.3H_2O;
         D = NaClO_4 \cdot H_2O.
COMMENTS/ADDITIONAL DATA:
The solubility isotherm of the system has four crystallization branches
 (see Figure). The first and fourth correspond to the crystallization in
the solid phase of the initial subtances. The second (the longest) branch
corresponds to the crystallization of congruently soluble NaClO_4 \cdot C_8H_{12}N_4,
the composition of which was confirmed by chemical and thermographic
analyses:
                       : NaClO_4 46.45%; C_6H_{12}N_4 53.32%
        Found 🗙
        Calculated % : NaClO<sub>4</sub> 46.62%; C<sub>6</sub>H<sub>12</sub>N<sub>4</sub> 53.38%
The compound was isolated as elongated crystals and its density is
1.703 \times 10^3 \text{ kg m}^{-3}.
When the concn of sodium perchlorate was increased a complex with the
 formula 5NaClO_4 \cdot 2C_5H_{12}N_4 \cdot 3H_2O was formed. The composition of this
compound was confirmed similarly:
                       : NaClO<sub>4</sub> 64.69%; C_6H_{12}N_4 29.49%; H_2O 5.81%
         Found 🗙
        Calculated X : NaClO<sub>4</sub> 64.67X; C_6H_{12}N_4 29.62X; H_2O 5.71X
 The compound crystallized out as rectangular plates and its density is
 1.8639 \times 10^3 kg m<sup>-3</sup>.
                                                        (continued next page)
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COMMENTS/ADDITIONAL DATA: (continued)



COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Sodium perchlorate; NaClO _d ;	Bestuzheva, M.M.; Kinderov, A.B.;
[7601-89-0]	Karnaukhov, A.S.
(2) Benzamide; C ₇ H ₇ NO; [55-21-0]	
(3) Water; H ₂ O; [7732-18-5]	Uch. Zap. Yarosl. Gos. Ped.
-	Inst. <u>1978</u> , 169, 37-41.
VARIABLES:	PREPARED BY:
One temperature: 298 K	E.S. Gryzlova
Composition	
EXPERIMENTAL VALUES: Solubility system NaClO ₄ -C ₆ H ₅ CONH ₂ -	
Liquid phase composition	Solid phase

1

	Liquid	phase co	omposit	ion		Solid phase
mass	x	mol :	۲ ^α	molality	^B /mol kg	-1
(1)	(2)	(1)	(2)	(1)	(2)	
-	1.57	-	0.24	-	0.132	C6H5CONH2
4.36	1.42	0.67	0.22	0.378	0.124	· · · "
12.66	1.40	2.12	0.24	1.203	0.134	••
21.30	1.63	3.90	0.30	2.257	0.175	**
30.42	1.60	6.16	0.33	3.655	0.194	••
45.07	1.57	11.01	0.39	6.898	0.243	**
57.70	1.88	17.26	0.57	11.659	0.384	**
64.61	1.87	21.95	0.64	15.742	0.461	$NaClO_4.H_2O + C_6H_5CONH_2$
65.12	1.84	22.34	0.64	16.097	0.460	Ψ ² ₁₁ 0 0 ²
66.28	1.32	23.03	0.46	16.708	0.336	NaClO4.H20
67.84	-	.23.69	-	17.228	-	9 T L

^a Compiler's calculation.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND E
Isothermal method was used. Per	iods Not stated
of equilibration varied from 2	to 3
days in the system and from 4	to 6 ESTIMATED EN
days at the eutonic points. Be	nza- Not stated
mide was determined by the Kjel	dahl
method (ref. 1); $ClO_{\overline{4}}$ ion by ni	tron REFERENCES:
precipitation (ref. 2). The den	sity 1. Hiller
and viscosity of saturated solut	ions G.E.F.
were measured. The maximum den	sity Analys
and viscosity values occurred at	the N.YI
eutonic composition.	2. Loebic
	1926.

PURITY OF MATERIALS:

RROR:

- orand, W. F.; Lundell Applied Inorganic is, 2nd edit.Wiley, London 1963
- ch, O.L. Anal. Chem., <u>926, 68,</u> 34.

COMPONENTS:			ORIGINAL MEA	SUREMENTS	
(1) Sodium perchlorate	NaClos:		Chernykh, L		· · · · · ·
[7601-89-0]		Alekseeva	-	,,	
(2) Perchloric acid; HClO ₄ ;				,	
[7601-90-3]	· • • •		Zh. Neorg.	Khim. <u>1970</u> ,	15, 1922-
(3) Water; H ₂ O; [7732-	-18-5]]	_		Chem. (Eng
-			Transl.)	<u>1970</u> , <i>15</i> , 9	87-9.
VARIABLES:			PREPARED BY:		
One temperature: 298 M	2		C.C. Ho		
Composition					
EXPERIMENTAL VALUES:					
Solubility system NaC	:104-HC104	-H ₂ O at :	25°C:		
Lig	uid phase	composi	tion		Solid ^b
mass X			molality ^a ,	/mol kg ⁻¹	phase
(1) (2)	(1)	(2)	(1)	(2)	
67.70 -	23.57	-	17.12	-	A
58.26 7.62 49.45 14.63	19.46	3.102 5.728	13.95	2.223 4.054	Å
32.30 28.81	9.737 8.584	10.59	6.783	7.374	Ä
28.47 32.80 25.26 35.33	8.084 7.514	12.05 12.81	6.004 5.235	8.430 8.924	A A
23.86 36.47	7.061	13.15	4.912	9.151	A + B
	AUXIL	IARY INF	ORMATION		
METHOD/APPARATUS/PROCEI)URE:		SOURCE AND P	URITY OF MA	TERIALS:
(1) was analysed on co	lumns of a	KU-2	Chémically	pure grade	57% HC104,
ion exchange resin and			anhydrous H		•
cally. The solubility	was found	by	recrystalli	•	
isothermal saturation	at 25°C. 1	Equi-	The anhydro	us acid was	made by th
librium was reached in	6-8h. In	ana-	recommended	method (re	f. 1). The
lyses of specimens of	liquid and	d so-	HClO ₄ solut:	ions were t	ested for
lid phases, the H ⁺ ion	concn w	8.8	Cl ion, the	e anhydrous	acid for
determined by titratio		1	sulfur oxide	es and chlo	ride oxides
solution and the sum o					
cations was determined			ESTIMATED ER	-	
of Ku-2 ion-exchange r the concn of Na^+ ion i	•	1	Temperature: $\pm 0.05^{\circ}C$ Solubility : nothing specified.		
	-	cimen -	Solubility	. NOTHING B	pecified.
was found by difference	found her	1	REFERENCES :		
was found by difference phase composition was				G. Handbuch	der Prapa-
was found by difference			-		-
was found by difference phase composition was			rativen	anorganisch	en chemie
was found by difference phase composition was			rativen (Transl.	anorganisch into Russ.	en chemie
was found by difference phase composition was			rativen (Transl. Lit. Mos	anorganisch	en chemie), Inostr.

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ORIGINAL MEASUREMENTS:
Chernykh, L.V.; Ivanov, Y.V.;
Alekseeva, E.A.
Zh. Neorg. Khim. <u>1970</u> , 15, 1922-
27; *Russ. J. Inorg. Chem. (Engl. Transl.) <u>1970</u> , 15, 987-9.

EXPERIMENTAL VALUES: (continued)

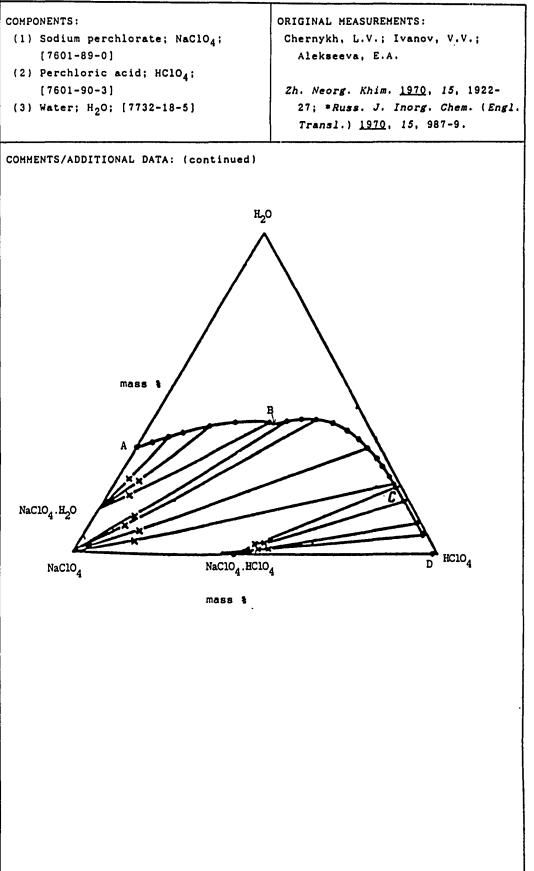
	Li	quid phase	composit	ion		Solid ^b
mə		mol	Xª	molality	/mol kg ⁻¹	phase
(1)	(2)	(1)	(2)	(1)	(2)	
23.12	37.15	6.832	13.38	4.753	9.308	В
19.40	40.88	5.720	14.69	3.989	10.25	В
16.60	43.42	4.865	15.51	3.391	10.81	В
13.56	46.29	3.955	16.46	2.758	11.48	В
10.45	50.06	3.075	17.95	2.161	12.62	В
4.60	58.13	1.399	21.55	1.008	15.53	В
3.00	63.26	0.970	24.92	0.7262	18.66	B B
2.33	66.45	0.788	27.41	0.6095	21.19	В
2.03	69.01	0.717	29.72	0.5725	23.72	В
1.78	69.30	0.622	29.85	0.4967	23.84	В
1.53	74.46	0.599	35.52	0.5204	30.87	В
1.57	76.34	0.641	38.02	0.5805	34.40	В
1.09	78.63	0.464	40.82	0.4390	38.60	С
1.40	78.51	0.599	40.96	0.5691	38.90	С
1.02	84.10	0.498	50.09	0.5599	56.26	С
1.00	91.60	0.614	68.52	1.104	123.22	С
1.26	93.80	0.845	76.65	2.083	189.01	С

^a Compiler's claculations. ^b A = NaClO₄.H₂O; B = NaClO₄; C = NaClO₄.HClO₄.

COMMENTS/ADDITIONAL DATA:

The solubility isotherm of the ternary system (see Figure) does not have a branch with a salt solubility minimum but there is a monotonic decrease in the solubility of NaClO₄. Evidently the Na⁺ ion does not compete with the H_3O^+ as a salting-out agent and this part is played by the acid throughout the whole region. The isotherm has two eutonic points (B and C). Point B corresponds to the change of the solid phase from the crystal hydrate NaClO₄. H₂O to the anhydrous salt and point C to the change from NaClO₄ to the compound NaClO₄. HClO₄. It was found that the solubility of NaClO₄ in the anhydrous acid is 0.624X (point D).

(continued next page)



VARIABLES: Temperature: 273K and 298K	PREPARED BY: C.C. Ho				
(3) Water; H ₂ O; [7732-18-5]	Transl.) <u>1957</u> , 2, 311-6.				
[7778-74-7]	*Russ. J. Inorg. Chem., (Engl.				
<pre>(2) Potassium perchlorate; KClO₄;</pre>	Zh. Neorg. Khim. <u>1957</u> , 2, 910-4.				
<pre>(1) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>	Karnaukhov, A.S.; Makin, A.V.				
COMPONENTS:	ORIGINAL MEASUREMENTS:				

EXPERIMENTAL VALUES:

Composition.

Solubility system NaClO₄-KClO₄-H₂O at 0^oC:

		Liqu	id Phase	compositi	on		Solid
	mas	5 X	mol	ת	Molalit	y ^a /mol kg	-1 phase
Point	(1)	(2)	(1)	(2)	(1)	(2)	
1	-	0.75	-	0.098	-	0.0545	кс10 ₄
2	5.15	0.63	0.797	0.0862	0.446	0.0483	
3	6.94	0.55		0.0764		0.0429	11
4	9.23	0.45	1.480	0.0638	0.835	0.0360	1+
5	11.71	0.49		0.0711	1.089	0.0403	**
6		0.48		0.0698	1.104	0.0395	**
7	19.54	0.51		0.0800	1.996	0.0460	
8	21.56	0.50		0.0801	2.259	0.0463	**
2 3 4 5 6 7 8 9	31.82	0.49		0.0880		0.0522	19
10			7.868			0.0516	41
11	41.24		9.418			0.0569	**
12	50.00	0.51	12.93	0.117	8.251	0.0744	н
13	55.37	0.52	15.57	0.129	10.25	0.0851	KClO ₄ + NaClO ₄ ^b
14	55.32	0.51	15.54	0.127	10.23	0.0833	**
15	55.35	0.51	15.56	0.127	10.24	0.0834	**
16	55.32	0.54	15.55	0.134	10.24	0.0883	**

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The isothermal method was used. Equilibrium was attained after 5-6 days at 25° C, but after 10-12 days at 0° C. ClO_4^{-} was determined gravimetrically by precipitation from a satd sln of rubidium chloride, filtered, washed with 96% alcohol and dried to constant weight at 105° C. Potassium was determined by the gravimetric method of cobalt nitrate in the form of K₂NaCo(NO₃)₆.H₂O. Na⁺ was determined by the zinc-uranyl-acetate gravimetric method. SOURCE AND PURITY OF MATERIALS: Chemically pure sodium perchlorate was purified by two recrystallizations. $KClO_4$ was obtained from 30% $HClO_4$ and chemically pure KCl. The salt obtained was twice recrystallized. Purities of salts obtained varied within the limits from 99.54-99.76%.

ESTIMATED ERROR: Nothing specified.

REFERENCES: (continued next page)

OMPONENTS: (1) Sodium perchlorate; NaClO ₄ : (7601-89-0) (2) Potassium perchlorate; KClO ₄ : (7778-74-7] (3) Water; H ₂ O; (7732-18-5) XPERIMENTAL VALUES: (continued) Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 0 ⁶ C: Liquid Phase composition Solid mass X mol X ^a Holality ^A /mol kg ⁻¹ phase Ponit (1) (2) (1) (2) (1) (2) 17 58.23 0.42 17.15 0.109 11.50 0.0733 nKClO ₄ .mNaClO ₄ 18 60.15 0.28 18.26 0.0751 12.42 0.0511 " 20 62.89 - 19.96 - 13.84 - NaClO ₄ .H ₂ O ^a Compiler's calculations. b (evaluator's remark) the solid phase is not NaClO ₄ Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 25 ^o C: Liquid Phase composition Solid mass X mol X ^a Holality ^A /mol kg ⁻¹ phase Ponit (1) (2) (1) (2) (1) (2) 1 - 2.30 - 0.305 - 0.170 KClO ₄ 2 2.58 2.18 0.364 0.255 0.204 0.165 " 3 4.11 2.21 0.639 0.304 0.358 0.170 " 4 6.52 2.03 1.035 0.285 0.582 0.160 " 5 10.00 1.36 1.530 0.196 0.161 " 5 10.00 1.36 1.530 0.196 0.921 0.111 " 6 11.95 1.34 1.984 0.197 1.126 0.112 " 1 - 2.30 - 0.305 - 0.170 KClO ₄ 3 1.55 1.531 1.65 2.261 0.273 " 4 6.52 2.03 1.035 0.285 0.582 0.160 " 5 1.030 1.35 1.245 0.182 " 1 4 6.52 2.03 1.035 0.285 0.582 0.160 " 3 4.11 2.21 0.639 0.326 0.182 " 1 4 6.52 1.03 1.263 0.251 1.877 0.144 " 1 4 6.52 1.03 1.263 0.251 1.877 0.144 " 3 18.39 1.60 3.263 0.261 1.877 0.144 " 3 19 6.61.32 0.47 22.68 0.142 16.31 0.102 NaClO ₄ .H ₂ O 16 67.82 - 23.67 - 17.21 - "									
$ \begin{bmatrix} 7601-89-0 \\ 12 \end{bmatrix} Potassium perchlorate; KCl0q; \\ [7778-74-7] \\ [3] Water; H_20; [7732-18-5] \\ \\ \hline \\ KPERIMENTAL VALUES: (continued) \\ \\ Solubility system NaCl0q-KCl0q-H_2O at 0°C: \\ \\ Liquid Phase composition \\ mass X mol Xa Holalitya/mol kg-1 phase \\ Ponit (1) (2) (1) (2) (1) (2) \\ 17 58.23 0.42 17.15 0.109 11.50 0.0733 nKCl0q.mNaCl0q \\ 18 60.15 0.28 18.26 0.0751 12.42 0.0511 \\ 19 61.46 0.16 19.06 0.0438 13.08 0.0301 \\ \\ 19 61.46 0.16 19.06 - 13.84 - NaCl0q.H_2O \\ compiler's calculations. \\ \\ b (evaluator's remark) the solid phase is not NaCl0q \\ \\ Solubility system NaCl0q-KCl0q-H_2O at 25°C: \\ \\ \\ Liquid Phase composition \\ \\ 50 (evaluator's remark) the solid phase is not NaCl0q \\ \\ \\ Solubility 1 = 2.38 2.18 0.364 0.295 0.204 0.165 \\ \\ 3 4.11 2.21 0.639 0.304 0.358 0.170 \\ \\ 4 6.52 2.03 1.035 0.284 0.195 0.582 0.160 \\ \\ 5 10.00 1.36 1.630 0.196 0.921 0.111 \\ \\ 7 16.74 1.60 2.921 0.247 1.674 0.141 \\ \\ 9 26.06 1.62 5.021 0.276 2.943 0.162 \\ \\ 1 4 0.32 0.138 1.45 0.364 0.295 0.592 0.101 \\ \\ 1 4 0.82 1.30 0.305 0.291 0.111 \\ \\ 7 16.74 1.60 2.921 0.276 2.943 0.162 \\ \\ 1 4 0.32 1.30 1.50 0.286 0.170 \\ \\ 1 4 0.32 1.30 1.50 0.286 0.192 \\ \\ 1 4 0.32 0.138 1.45 0.364 0.295 0.524 0.165 \\ \\ 3 10.00 1.36 1.630 0.196 0.921 0.111 \\ \\ 1 4 0.82 1.30 9.376 0.264 5.760 0.162 \\ \\ 1 4 0.82 1.30 9.376 0.264 5.760 0.162 \\ \\ 1 4 0.82 1.30 9.376 0.264 5.760 0.162 \\ \\ 1 4 0.82 1.30 9.376 0.264 5.760 0.162 \\ \\ 1 4 0.82 1.30 9.376 0.264 5.760 0.162 \\ \\ 1 4 0.82 1.30 9.376 0.264 5.760 0.162 \\ \\ 1 4 0.82 1.30 9.376 0.264 5.760 0.162 \\ \\ 1 5 6 0.32 0.47 22.68 0.142 16.31 0.102 NaCl0q.H_2O \\ 1 6 07.82 - 23.67 - 17.21 - \\ \end{bmatrix}$	OMPONEN'	rs:			01	RIGINAL M	EASUREMEN	TS:	
(2) Potassium perchlorate; KClQ ₄ ; (7778-74-7] (3) Water; H ₂ O; (7732-18-5) XPERIMENTAL VALUES: (continued) Solubility system NaClQ ₄ -KClQ ₄ -H ₂ O at 0°C: Liquid Phase composition mass X mol X ^a Holality ^a /mol kg ⁻¹ phase Ponit (1) (2) (1) (2) (1) (2) 17 58.23 0.42 17.15 0.109 11.50 0.0733 nKClQ ₄ .mNaClQ ₄ 18 60.15 0.28 18.26 0.0751 12.42 0.0511 " 19 61.46 0.16 19.06 0.0438 13.08 0.0301 " 20 62.89 - 19.96 - 13.84 - NaClQ ₄ .H ₂ O ^a Compiler's calculations. ^b (evaluator's remark) the solid phase is not NaClQ ₄ Solubility system NaClQ ₄ -KClQ ₄ -H ₂ O at 25°C: Liquid Phase composition Solid mass X mol X ^a Holality ^a /mol kg ⁻¹ phase Point (1) (2) (1) (2) (1) (2) ^c 2.38 2.18 0.364 0.295 0.204 0.165 " 3 4.11 2.21 0.639 0.304 0.358 0.170 " 4 6.52 2.03 1.035 0.280 0.304 0.358 0.170 " 4 6.52 2.03 1.035 0.280 0.522 0.160 " 5 10.00 1.36 1.630 0.196 0.921 0.111 " 7 16.74 1.60 2.921 0.271 0.77 0.144 " 9 26.06 1.62 5.021 0.276 2.943 0.162 " 1 4 0.32 0.30 0.304 0.358 0.170 " 4 1.13 0.21 0.21 0.21 0.12 " 7 16.74 1.60 2.921 0.247 1.674 0.141 " 9 26.06 1.62 5.021 0.276 2.943 0.162 " 1 4 0.82 1.30 9.376 0.264 5.760 0.162 " 1 4 0.82 1.30 9.376 0.264 5.970 1.58 " 1 5 66.32 0.47 22.68 0.142 16.31 0.102 NaClO ₄ .H ₂ O 1 6 07.82 - 23.67 - 17.21 - "						Karnaukhov, A.S.; Makin, A.V.			
(3) Water; H ₂ O: $(7732-18-5)$ Transl.) <u>1357</u> , 2, 311-6. XPERIMENTAL VALUES: (continued) Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 0°C: Liquid Phase composition Solid mass X mol X ^a Holality ^a /mol kg ⁻¹ phase Ponit (1) (2) (1) (2) (1) (2) 17 58.23 0.42 17.15 0.109 11.50 0.0733 nKClO ₄ .mNaClO ₄ 18 60.15 0.28 18.26 0.0751 12.42 0.0511 " 19 61.46 0.16 19.06 0.0438 13.08 0.0301 " 20 62.89 - 19.96 - 13.84 - NaClO ₄ -H ₂ O ^a Compiler's calculations. b (evaluator's remark) the solid phase is not NaClO ₄ Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 25°C: Liquid Phase composition Solid mass X mol X ^a Holality ^a /mol kg ⁻¹ phase Point (1) (2) (1) (2) (1) (2) 1 - 2.30 - 0.305 - 0.170 KClO ₄ 2 2.38 2.18 0.364 0.295 0.204 0.165 " 3 4.11 2.21 0.639 0.304 0.388 0.170 " 5 10.00 1.36 1.630 0.195 0.5921 0.111 " 7 16.74 1.60 2.921 0.247 1.674 0.141 " 9 26.06 1.62 5.021 0.276 2.943 0.162 " 1 4 0.52 2.03 1.035 0.264 0.588 0.170 " 5 10.00 1.36 1.630 0.195 0.5921 0.111 " 7 16.74 1.50 2.921 0.247 1.674 0.141 " 9 26.06 1.62 5.021 0.276 2.943 0.162 " 11 40.82 1.30 9.376 0.264 5.760 0.162 " 11 40.82 1.30 9.376 0.264 5.760 0.162 " 13 58.37 1.33 17.51 0.352 11.83 0.238 " 14 63.26 1.34 2.0.74 0.388 14.59 0.273 " 15 66.32 0.47 22.68 0.142 16.31 0.102 NaClO ₄ .H ₂ O	(2) Pot	assium p	erchlora	te; KClO ₄		Zh. Neorg	. Khim. <u>1</u> 9	9 <u>57</u> , 2, 910-4.	
XPERIMENTAL VALUES: (continued) Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 0°C: Liquid Phase composition Solid mass X mol X ^A Holality ^A /mol kg ⁻¹ phase Ponit (1) (2) (1) (2) (1) (2) 17 58.23 0.42 17.15 0.109 11.50 0.0733 nKClO ₄ .mNaClO ₄ 18 60.15 0.28 18.26 0.0751 12.42 0.0511 " 19 61.46 0.16 19.06 0.0438 13.08 0.0301 " 20 62.89 - 19.96 - 13.84 - NaClO ₄ .H ₂ O ^A Compiler's calculations. b (evaluator's remark) the solid phase is not NaClO ₄ Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 25°C: Liquid Phase composition Solid mass X mol X ^A Holality ^A /mol kg ⁻¹ phase Point (1) (2) (1) (2) (1) (2) 1 - 2.30 - 0.305 - 0.170 KClO ₄ 2 2.38 2.18 0.364 0.295 0.204 0.165 " 3 4.11 2.21 0.639 0.304 0.355 0.160 " 4 6.52 2.03 1.035 0.285 0.150 " 4 6.52 2.03 1.035 0.285 0.150 " 5 10.00 1.36 1.630 0.196 0.921 0.111 " 6 11.95 1.34 1.984 0.197 1.126 0.112 " 7 16.74 1.60 2.921 0.251 1.877 0.144 " 9 25.06 1.62 5.021 0.276 2.943 0.162 " 1 4 0.325 0.264 5.399 7.0188 " 11 40.82 1.30 9.376 0.264 5.399 7.0188 " 11 40.82 1.30 9.376 0.264 5.760 0.162 " 13 58.37 1.33 17.51 0.325 1.887 0.164 " 13 58.37 1.33 17.51 0.325 1.83 0.233 " 15 66.32 0.47 22.68 0.142 16.31 0.102 NaClO ₄ .H ₂ O	•	-		•					
Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 0°C: Liquid Phase composition Solid mass X mol X ^A Molality ^A /mol kg ⁻¹ phase Ponit (1) (2) (1) (2) (1) (2) 17 58.23 0.42 17.15 0.109 11.50 0.0733 nKClO ₄ .mNaClO ₄ 18 60.15 0.28 18.26 0.0751 12.42 0.0511 " 19 61.46 0.16 19.06 0.0438 13.08 0.0301 " 20 62.89 - 19.96 - 13.84 - NaClO ₄ -H ₂ O ^a Compiler's calculations. b (evaluator's remark) the solid phase is not NaClO ₄ Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 25°C: Liquid Phase composition Solid mass X mol X ^a Molality ^A /mol kg ⁻¹ phase Point (1) (2) (1) (2) (1) (2) 1 - 2.30 - 0.305 - 0.170 KClO ₄ 2 2.38 2.18 0.364 0.225 0.204 0.165 " 3 4.11 2.21 0.639 0.304 0.358 0.170 " 4 6.52 2.03 1.035 0.285 0.921 0.111 " 5 10.00 1.36 1.630 0.196 0.921 0.111 " 6 11.65 1.34 1.984 0.197 1.126 0.112 " 7 16.74 1.60 2.921 0.217 1.674 0.144 " 8 18.39 1.60 3.263 0.265 3.997 0.158 " 10 40.82 1.30 9.76 0.264 5.760 0.162 " 11 40.82 1.30 9.76 0.264 5.760 0.162 " 12 49.94 1.26 13.05 0.291 8.358 0.186 " 13 65.37 1.33 17.51 0.352 11.83 0.238 " 14 63.25 1.34 20.74 0.388 14.59 0.273 " 15 66.32 0.47 22.68 0.142 16.31 0.102 NaClO ₄ .H ₂ O	(3) Wate	er; H ₂ O;	[7732-1	8-5)		Transl.) <u>1957</u> , 2	, 311-6.	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	EXPERIME	NTAL VAL	UES: (co	ntinued)	l			••••	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Solubil	ity syst	em NaClO	4-KC104-H	1 ₂ 0 at 0°0	:			
Ponit (1) (2) (1) (2) (1) (2) (1) (2) 17 58.23 0.42 17.15 0.109 11.50 0.0733 nKClo ₄ .mNaClo ₄ 18 60.15 0.28 18.26 0.0751 12.42 0.0511 " 19 61.46 0.16 19.06 0.0438 13.08 0.0301 " 20 62.89 - 19.96 - 13.84 - NaClo ₄ .H ₂ O ^a Compiler's calculations. b (evaluator's remark) the solid phase is not NaClo ₄ Solubility system NaClo ₄ -KClo ₄ -H ₂ O at 25°C: Liquid Phase composition Solid mass X mol X ^a Molality ^a /mol kg ⁻¹ phase Point (1) (2) (1) (2) (1) (2) 1 - 2.30 - 0.305 - 0.170 KClo ₄ 2 2.38 2.18 0.364 0.295 0.204 0.165 " 3 4.11 2.21 0.639 0.304 0.358 0.170 " 4 6.52 2.03 1.035 0.285 0.582 0.160 " 5 10.00 1.36 1.630 0.196 0.921 0.111 " 6 11.95 1.34 1.984 0.197 1.126 0.112 " 7 16.74 1.60 2.921 0.247 1.674 0.144 " 9 26.06 1.62 5.021 0.276 2.943 0.162 " 1 4 0.82 1.30 9.376 0.264 5.760 0.162 " 1 4 0.82 1.30 9.376 0.264 5.760 0.162 " 1 4 0.82 1.30 9.376 0.264 5.760 0.162 " 1 4 0.82 1.30 9.376 0.265 3.997 0.158 " 1 4 0.82 1.30 9.376 0.264 5.760 0.162 " 1 4 0.62 1.00 9.376 0.265 3.997 0.158 " 1 4 0.82 1.30 9.376 0.264 5.760 0.162 " 1 4 0.62 1.30 9.376 0.264 5.760 0.162 " 1 4 0.62 1.30 9.376 0.264 5.760 0.162 " 1 4 0.62 1.30 9.376 0.265 3.997 0.158 " 1 4 0.32.6 1.34 20.74 0.388 14.55 0.273 " 1 5 66.32 0.47 22.68 0.142 16.31 0.102 NaClo ₄ .H ₂ O 1 6 67.82 - 23.67 - 17.21 - "			Liqu	id Phase	composit	ion		Solid	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		mas	s X	mol	ת	Molali	ty ^a /mol k	g ⁻¹ phase	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$									
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	17	58.23	0.42	17.15	0.109	11.50	0.0733	nKClO ₄ .mNaClO ₄	
^a Compiler's calculations. ^b (evaluator's remark) the solid phase is not NaClO ₄ Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 25°C: Liquid Phase composition Solid mass X mol X ^a Holality ^a /mol kg ⁻¹ phase Point (1) (2) (1) (2) (1) (2) 1 - 2.30 - 0.305 - 0.170 KClO ₄ 2 2.38 2.18 0.364 0.295 0.204 0.165 " 3 4.11 2.21 0.639 0.304 0.358 0.170 " 4 6.52 2.03 1.035 0.285 0.582 0.160 " 5 10.00 1.36 1.630 0.196 0.921 0.111 " 6 11.95 1.34 1.984 0.197 1.126 0.112 " 7 16.74 1.60 2.921 0.247 1.674 0.141 " 8 18.33 4.5 6.699 0.265 3.997 0.158 " 10 32.38 1.45 6.699 0.265 3.997 0.158 " 11 4.062 1.30 9.376 0.264 5.760 0.162 " 12 49.94 1.26 13.05 0.291 8.358 0.186 " 13 58.37 1.33 17.51 0.352 11.83 0.238 " 14 63.26 1.34 20.74 0.388 14.59 0.273 "								**	
b (evaluator's remark) the solid phase is not NaClO ₄ Solubility system NaClO ₄ -KClO ₄ -H ₂ O at 25°C: Liquid Phase composition Solid mass X mol X ^a Molality ^a /mol kg ⁻¹ phase Point (1) (2) (1) (2) (1) (2) 1 - 2.30 - 0.305 - 0.170 KClO ₄ 2 2.38 2.18 0.364 0.295 0.204 0.165 " 3 4.11 2.21 0.639 0.304 0.358 0.170 " 4 6.52 2.03 1.035 0.285 0.582 0.160 " 5 10.00 1.36 1.630 0.196 0.921 0.111 " 6 11.95 1.34 1.984 0.197 1.126 0.112 " 7 16.74 0.3263 0.251 1.877 0.144 " 8 18.39 1.60 3.263 0.251 1.877 0.144 " 9 26.06 1.62 5.021 0.276 2.943 0.162 " 11 40.82 1.30 9.376 0.264 5.760 0.162 " 11 40.82 1.30 9.376 0.264 5.760 0.162 " 12 49.94 1.26 13.05 0.291 8.358 0.186 " 13 58.37 1.33 17.51 0.352 11.83 0.238 " 14 63.26 1.34 20.74 0.388 14.59 0.273 "	20	62.89	-	19.96	-	13.84	-	"NaClO4-H2O	
Point(1)(2)(1)(2)(1)(2)1-2.30-0.3050.170 $KClo_4$ 22.382.180.3640.2950.2040.165"34.112.210.6390.3040.3580.170"46.522.031.0350.2850.5820.160"510.001.361.6300.1960.9210.111"611.951.341.9840.1971.1260.112"716.741.602.9210.2471.6740.141"818.391.603.2630.2511.8770.144"926.061.625.0210.2762.9430.162"1032.381.456.6990.2653.9970.158"1140.821.309.3760.2645.7600.162"1249.941.2613.050.2918.3580.186"1358.371.3317.510.35211.830.238"1463.261.3420.740.38814.590.273"1566.320.4722.680.14216.310.102NaClo ₄ .H ₂ O1667.82-23.67-17.21-"							•		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Defet							; phase	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		• - •						KC10.	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	-					0 204		· 4	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3	4.11	2.21	0.639	0.304	0.358	0.170	••	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$									
7 16.74 1.60 2.921 0.247 1.674 0.141 8 18.39 1.60 3.263 0.251 1.877 0.144 " 9 26.06 1.62 5.021 0.276 2.943 0.162 " 10 32.38 1.45 6.699 0.265 3.997 0.158 " 11 40.82 1.30 9.376 0.264 5.760 0.162 " 12 49.94 1.26 13.05 0.291 8.358 0.186 " 13 58.37 1.33 17.51 0.352 11.83 0.238 " 14 63.26 1.34 20.74 0.388 14.59 0.273 " 15 66.32 0.47 22.68 0.142 16.31 0.102 NaCl04.H ₂ O 16 67.82 - 23.67 - 17.21 - "	6	11.95	1.34	1.984	0.197	1.126	0.112		
9 26.06 1.62 5.021 0.276 2.943 0.162 " 10 32.38 1.45 6.699 0.265 3.997 0.158 " 11 40.82 1.30 9.376 0.264 5.760 0.162 " 12 49.94 1.26 13.05 0.291 8.358 0.186 " 13 58.37 1.33 17.51 0.352 11.83 0.238 " 14 63.26 1.34 20.74 0.388 14.59 0.273 " 15 66.32 0.47 22.68 0.142 16.31 0.102 NaClO ₄ .H ₂ O 16 67.82 - 23.67 - 17.21 - "									
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	9	26.06	1.62	5.021	0.276	2.943	0.162		
12 49.94 1.26 13.05 0.291 8.358 0.186 " 13 58.37 1.33 17.51 0.352 11.83 0.238 " 14 63.26 1.34 20.74 0.388 14.59 0.273 " 15 66.32 0.47 22.68 0.142 16.31 0.102 NaClO ₄ .H ₂ O 16 67.82 - 23.67 - 17.21 - "									
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	12	49.94	1.26				0.186		
16 67.82 - 23.67 - 17.21 - "									
	15	66.32	0.47	22.68	0.142	16.31	0.102	NaC104.H20	
^a Compiler's calculations.	16	67.82	-	23.67	-	17.21	-	••	
	a	Compile	r's calc	ulations.					

COMPONENTS :			ORIGINAL	ORIGINAL MEASUREMENTS;				
(1) Sodium		orate: Nad	clo4:		a.Lepeshkov, I.N.; Druzhinina, G.V.;			
[7601-89-0]					Troitskii, E.N.			
(2) Potassium perchlorate; KClO ₄ ;					sl. kn. I	zđ. <u>1966</u> , 37-45		
[7778-			4,	b.Druzi	ninina, G	.v.		
(3) Water;	-	7732-18-5]			osl. Gos. Ped. Inst.		
	<u> </u>		-	1966	, 59, 73-8	2		
VARIABLES:				PREPARE	D BY:			
Temperatur Compositio		.2 and 32	3.2 K	E.S. G	ryzlova			
EXPERIMENTA	L VALUE	S:						
Solubility	system	NaClO4-K	C104-H20 at	298.2 K:				
	Lio	uid phase	compositio	n		Solid phase		
maa	s X			molality	^a /mol kg ⁻			
(1)		(1)		(1)				
-	2.00		0.26	-	0.147	KC104		
3.00	1.28	0.46	0.17	0.256	0.097			
	0.64		0.09		0.050	88		
	0.46 0.39		0.07 0.06	$1.106 \\ 1.726$		**		
	0.37		0.06	2.363	0.035	**		
26.20	0.36	4.98	0.06	2.914	0.035			
	0.35	6.70	0.06	3.989		29 82		
	0.32 0.33		0.06 0.07	5.129 7.000		89		
	0.29		0.07	9.042	0.044	**		
58.51	0.26	17.26	0.07	11.590	0.046	P9 43		
63.50	0.22	20.47	0.06	14.295	0.044	••		
	0.21		0.06	17.175		$KClO_4 + NaClO_4.H_2$		
	0.20 0.22		0.06 0.07	17.162 17.188				
	0.21		0.06	17.175		**		
	0.20	23.59	0.06	17.154	0.045	**		
67.80	-	23.65	-	17.197		NaClO4.H20		
a Compile	r's cal	culation.						
			UXILIARY I	NFORMATION	٩			
ETHOD/APPA	RATUS/P	ROCEDURE :		SOURCE	AND PURI	TY OF MATERIALS:		
Isothermal	•					purified by double		
brium of			-		stallizat			
in 4 or 5				1 -				
days for 3					TED ERROR			
•								
mined grav acetate;				1	rature: <u>+</u>	, V+1 R		
	=		-	-	1050.			
with sodiu	m tetra]	hueuàTacer		REFEREN None.	IVED ;			
				I none.				
						(continued next page		

COMPONENTS:	ORIGINAL MEASUREMENTS;
 Sodium perchlorate; NaClO₄; 	a.Lepeshkov, I.N.; Druzhinina, G.V.;
[7601-89-0]	Troitskii, B.N.
(2) Potassium perchlorate; KClO ₄ ;	Yarosl. kn. Izd. <u>1966</u> , 37-45
[7778-74-7]	b.Druzhinina, G.V.
(3) Water; H ₂ O; [7732-18-5]	Uch. Zap. Yarosl. Gos. Ped. Inst.
	<u>1966, 59, 73-82</u>

EXPERIMENTAL VALUES: (continued)

Solubility system KClO₄-NaClO₄-H₂O at 323.2 K:

	Liqui	d phase d	composit	ion		Solid phase
mass	x	mol	LX	molality,	/mol kg ⁻¹	
(1)	(2)	(1)	(2)	(1)	(2)	
-	4.93	-	0.67	-	0.374	.kclo4
3.11	3.60	0.49	0.50	0.272	0.279	
7.47	2.38	1.20	0.34	0.677	0.191	11
12.31	2.02	2.06	0.30	1.174	0.170	11
17.23	1.79	3.03	0.28	1.738	0.160	**
26.20	1.18	5.03	0.20	2.947	0.117	••
30.73	0.99	6.20	0.18	3.676	0.105	**
36.50	0.87		0.17	4.760	0.100	
40.53	0.65	9.19	0.13	5.628	0.080	н
45.28	0.62	10.95	0.13	6.836	0.083	**
	0.64	13.61	0.15	8.764	0.096	**
51.43						42
56.91	0.61		0.16	10.942	0.104	••
60.61	0.62	18.67	0.17	12.768	0.115	••
67.00	0.60		0.18	16.889	0.134	**
71.05	0.62	26.90	0.21	20.483	0.158	•
72.52	0.61	28.36	0.21	22.043	0.164	$KC10_4 + NaC10_4.H_20$
72.65	0.59	28.49	0.20	22.173	0.159	
72.70	0.60	28.54	0.21	22.238	0.162	**
72.54	0.61	28.38	0.21	22.065	0.164	*1
72.81	0.60	28.66	0.21	22.364	0.163	н
73.20		28.67	-	22.308	-	NaClO4.H20

^a Compiler's calculation.

```
COMPONENTS:

(1) Sodium perchlorate; NaClO<sub>4</sub>;

[7601-89-0]

(2) Cesium perchlorate; CsClO<sub>4</sub>;

[13454-84-7]

(3) Water; H<sub>2</sub>O; [7732-18-5]

(3) Water; H<sub>2</sub>O; [7732-18-5]

(3) Water; H<sub>2</sub>O; [7732-18-5]

(4) ORIGINAL MEASUREMENTS:

Shklovskaya, R.M.; Arkhipov, S.M.;

Kuzina, V.A.; Kirgintsev, A.N.

(2) Cesium perchlorate; CsClO<sub>4</sub>;

[13454-84-7]

(3) Water; H<sub>2</sub>O; [7732-18-5]

(4) Provide the state of the
```

EXPERIMENTAL VALUES: (continued)

Solubility system $NaClO_4-CsClO_4-H_2O$ at 348.2 K:

lid phase		i	omposition	id phase co	Liqu	
		molality ^a /m	([#]	mol 5	is X	mas
	(2)	(1)	(2)	(1)	(2)	(1)
A	0.5684	-	1.0137	-	11.667	-
**	0.2585	1.0646	0.4549	1.8733	5.046	10.950
••	0.2331	2.9819	0,3969	5.0779	3.816	25.725
**	0.2615	5.4464	0.4272	8.8970	3.517	38.600
н	0.3262	9.3286	0.5006	14.3158	3.417	51.497
	0.3575	11.033	0.5344	16.4923	3.413	55.502
A + C	0.3656	11.267	0.5445	16.781	3.447	55.976
ç	0.3622	11.478	0.5379	17.042	3.381	56.450
17	0.3207	12.061	0.4724	17.766	2.921	57.883
19	0.2957	13.025	0.4297	18.923	2.580	59.875
++	0.1736	17.285	0.2380	23.689	1.278	67.044
**	0.1385	24.093	0.1737	30.215	0.808	74.080
C + E	0.0926	23.963	0.1164	30.118	0.544	74.175
Е	-	24.341	-	30.483	-	74.876

```
a Compiler's calculation.
```

```
<sup>b</sup> A = CsClO_4; B = 3CsClO_4 \cdot NaClO_4; C = CsClO_4 \cdot NaClO_4
D = NaClO_4 \cdot H_2O; E = NaClO_4
```

AUXILIARY INFORMATION

```
METHOD/APPARATUS/PROCEDURE: (continued)
ed gravimetrically with nitron (ref. 1); Cs^+ by precipitation as the
tetraphenylborate (ref. 2). The solid phases were identified by the
method of residues and by x-ray diffraction.
```

ESTIMATED ERROR:	REFERENCES:				
Temperature: <u>+</u> 0.1 ^Q C.	 Loebich, O. Z. Analyt. Chem. <u>1926</u>, 68, 34. Yanson, E.Yu.; Levin'sh, A.F. Uspekhi. Khim. <u>1953</u>, 28, 980. 				

						1
COMPONENTS:				ORIGINAL MEA	SUREMENTS	5:
		te; NaClO ₄	;	Shklovskaya, R.M.; Arkhipov, S.M.;		
[7601-	-			Kuzina, V	/.A.; Kirg	intsev, A.N.
		te; CsClO ₄	;			
[13454-	•					274, 19, 846-9;
(3) Water;	H ₂ O; [773	2-18-5]				Chem. (Engl.
				Transl.)	<u>1974</u> , I	9, 462-3.
VARIABLES:				PREPARED BY	:	
Temperatur	e: 298.2 K	and 348.2	к.	W.L. Ng		
Compositio	n.					
EXPERIMENTA	L VALUES:					
		.clo ₄ -csclo,	4 ^{-H} 2 ^O at	298.2 K:		
	Liqu	id phase co	ompositi	on		Solid phase ^b
ma	 88 %			molality ^a /	mol kg ⁻¹	•••••••
(1)	(2)		(2)	(1)	(2)	
-	1.96	-	0.1548	•	0.086	A
6.262 13.230	0.598 0.440	0.9791 2.2043	0.0493 0.0386		0.0276	67 11
20.042	0.379	3.5719	0.0356	2.057	0.0205	"
32.377 37.010	0.468 0.502	6.6205	0.0504 0.0573		0.0300 0.0346	**
39.359	0.528	8.7817			0.0348	**
43.492	0.562	10.257	0.0698	6.349	0.0432	
43.540 43.588	0.563 0.565	10.275 10.294	0.0700 0.0703		0.0433 0.0435	A + B B
44.504	0.565		0.0712		0.0443	n
44.957	0.565	10.820	0.0717		0.0446	
46.587 47.114	0.556 0.556	$11.471 \\ 11.689$	0.0721 0.0727		0.0453 0.0457	*1
47.138	0.552	11,698	0.0722		0.0454	B + C
47.162	0.548	11.707	0.0717		0.0451	C,
48.919 54.996	0.488 0.385	12.447 15.343	0.0654		0.0415 0.0371	**
57.436	0.383	16.681	0.0586	11.121	0.0391	**
58.746 60.413	0.292 0.237	17.417 18.420	0.0456		0.0307	10
62.117	0.201	19.514	0.0381 0.0333		0.0259 0.0230	••
67.246	0.168	23.284	0.0307		0.0222	14
68.388 68.464	0.128 0.129	24.214 24.279	0.0239	17.741 17.804	$0.0175 \\ 0.0177$	C + D C + D
68.516	-	24.254	-	17.774	-	D
a Compile	r's calcul	ation.			<u></u>	······
L			NaClOs :	$C = CsClO_4$.NaClO.	
	•	E = NaCl(•			
	<u></u>	AUXI	LIARY IN	FORMATION		
IETHOD/APPA	•	EDURE: thod used,	_	OURCE AND PU "Chemically		ATERIALS: Ide salts were
		librated :	1			from doubly-
	-	r 30 days.		recrystalliz distilled wa		row doubly,"
				arstiten M9		
-		he solid	1			
ridnia bus	ses, ulu4	was determ:	-n-		1	
			1		(contir	nued next page)
			1			

OMPONENTS: (1) Sodium p [7601-89		ate; NaCl		ORIGINAL MEASUREMENTS: Kudryakova, S.A.; Karnaukhov, A.S.			
(2) Ammonium [7790-98	perchl	orate; NH,	1C104;		p. Yarosl. 79, 36-42.	Gos. Ped. Inst.	
(3) Water; H	2 ⁰ ; {77	32-18-5}					
ARIABLES:				PREPARED	BY:		
Temperature: Composition	298.2,	308.2, 30	53.2 K.	N.A. Ko	zyreva		
XPERIMENTAL	VALUES:						
Solubility s	ystem Na	aC104-NH40	C104-H20	at 298.2 K	:-		
	Liqu	id phase (compositi	on		Solid phase ^b	
mass	x	mol	Xª	molality ^a	/mol kg ⁻¹		
(1)	(2)	(1)	(2)	(1)	(2)		
	18.60	-	3.39	-	1.945	A	
4.77 8.20			3.04 2.99	0.493 0.879		**	
13.37	13.58	2.55	2.70	1.495	1.582		
19.07		3.76	2.22	2.221	1.314	**	
23.90	9.47	4.91 5.97	2.03 1.71	2.930 3.593	1.210 1.031		
28.18 35.71	6.36	8.19		5.035	0.934	**	
39.47 45.06	5.62	9.43	1.40	5.871	0.871	**	
45.06	4.87	11.54		7.350	0.828	**	
49.59 52.62	4.40	13.52 14.92	1.25	8.803 9.866	0.814 0.746	n	
	2.75	20.29	0.94	14.295	0.662	49	
61.92	2.70	20.29	0.92	14.294	0.650	A + B	
63.33 64.73		21.28 22.15		15.177 15.943	0.647 0.542	B "	
	•	00.07	0 00	17 050			
	1.63 1.49	23.37 23.55	0.60 0.55	17.058 17.221	0.436 0.400	B + C "	
66.58	1.70	23.45	0.62	17.143	0.456	С	
	0.68			17.142		и	
67.64	-	23.52	•	17.071		••	
^a Compiler':	1						
			(10) = (1)			010 11 0	
n - m40.	•	$B = n(NH_4)$ $E = n(NH_4)$	-	• •); C = Na	сто ₄ .н ₂ о ;	
		AUX	ILIARY I	NFORMATION	,		
ETHOD/APPARA		FDURE .		SOURCE		OF MATERIALS:	
Isothermal			Equili			irified by two	
				4	-	-	
brium in th						ns and then ground	
solid solut				1	e powder.		
days. Sodiu	m ion wa	us determi	ned gra	-			
vimetrically	as so	odium zir	ic urany	1			
acetate; amm	onium ic	on by the	volumet	-			

```
COMPONENTS:
                                             ORIGINAL MEASUREMENTS:

    Sodium perchlorate; NaClO<sub>4</sub>;

                                              Kudryakova, S.A.; Karnaukhov, A.S.
     [7601-89-0]
 (2) Ammonium perchlorate; NH<sub>4</sub>ClO<sub>4</sub>;
                                              Uch. Zap. Yarosl. Gos. Ped. Inst.
                                                1970, 79, 36-42.
     [7790-98-9]
 (3) Water; H_2O; [7732-18-5]
EXPERIMENTAL VALUES: (continued)
  Solubility system NaClO<sub>4</sub>-NH<sub>4</sub>ClO<sub>4</sub>-H<sub>2</sub>O at 308.2 K:
                                                                   Solid phaseb
                  Liquid phase composition
                                           molality<sup>a</sup>/mol kg<sup>-1</sup>
                             mol %<sup>a</sup>
          mass %
                                              (1)
       (1)
               (2)
                           (1)
                                  (2)
                                                        (2)
       • _
              22.43
                                   4.25
                                                        2.461
                                                                          Å
       3.16 21.67
                           0.59
                                              0.343
                                   4.21
                                                        2.454
                                                                          ...
                                              0.667
                                                        2.320
       6.03
              20.13
                          1.14
                                   3.97
                                                                          ...
       8.34
              18.50
                           1.59
                                   3.67
                                              0.931
                                                        2.152
                                                                          ••
      15.88
              15.63
                           3.19
                                   3.27
                                              1.894
                                                        1.942
                                                                          ..
                                                        1.725
      20.90
              13.33
                           4.34
                                  2.88
                                              2.595
                                                                          =
                                                        1.600
      23.64
              12.08
                           5.00
                                  2.66
                                              3.004
                                              3.405
                                                                          ...
      26.05
                           5.63
                                  2.58
                                                        1.561
              11.46
                                                                          ..
      28.46
              10.78
                           6.29
                                   2.48
                                              3.826
                                                        1.510
                                                                          ...
      34.11
               8.41
                           7.87
                                  2.02
                                              4.847
                                                        1.245
                                                                          ..
               7.88
                          8.53
                                  1.93
                                              5.287
      36.20
                                                        1.199
                                                                          **
       43.57
               5.89
                         11.08
                                  1.56
                                              7.041
                                                        0.992
                                                                          ..
      50.05
               5.36
                         13.95
                                  1.56
                                              9.167
                                                        1.023
                                                                          **
      56.18
               4.71
                         17.19
                                  1.50
                                             11.732
                                                        1.025
               4.38
                         19.99
                                                        1.065
      60.60
                                  1.51
                                             14.133
      60.75
               4.50
                         20.14
                                 1.55
                                            14.278
                                                        1.102
                                                                        A + B
      64.45
               3.12
                         22.37
                                             16.231
                                                        0.819
                                  1.13
                                                                          в
      66.74
               2.23
                         23.84
                                  0.83
                                            17.566
                                                        0.612
      67.64
               2.33
                         24.67
                                  0.89
                                             18.396
                                                        0.660
                                                                        B + C
                                                                          C
"
      67.58
               2.27
                         24.59
                                  0.86
                                             18.307
                                                        0.641
      67.68
               2.35
                         24.72
                                  0.89
                                             18.444
                                                        0.667
                                                                          ...
                         25.29
                                             18.871
                                                        0.242
      69.20
               0.85
                                  0.32
                                                                          **
      69.80
                -
                         25.38
                                   -
                                             18.877
                                                         -
  <sup>a</sup> Compiler's calculation.
  ь
    A = NH_4 ClO_4 ;
                     B = n(NH_4ClO_4).m(NaClO_4.H_2O) ; C = NaClO_4.H_2O ;
     D = NaClO_4; E = n(NH_4ClO_4).m(NaClO_4)
                              AUXILIARY INFORMATION
METHOD: (continued)
                                               ESTIMATED ERROR:
 ric Formalin method; perchlorate ion
                                                Temperature: ± 0.1 K
 by difference and occasionally
                                         by
 nitron precipitation. Solid solutions
 were studied by the differential ther-
                                               REFERENCES:
 mal, microphotographic and X-ray pow-
 der analytical methods.
                                                               (continued next page)
```

```
COMPONENTS:

(1) Sodium perchlorate; NaClO<sub>4</sub>;

[7601-89-0]

(2) Ammonium perchlorate; NH<sub>4</sub>ClO<sub>4</sub>;

[7790-98-9]

(3) Water; H<sub>2</sub>O; [7732-18-5]

(CRIGINAL MEASUREMENTS:

Kudryakova, S.A.; Karnaukhov, A.S.

Uch. Zap. Yarosl. Gos. Ped. Inst.

<u>1970</u>, 79, 36-42.
```

EXPERIMENTAL VALUES: (continued)

Solubility system $NaClO_4 - NH_4ClO_4 - H_2O$ at 363.2 K:

	Liquid	phase	compositio	on		Solid phase ^b
mass	x	mol	xª	molality ^a	/mol kg ⁻¹	
(1)	(2)	(1)	(2)	(1)	(2)	
- 4	3.37	-	10.51	-	6.518	A.
4.18 4	0.45	0.99	9.97	0.617	6.218	
9.82 3	5.37	2.34	8.79	1.463	5.493	**
14.14 3	2.86		8.38		5.277	**
20.69 2	7.65	5.16	7.19	3.271	4.556	**
25.40 2	4.80	6.52	6.63	4,166	4.239	••
30.75 2	1.80	8.18	6.04	5.293	3.910	**
37.50 1	8.40	10.52	5.38	6.945	3.551	**
40.85 1	6.93	11.83	5.11	7.902	3.413	**
			4.56			**
			4.14			**
51.38 1	1.20	16.19	3.68	11.214		**
58.76	9.20	20.54	3.35	14.978		**
			2.56			"
68.28	6.43	27.66	2.71	22.051	2.164	A + E
70.85	5.27	29.69	2.30	24.232	1.878	E
71.94	4.56	30.43	2.01	25.002	1.652	"
73.67	3.67	31.82	1.65	26.553	1.379	E + D
73.78	3.56	31.87	1.60	26.592	1.337	**
73.58	3.65	31.70	1.64	26.392	1.364	D
			1.07			
		31.49			0.306	**
	-	31.61		25.652	-	"

```
<sup>a</sup> Compiler's calculation.
```

^b $A = NH_4ClO_4$; $B = n(NH_4ClO_4).m(NaClO_4.H_2O)$; $C = NaClO_4.H_2O$;

 $D = NaClO_4 ; E = n(NH_4ClO_4).m(NaClO_4)$

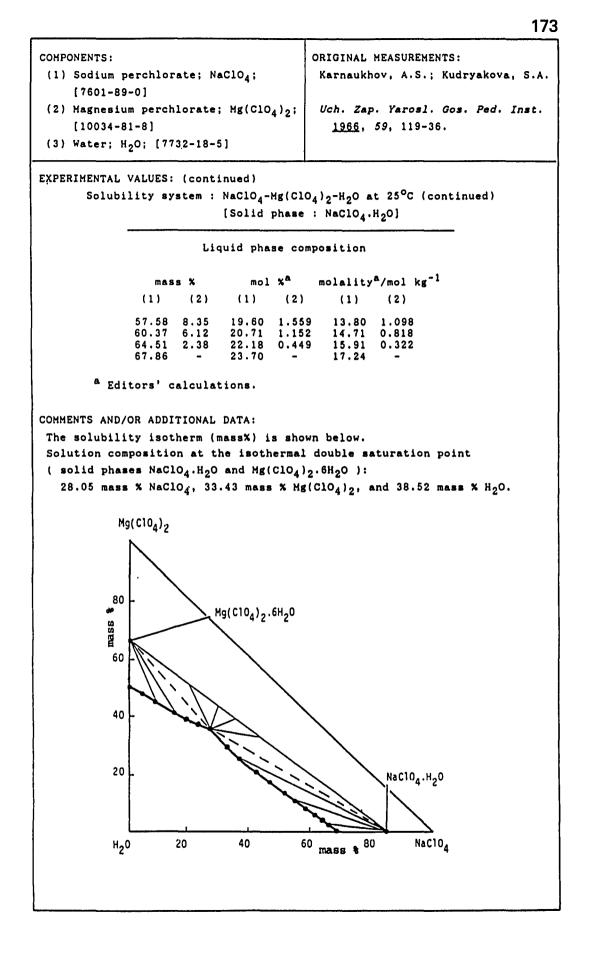
•

COMPONENTS:				ORIGINAL MEASUREMENTS:				
(1) Sodium [7601-		rate; NaC	104;	Smirnov, V.N.; Ivanov, S.A.; Chechneva, I.V.				
(2) Thalli		lorate; T	LC104;					
[13453			4	Uch.	Zap. Ya	rosl. Gos. Ped. Inst.		
(3) Water;	H ₂ 0; [7	732-18-5]		<u>197</u>	3, 120,	13-5.		
ARIABLES:				PREPARI	ED BY:			
One temper	ature: 2	98 K		N.A. 1	(ozyreva	,		
Compositio	n							
XPERIMENTA	L VALUES	:						
Solubilit	y system	NaClO4-T	LC104-H20 a	t 298 K:	:			
			compositio		A /	Solid phase		
	ss X (2)	mol (1)	X^A	molality (1)		g •		
	(2)		(2) 0.98	-	(2)	TICIO4		
		2.64			0.268	7		
			0.42					
			0.32			**		
66.41	2.38	23.76	0.34	17.379	0.251	$NaClO_4.H_2O + TlClO_4$		
66.35	2.41	23.73	0.35	17.346	0.254	NaClO4.H20		
67.89	-	23.73	-	17.268	-	**		
^a Comp	iler's c	alculation	JXILIARY IN	FORMATIC				
brium was	method attained	was used in 5-7 da	•	Not s	stated.	RITY OF MATERIALS:		
lium ion was determined by bromate method; perchlorate ion gravimetrical- ly by precipitation with nitron and					ESTIMATED ERROR:			
sodium ion	by diff	erence.						
				REFERENCES :				

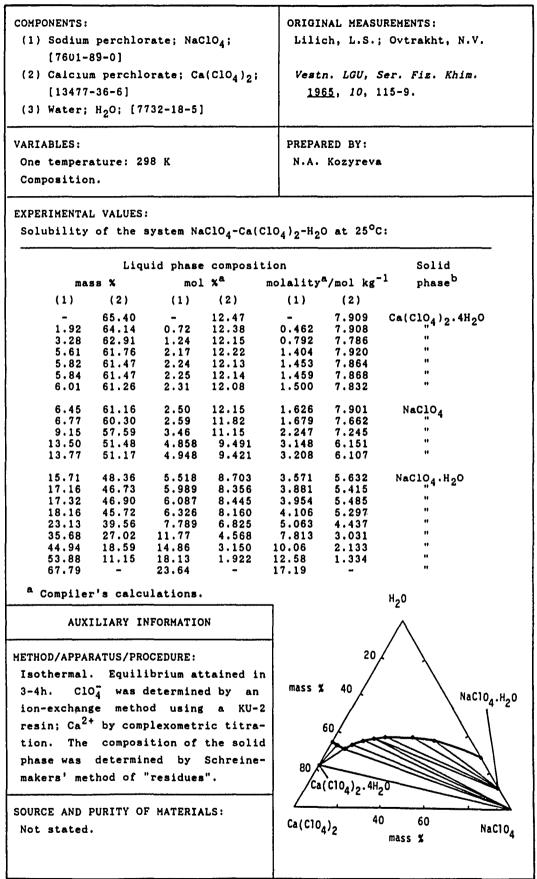
.

ORIGINAL MEASUREMENTS: COMPONENTS: Sodium perchlorate; NaClO₄; Karnaukhov, A.S.; Kudryakova, S.A. [7601-89-0] (2) Magnesium perchlorate; $Mg(ClO_4)_2$; Uch. Zap. Yarosl. Gos. Ped. Inst. [10034-81-8] 1966, 59, 119-36. (3) Water; H₂O; [7732-18-5] VARIABLES: PREPARED BY: E.S. Gryzlova One temperature: 298.2 K Composition **EXPERIMENTAL VALUES:** Solubility system : $NaClO_4 - Mg(ClO_4)_2 - H_2O$ at 25°C Liquid phase composition Solid phase mol %^a molality^a/mol kg⁻¹ mass X (2) (2) (1) (1) (1) (2) 49.80 7.413 4.444 $Mg(C10_4)_2.6H_2O$ ---0.812 2.95 47.88 7.228 0.490 4.363 1.581 9.12 43.76 2.581 6.793 4.161 15.13 40.51 4.465 6.558 2.786 4.091 20.26 37.75 6.208 6.345 3.941 4.028 8.109 5.242 25.57 34.59 6.018 3.890 26.73 33.75 8.517 5.899 5.524 3.826 33.13 3.823 28.05 9.047 5.861 5.901 27.80 33.13 8.924 5.834 5.811 3.799 NaClO₄. H_2O + Mg(ClO₄)₂.6 H_2O 27.85 8.958 5.854 5.837 3.815 33.18 5.958 3.891 5.954 28.08 33.43 9.116 28.00 33.56 9.101 5.984 5.949 3.911 6.000 28.12 33.60 9.168 6.009 3.932 6.058 6.050 33. 33.73 3.969 28.20 9.232 6.087 3.980 28.30 9.283 6.069 NaClO4.H2O 31.48 30.27 10.22 5.390 6.722 3.545 11.64 7.736 35.49 27.04 4.863 3.233 2.776 40.48 22.77 13.37 4.126 8.996 ** 45.59 18.61 15.24 3.413 10.40 2.329 16.97 2.725 ... 50.27 14.72 11.73 1.884 11.01 54.38 18.39 2.043 12.83 1.425 ^a Editors' calculations. AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: The isothermal method was used. The salts were recrystallized Periods of equilibration varied from twice. Purity: 95.58-99.75%. 20 to 70 h. Mg²⁺ was determined by complexometric titration, Na⁺ gravi-ESTIMATED ERROR: metrically as sodium zinc uranyl Temperature: ±0.1°C. acetate, and Clo_4^- gravimetrically by nitron precipitation. **REFERENCES:** None.

(continued next page)



COMPONENTS: (1) Sodium perchlorate; NaClO ₄ ; [7601-89-0] (2) Magnesium perchlorate; Mg(ClO ₄) ₂ ; [10034-81-8] (3) Water; H ₂ O; [7732-18-5]	ORIGINAL MEASUREMENTS: Kudryakova, S.A.; Lepeshkov, I.N. Sb. Tr. Yarosl. Gos. Ped. Inst., 1969, 66, 40-50.
VARIABLES: One temperature: 363 K Composition	PREPARED BY: I.S. Bodnya
EXPERIMENTAL VALUES: Solubility System : NaClO ₄	-Mg(ClO ₄) ₂ -H ₂ O at 90°C
Liquid phase composition mass % mol % ^a molality	phase ^a /mol kg ⁻¹
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	(2) 5.603 $Mg(Clo_4)_2.6H_{2}O$ 5.377 " 5.266 " 5.025 " 4.942 " 4.804 " 4.661 " 4.509 " 4.456 NaClo_4 + Mg(Clo_4)_2.6H_{2}O 4.449 " 4.438 " 4.336 " 4.336 " 4.367 NaClo_4 4.095 " 3.750 " 3.475 " 3.126 " 2.388 " 1.815 " 0.961 " - "
AUXILIARY IN METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The isothermal method was used. Mg^{2+} was determined volumetrically by tit- ration with Trilon B; Na ⁺ gravi- metrically by precipitation with zinc uranyl acetate; and ClO_4^- gravimetri- cally by nitron precipitation. The densities and relative viscosities of the saturated solutions were mea- sured.	Not given.



COMPONENTS: (1) Sodium perchlorate; NaClO ₄ ; [7601-89-0]	ORIGINAL MEASUREMENTS: Ivanov, S.A.
(2) Calcium perchlorate; $Ca(ClO_4)_2$; [13477-36-6] (3) Water; H ₂ O; [7732-18-5]	Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1969</u> , 66, 82-95.
VARIABLES: One temperature: 313 K Composition.	PREPARED BY: N.A. Kozyreva
EXPERIMENTAL VALUES:	I

Solubility of the system $NaClO_4-Ca(ClO_4)_2-H_2O$ at $40^{\circ}C$:

		Liquid ph	ase comp	osition		Solid
mas	8 X	mol	Xª	molality	^a /mol kg ⁻¹	phase
(1)	(2)	(1)	(2)	(1)	(2)	•
2.50	68.40 67.00		14.03			$Ca(Clo_4)_2.4H_2O$
6.00	64.98	2.54	14.08	1.689	9.370	
6.40	65.08	2.74	14.28	1.833	9.548	$Ca(ClO_4)_2.4H_2O$
						+ $NaClO_4$
6.23	65.14	2.66	14.25	1.777	9.516	tt 11
5.90	64.90	2.48	13.99	1.650	9.300	t f #F
6.10	65.30	2.61	14.30	1.742	9.554	11 10
	65.20	2.63	14.26	1.753		NaClO4
	59.80		12.55	2.813		H
	55.90	5.241	11.37	3.489		**
15.20	50.04	5.486	9.253	3.571	6.024	**
20.17	45.70			4.827	5.603	**
23.04	42.20	8.202	7.697	5.413	5.080	11
29.82	35.00	10.40	6.251	6.923	4.163	47
36.05	31.71	13.28	5.986	9.132	4.116	**

^a Compiler's calculations.

AUXILIARY INFORMATION

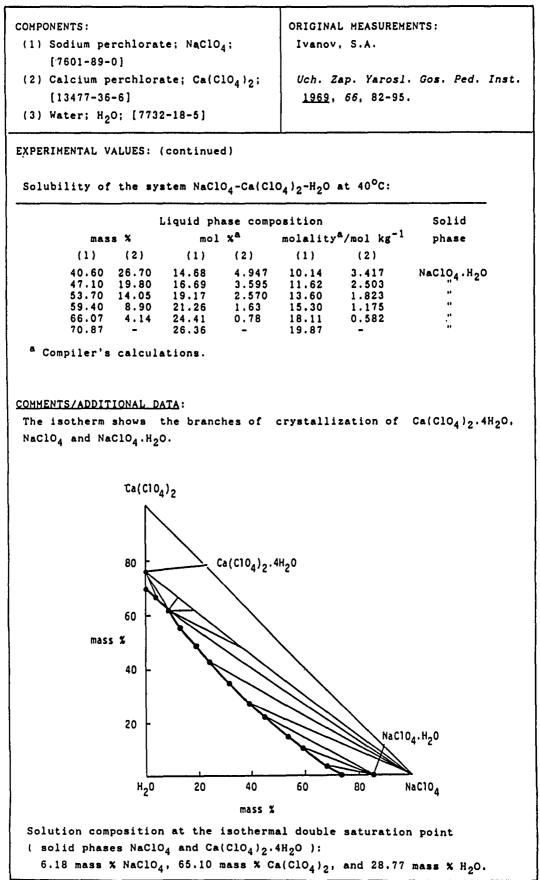
METHOD/APPARATUS/PROCEDURE:

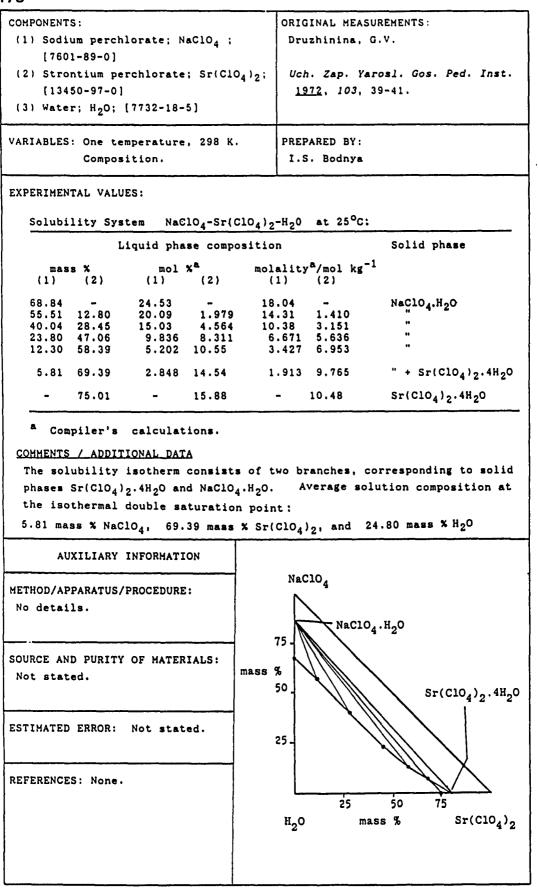
Isothermal method. Periods of equilibrium varied from 3-5 days. The solid phases were studied thermographically. The densities, viscosities and refractive indexes of saturated solutions were measured. SOURCE AND PURITY OF MATERIALS: Not stated.

ESTIMATED ERROR: Not stated.

REFERENCES:

(continued next page)





	17	
COMPONENTS:	ORIGINAL MEASUREMENTS:	
<pre>(1) Sodium perchlorate; NaClO4; [7601-89-0]</pre>	Zaitseva, S.N.; Lepeshkov, I.N.	
<pre>(2) Barium perchlorate; Ba(ClO4)2; [13465-95-7]</pre>	Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1969</u> , 66, 113-21.	
(3) Water; H ₂ O; [7732-18-5]	1909, 00, 113-21.	
VARIABLES:	PREPARED BY:	
Temperature/K: 298 and 323 Composition	N.A. Kozyreva	
EXPERIMENTAL VALUES:		
Solubility system : Ba	(ClO ₄) ₂ -NaClO ₄ -H ₂ O	
Liquid phase compositio	n Solid ph ase^b	
mass % mol % ^a molalit (1) (2) (1) (2) (1)	y ^a /mol kg ⁻¹	
At 25°C		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	5 4.925 A 5 4.419 A	
39.89 33.00 16.89 5.088 12.0 40.67 32.19 17.17 4.949 12.2 40.67 32.73 17.43 5.107 12.4 41.32 32.90 18.08 5.243 13.0	2 3.620 A + B 24 3.527 A + B 19 3.659 A + B 19 3.795 A + B	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	9 3.646 B 4 3.028 B 3 2.407 B 5 1.254 B	
67.48 - 23.39 - 16.9	95 - B	
At 50 [°] C - 72.52 - 12.39 -	7.849 A	
	8 7.551 A	
8,20 65,63 3,905 11,38 2,55	9 7.458 A	
14.69 59.31 6.897 10.14 4.61 21.67 53.17 10.22 9.132 7.03	4 6.784 A	
28.32 48.04 13.72 8.472 9.78	4 6.285 A 4 6.044 A	
^a Editors' calculations ; ^b A = Ba(Clo_4) ₂ .3H ₂ O ; B = NaClO ₄ .H ₂ O.	
AUXILIARY IN	FORMATION	
METHOD/APPARATUS/PROCEDURE: The isothermal method was used [1]. The densities and viscosities of the	SOURCE AND PURITY OF MATERIALS: Not stated.	
The densities and viscosities of the saturated solutions were measured.	REFERENCES :	
ESTIMATED ERROR:	1. Karnaukhov, A.S. <i>Izv. SFKhA</i> AN SSSR, <u>1954</u> , 25, 335.	
Not stated.	(continued next page)	

.

		ORIGINAL ME	ASUREMENTS:	
(1) Sodium perch	hlorate; NaClO4;	Zaitseva,	S.N.; Lepeshkov, I.N.	
[7601-89-0]		Uch. Zap. Yarosl. Gos. Ped. Ins 1969, 66, 113-21.		
(2) Barium perch	hlorate; Ba(ClO4)2;			
[13465-95-7]			
(3) Water; H ₂ O;	[7732-18-5]			
<u></u>	<u> </u>	<u> </u>	······	
XPERIMENTAL VALU Solubilit: 	ES: (continued) y system : Ba(ClO ₄) ₂ -	NaClO ₄ -H ₂ O at	50°C (continued)	
	Liquid phase composit	ion	Solid	
			phase ^a	
mass % (1) (2)	mol % ⁸ molali (1) (2) (1	ty ^a /mol kg ⁻¹) (2)		
	14.73 8.158 10.	61 5.873	В	
34.05 43.02 34.67 42.89	17.10 7.701 12.	62 5.684	B B	
35.35 42.74	17.69 7.789 13.	18 5.802	В	
35.83 40.90	17.70 7.528 13. 17.15 7.130 12.	14 5.589 58 5.227	B + C B + C	
35.40 41.71	17.17 7.367 12.	63 5.419	B + C	
35.14 41.84 36.68 41.76		47 5.405 90 5.761	B + C C	
37.43 40.19	18.33 7.168 13.	66 5.341	С	
47.97 28.00	21.66 4.603 16.	34 4.281 30 3.465	C C	
51.46 22.79	21.92 3.535 16.	32 2.632 40 1.541	C	
64.15 10.01	26.35 1.497 20.	40 1.541 28 1.152	C D	
68.79 4.14	27.05 0.593 20.	76 0.455	D	
	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	23 0.252 25 -	ם מ	
73.15 -			-	
^a Editors' cal				
^a Editors' cal	culations. $2.2H_2O$; C = NaClO ₄	; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .)	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .)	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	
^a Editors' cal		; D = NaClO ₄ .1	H20.	
^a Editors' cal		; D = NaClO ₄ .1	H20.	
^a Editors' cal		; D = NaClO ₄ .1	H ₂ 0.	

i.

COMPONEN	ITS:				ORIGINAI	MEASUREMENTS:	
(1) Sod	lium per	chlorate	; NaClO	4;	Lebosho	china, V.I.; Kudryakova, S.A.	
-	01-89-0						
		lorate; 2	Zn(C104) ₂ ;		ap. Yarosl. Gos. Ped. Inst.	
-	637-61-				<u>1976</u> ,	154, 68-71.	
(3) Wat	er; H ₂ 0	; [7732-:	[8-5]				
VARIABLE	:S :				PREPARED BY:		
One tem	peratur	e: 298 K			N.A. Ko	zyreva	
Composi	tion						
EXPERIME	WTAL VA						
EXPERIME	NIAL VA	6063.					
Solubi	lity sy	stem NaC	10 ₄ -Zn(0	с10 ₄) ₂ -н ₂ с	at 298	К:	
	L: Las X	iquid pha		position molality	A/mol ka	Solid phase	
		(1)		(1)		5	
1	53.17		7.18		4.296	$2n(ClO_4)_2.6H_2O$	
				0.865			
				2.105		"	
20.29	38.71	6.40	5.66	4.042	3.573	••	
23.64	35.20	7.39	5.10	4.691	3.236	$Zn(ClO_4)_2.6H_2O + NaClO_4.H_2O$	
29.38	30.71	9.33	4.52	6.012	2.912	NaClO ₄ .H ₂ O	
36.14	26.38	11.92	4.03	7.875	2.663	**	
39.58	23.00	13.00	3.50	8.639	2.326	"	
51.70	12.48	17.18	1.92	11.788	1.318		
[22.00		-	0.447	"	
67.65	-	23.53	-	17.079	-	"	
a Compi	ler's c	alculatio	on.				
• -							
						· · · · · · · · · · · · · · · · · · ·	
			AUX	ILIARY INI	FORMATION	i	
METHOD/A	PPARATI	SZPROCEDI	IBE .		SOURCE	AND PURITY OF MATERIALS:	
		•		Equili-	Not st		
				ays. Zn^{2+}			
				tric ti-			
				riochrome	ESTIMAT	TED ERROR:	
black T	at pH	9.7; C	104 grav	vimetri-	Not sta	ated.	
cally a	s nitro	n perchlo	orate.				
ļ						· · · · ·	
					REFEREN	ICES:	
					1		

COMPONENTS: ORIGINAL MEASUREMENTS: Sodium perchlorate; NaClO₄; Karnaukhov, A.S.; Tarakanov, V.F. [7601-89-0] (2) Nickel perchlorate; Ni(ClO₄)₂; Uch. Zap. Yarosl. Gos. Ped. Inst. [13637 - 71 - 3]1970, 79, 28-31. (3) Water; H_2O ; [7732-18-5] VARIABLES: PREPARED BY: One temperature: 298.2 K N.A. Kozyreva Composition EXPERIMENTAL VALUES: Solubility system NaClO₄-Ni(ClO₄)₂-H₂O at 298.2 K: Liquid phase composition Solid phase molality/mol kg⁻¹ mass % mol X (1) (2) (1) (2) (1)(2) 52.42 7.15 4.277 $Ni(ClO_4)_2.6H_2O$ -5.08 47.63 0.877 1.46 6.48 3.910 6.50 46.58 1.87 6.37 1.131 3.854 1.653 9.33 44.58 2.71 6.16 3.755 41.81 3.58 5.78 2.194 3.538 12.32 17.04 38.81 5.08 5.50 3.152 3.412 20.59 36.53 6.25 5.27 3.922 3.307 24.94 4.879 3.097 7.69 4.88 33.31 31.66 28.94 10.11 4.39 6.563 $2.851 \text{ Ni}(ClO_4)_2.6H_2O + \text{NaClO}_4.H_2O$ 30.73 29.42 9.74 4.43 6.298 2.866 30.44 29.56 9.62 4.44 6.215 2.869 30.38 29.76 9.63 4.48 6.225 2.898 NaCl04.H20 32.61 27.59 10.31 4.15 6.692 2.691 44.72 17.43 14.41 2.67 9.650 1.788 11.88 51.52 16.84 1.85 11.497 1.260 64.71 1.98 22.16 0.32 15.866 0.231 67.89 23.73 -17.268 ^a Compiler's calculations. Solution composition at the isothermal double saturation point (solid phases NaClO₄.H₂O and Ni(ClO₄)₂).6H₂O : 30.80 mass %, 29.42 mass % Ni(ClO₄)₂, and 39.78 mass % H₂O. AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: Isothermal method was used. The time Not stated. of equilibration varied from 4 to 5 days. Ni²⁺ was determined by titrat- ESTIMATED ERROR: ing with Trilon B; ClO₄ gravimetri-Temperature: <u>+</u>0.1 K cally, by nitron precipitation. The composition of the true solid phase REFERENCES: determined by Schreinemakers' WAS method of "residues".

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COMPONENTS: (1) Sodium perchlorate; NaClO4; [7601-89-0]	ORIGINAL MEASUREMENTS: Caven, R.M.; Bryce, G.
<pre>(2) Aluminium perchlorate; Al(ClO [14452-39-2] (3) Water; H₂O; [7732-18-5]</pre>	D4)3; J. Chem. Soc. <u>1934</u> , 514-7.
VARIABLES: One temperature: 303.2 K	PREPARED BY: K.H. Khoo
Composition EXPERIMENTAL VALUES: Solubility system : NaClO ₄	$(-A1(ClO_{4})_{2}-H_{2}O \text{ at } 30.2^{O}C$
Liquid phase compo g/100 g(3) molal	psition Solid phase
(1) (2) (1	
116.6 37.30 9.5 100.7 45.59 8.2	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
- 110.1 -	45 2.58 $A1(ClO_4)_3 \cdot nH_2O$ - 3.38 "
^A Compiler's calculat AUXILIA	ARY INFORMATION
METHOD/APPARATUS/PROCEDURE: The isothermal method was u Aluminium was determined as the o Sodium was determined in the pres of aluminium as sodium magne	oxide.
uranyl acetate. The method of lysis of the solid phase was mentioned.	ana- Temperature: <u>+</u> 0.1 ⁰ C
	None.

		ORIGINAL MEASUREMENTS:		
(1) Sodium per [7601-89-0	rchlorate; NaClO ₄ ;)]	Druzhinina, G.V.; Paraguzova, T.V		
(2) Cerium per [14017-47-	rchlorate; Ce(ClO ₄) ₃ ; -1]	Uch. Zap. Yarosl. Gos. Ped. Inst <u>1975</u> , 144, 76-85.		
(3) Water; H ₂ (); [7732-18-5]			
/ARIABLES: One temperatur Composition	re: 298 K	PREPARED BY: I.S. Bodnya		
XPERIMENTAL VA Solubility sys	ALUES: stem Ce(ClO ₄) ₃ -NaClO ₄ -H ₂ O	at 298 K:		
· mass %	Liquid phase composition mol X ^a molal	Solid phase ity ^a /mol kg ⁻¹		
(1) (2	2) (1) (2) (1) (2)		
67.80 - 60.56 6.	- 23.65 - 17.1 12 20.97 0.59 14.8			
47.28 16.		03 1.021 "		
19.56 42.	.34 6.74 4.07 4.1	93 2.535 "		
12.15 51. 11.04 52.				
8.31 56.	48 3.16 5.99 1.9	28 3.659		
6.38 60.	17 3.05 6.36 1.8 94 2.60 6.93 1.5	94 4.253 $Ce(ClO_4)_3.9H_2O + NaClO_4$		
	94 2.60 6.93 1.5 60 2.43 6.78 1.4 01 0.91 6.89 0.5	87 4.147 "		
- 64.	33 - 6.90 -	4.113 "4 5 2		
	AUXILIARY INF	ORMATION		
	IS/PROCEDURE: .hod was used. ClO ₄ was	SOURCE AND PURITY OF MATERIALS: Not stated.		
Isothermal met determined gr	avimetrically as nitron			
determined gr perchlorate; with the indic composition of	avimetrically as nitron Ce ³⁺ trilonometrically ator xylenol orange. The solid phases was deter- cally by Schreinemakers'	ESTIMATED ERROR: Not stated.		

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				185
COMPONENTS: (1) Sodium perchlorate; [7601-89-0]	NaClO ₄	;	ORIGINAL Andronov	MEASUREMENTS: 7a, N.P.
<pre>(2) Terbium perchlorate; [14014-09-6] (3) Water; H₂O; [7732-18</pre>		⁰ 4)3;	Uch. Zap. Yarosl. Gos. Ped. Inst <u>1976</u> , 154, 25-7.	
VARIABLES: One temperature: 298 K Composition			PREPARED N.A. Koz	
EXPERIMENTAL VALUES:				
Solubility system NaClO ₄	,-ТЬ(С10 	о ₄) ₃ -н ₂ о	at 298 K	:
Liquid phas			_	Solid phase
		molality	/ ^a /mol kg [~]	.1
(1) (2) (1)		(1)	(2)	
67.92 - 23.75 51.42 13.84 17.66		17.292 12.089		NaClO ₄ .H ₂ O
33.27 30.59 11.59	2.85	7.519	1.851	
18.52 45.37 6.71	4.40	4.189	2.748	**
17.75 47.57 6.67 16.36 49.46 6.25	4.79 5.06			**
13.85 51.90 5.32	5.33	3.303	3.314	NaClO4
	5.67			0 T
11.81 55.40 4.73 7.99 59.31 3.25	5.95 6.45	2.942		
6.96 61.34 2.91	6.88			
6.68 63.39 - 2.94	7.48	1.823	4.632	$NaClo_4 + Tb(Clo_4)_3.9H_2O$
3.53 63.70 1.45 - 64.30 -	7.01 6.63	0.880	4.251 3.939	ть(с10,),9H2O
a Compiler's calculation	1			
Average solution comp	osition	at the	isothermal	l double saturation point
(solid phases NaClO ₄ 6.68 mass % NaClO ₄ ,				, and 29.93 mass % H ₂ O.
·····	AUXIL	IARY INFO	ORMATION	
METHOD/APPARATUS/PROCEDUR No details given. The	solid p		SOURCE A Not sta	ND FURITY OF MATERIALS:
were studied under a mic by differential thermal			ESTIMATE Not stat	CD ERROR:
			REFERENC	;ES :

	NTS: dium perchlorate; 601-89-0]	NaC104	.;	ORIGINAL MEASUREMENTS: Cornec, E.; Dickeley, J			
•	dium chloride; Na	c1 :		Bul • Soc. Chim. France] 41, 1017-27.			ce 1927.
	647-14-5]						
-	ter; H ₂ O; [7732-1	.8-5]					
VARIABLE	S:			PREPAR			
Tempera Composi	ture/K: 273-373 tion			K.H. Khoo			
EXPERIME	NTAL VALUES:	<u>-, ,</u>					
	Solubility a		dium per ous temp			drate	
	t/°C	0	15	25	38	50	
	g(2)/100 g(3) molality ^{&} /	169	191	211	238	274	
	mol kg ⁻¹ 1	3.80	15.60	17.23	19.44	22.38	
	Solubility a	of an t vario	nhydrous ous temp	sodium erature:	perchl s (t)	orate	
	t/°C						100
	g(2)/100 g(3)	256	260	268	284	300	330
	molality ^a / mol kg ⁻¹ 2	0.91	21.23	21.89	23.19	24.50	26.95
	Solubility of	sodium	perchlo	rate in	aqueous	sodium	chloride
			(i) At	0°C			
	g(2)/100 g(3)	0	6.70	10.21	17.15	25.44	
	g(1)/100 g(3)						
	Solid phase ⁰	A	A+B	В	В	В	
			(ii) At	100°C			
	g(2)/100 g(3)						
	g(1)/100 g(3)						
	Solid phase ^b	С	C+B	В	В	В	
		(111)) At oth	er tempe	eratures		
	Temperature/ ^o C						
	g(2)/100 g(3)						
	g(l)/100 g(3) Solid phase ^b						
	9						
	^a Compiler's c	ຄ່າວນໄດ້	tione				

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COMPONENTS: ORIGINAL MEASUREMENTS: (1) Sodium perchlorate; NaClO4; Cornec, E.; Dickely, J. [7601-89-0] (2) Sodium chloride; NaCl; Bul . Soc. Chim. (France) 1927, [7647-14-5] 41, 1017-27. (3) Water; H₂O; [7732-18-5] PREPARED BY: **VARIABLES:** C.Y. Chan Temperature: 273 - 373 K Composition. **EXPERIMENTAL VALUES:** Solubility system NaCl-NaClO₄- H_2O at various temperatures : Sln density Liquid phase composition Solid mol kg⁻¹ a g cm⁻³ t/ °C mol X ^A mass% phase (2) (1) (1) (1) (2) (2) 32.69 -26.96 1.758 100 -76.75 -NaClO₄ 0.88 75.79 0.78 32.09 0.65 26.53 1.757 NaClO₄ + NaCl .. 1.44 69.32 1.11 25.57 0.84 19.36 1.664 NaCl 3.06 59.23 1.99 18.40 1.39 12.83 1.532 н .. ** 8.81 41.44 4.64 10.41 3.03 6.80 1.367 . 0.83 74.15 0.71 30.15 0.57 24.21 1.757 NaClO4 + NaCl 75 ** 55 0.78 73.00 0.65 28.87 0.51 22.74 1.755 50 0.81 72.46 0.66 28.32 0.52 22.14 1.749 NaCl+NaClO4.H20 38 1.05 69.41 0.81 25.48 0.61 19.19 1.713 " ** 25 1.37 66.58 1.00 23.18 0.73 16.97 1.683 ., - 62.87 - 19.94 - 13.83 -NaClO₄.H₂O 0 2.53 59.69 1.65 18.55 1.15 12.90 -0 NaCl+NaClO₄.H₂O 0 4.37 52.82 2.59 14.97 1.746 10.08 -NaC1 0 8.63 40.65 4.48 10.08 2.911 6.55 -0 15.44 23.86 6.90 5.09 4.352 3.210 -.. ^a Compiler's calculations. AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: No details of saturation method Commercial sodium perchlorate was given. The saturated solutions purified by several recrystallizwere evaporated in a water-bath and ations before use. the solids dried at 110 $^{\circ}$ C in $\bar{a}n$ oven, cooled and weighed in stoppered flasks. ESTIMATED ERROR: Not stated.

COMPONENTS: ORIGINAL MEASUREMENTS: (1) Sodium perchlorate: NaClO4; Karnaukhov, A.S. [7601-89-0] (2) Sodium chloride; NaCl; Izv. Vyssh. Uch. Zap. Khim. i. [7647-14-5] Khim. Tekhnolog. <u>1958</u>, 3, 34-9. (3) Water; H₂O; [7732-18-5] VARIABLES: PREPARED BY: One temperature: 293 K E.S. Gryzlova Composition **EXPERIMENTAL VALUES:** Solubility system NaClO₄-NaCl-H₂O at 293 K: Liquid phase composition Solid phase mol %^a molality^a/mol kg^{-1} mass % (2) (1) (1) (1) (2) (2) NaClO4 66.84 ---22.87 16.463 --0.82 66.30 0.59 22.75 0.427 16.469 н 1.62 65.55 1.16 22.44 0.844 16.307 1.26 21.92 1.78 64.80 0.911 15.836 1.28 21.52 1.24 21.48 0.923 15.477 NaClO₄^b + NaCl 1.83 64.26 0.891 15.429 1.77 64.23 1.85 64.11 1.29 21.42 0.930 15.382 NaCl 3.97 53.43 2.37 15.21 1.595 10.244 5.46 9.35 3.558 6.096 10.64 38.19 13.53 31.86 6.57 7.39 4.239 4.765 14.83 25.12 6.69 5.41 4.226 3.417 21.68 10.32 8.77 1.99 5.455 1.239 8.93 1.55 н 22.46 5.541 0.963 8.18 •• 5.39 9.19 1.00 0.620 23.59 5.684 26.50 10.00 6.169 -^A Compiler's calculation. b probably NaClO4 · H20 AUXILIARY INFORMATION METHOD/APPARATUS/PROCEDURE: SOURCE AND PURITY OF MATERIALS: Isothermal method (ref. 1) was used. Chemically pure salts were fur-Equilibrium of the saturated solutions ther purified by double recrywas reached in 2 days. Na⁺ was deter- stallization. Analysis gave mined gravimetrically as sodium zinc 99.41 % to 99.63 % purity. uranyl acetate; Cl by Mohr's method ESTIMATED ERROR: and in the transition points, gravimetrically as silver chloride. Not stated. **REFERENCES:** 1. Karnaukhov, A.S. Zh. Neorg. khim. 1957, 2, 915.

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COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Sodium perchlorate; NaClO4;	Karnaukhov, A.S.; Kudryakova, S.A.
{7601-89-0]	
(2) Sodium chloride; NaCl;	Uch. Zap. Yarosl. Gos. Ped. Inst.
{7647-14-5}	1966 , <i>59</i> , 119-36.
(3) Water; H ₂ O; [7732-18-5]	
VARIABLES:	PREPARED BY:
One temperature: 298.2 K	I.S. Bodnya
Composition	
EXPERIMENTAL VALUES:	
Solubility system $NaClO_4-NaCl-H_2O$ at 2	98.2 K:
Liquid phase composition	Solid phase
mass % mol % ^a molal	ity ^a /mol kg ⁻¹
(2) (1) (2) (1) (2)	
26.45 - 9.98 - 6.1 24.33 4.27 9.43 0.79 5.8	53 - NaCl 31 0.488 "
24.33 4.27 9.43 0.79 5.8 21.09 11.39 8.59 2.21 5.3	
18.32 17.50 7.80 3.56 4.8	
	16 3.482
8.49 40.41 4.39 9.97 2.8	43 6.459 "
7.12 42.00 5.21 17.05 1.3	
1.31 66.34 0.95 22.96 0.6 1.33 66.29 0.96 22.93 0.7	
1.35 66.18 0.98 22.85 0.7	11 16.646 " -
1.36 66.11 0.98 22.79 0.7 1.41 65.69 1.01 22.48 0.7	
	38 16.479 "
1.42 66.03 1.03 22.75 0.7 0.91 66.66 0.66 23.07 0.4	
- 67.84 - 23.69 -	
a Compiler's calculation.	·······
COMMENTS AND/OR ADDITIONAL DATA:	
Solution composition at the isotherma.	l double saturation point
(solid phases NaClO ₄ .H ₂ O and NaCl):	
1.36 mass % NaCl, 66.09 mass % NaCl	D_4 , and 32.55 mass % H_2O .
AUXILIARY IN	FORMATION
METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Isothermal method was used. Equili-	
brium was reached in 20-70 hours. Na ⁺	
was determined gravimetrically as so-	
dium zinc uranyl acetate; Cl ⁻ mercuri-	1
metrically; ClO ₄ gravimetrically by	
nitron precipitation.	Temperature: <u>+</u> 0.1 K
	REFERENCES :
	REFERENCES;

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OMPONENTS :	ORIGINAL MEASUREMENTS:				
(1) Sodium perchlorate; NaClO4;	Loseva, G.K.				
[7601-89-0]					
• •	Tr. Novocherkassk. Politekhn. Inst.				
(2) Sodium chloride; NaCl;	<u>1972, 266, 78-81</u>				
[7647-14-5]					
(3) Water; H ₂ O; [7732-18-5]					
ARIABLES:	PREPARED BY:				
One temperature: 333 K	E.S. Gryzlova				
Composition	E.S. Gryzlova				
XPERIMENTAL VALUES:	L _{egg}				
Solubility, system NaClO4-NaCl-H2O					
liquid phase composit mass % mol % ^a mo	ion solid phase lality ^a /mol kg ⁻¹				
(1) (2) (1) (2)	$\begin{array}{c} \text{Iallty} \\ \text{(1)} \\ \text{(2)} \end{array}$				
13.70 20.40 2.72 8.47 31.70 12.40 7.24 5.94	1.698 5.297 NaCl 4.632 3.796 "				
	4.632 3.796 ··· 6.719 2.897 ··				
49.50 5.60 13.51 3.20	9.004 2.134 "				
	11.205 1.559 "				
	17.058 1.300 " 17.265 0.866 "				
	17.265 0.866 " 19.467 0.703 "				
	21.442 0.620 "				
72.80 0.79 28.67 0.65	22.513 0.512 NaCl + NaClO4				
74.20 - 29.73 -	23.489 - NaClO4				
a Compiler's calculation					
AUXILIARY	INFORMATION				
ÆTHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:				
Isothermal method was used. The comp-	The reagents were purified by re-				
-	crystallization ; final components				
determined by chemical analysis. The					
composition of the solid phase was					
determined using Schreinemaker's					
method.					
	ESTIMATED ERROR:				
	not stated				
	REFERENCES :				

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COMPONENTS :			ORIG	NAL MEASUR	EMENTS	
(1) Sodium perchlora	ate; NaC	104;	Karr	naukhov, A	S., Troitskii, E.N.	
[7601-89-0]						
(2) Sodium chloride;	NaCl;		Uch	Zap. Yuro	sl Gos. Ped. Inst.	
[7647-14-5]			13	<u>)66</u> , 59, 8-	21.	
(3) Water; H ₂ O; [77]	32-18-5]					
VARIABLES:			PREPARED BY:			
One temperature: 36:	зк		N.A.	Kozyreva		
Composition						
EXPERIMENTAL VALUES:			L <u></u>			
Solubility system Na	aC104-Na	Cl-H ₂ O at 36	63 K:			
Liquid	l phase	composition			Solid phase	
mass %	mol	% ^a mo	olalıt	y ^a /mol kg ⁻	1	
(2) (1)	(2)	(1)	(2)	(1)		
27.80 -	10.61		5.588	-	NaCl	
25.11 5.05 22.95 8.72	9.88 9.23		5.152	0.591 1.042	41	
18.97 18.96	8.27	3.95	5.229	2.495	11	
14.80 23.85 12.10 29.94	6.57 5.64		4.128	3.175 4.219	"	
9.12 38.03	4.59		2.953		**	
6.80 45.20	3.69		2.424		"	
6.00 47.99 5.53 49.97	3.37 3.18		2.231		**	
4.60 52.62	2.73	14.91	1.840	10.046	и	
3.78 55.77 3.15 58.64	2.34 2.03		1.599	11.260 12.534		
1.85 63.20	1.27		0.906	14.769	"	
0.90 68.09	0.67		0.497	17.933		
0.87 67.34 0.88 66.93	0.64 0.64		0.468	17.300 16.981	$NaCl + NaClO_4$	
0.85 67.31	0.62		0.457	17.266	**	
0.86 68.06 0.87 67.17	0.64 0.64		0.473	17.885 17.165	**	
0.90 66.42	0.65		0.400			
0.89 66.95 - 75.85	0.65	23.30 (31.61	0.474 -	17.002 25.652	NaClO4	
a Compiler's calcu	ulation.				<u></u>	
Average solution c		on at the i	sothe	rmal double	e saturation point	
(solid phases NaC	10_4 and	NaCl):				
0.87 mass % NaC	•		10 ₄ ,	and 31.92 m	mass% H ₂ O.	
	A	UXILIARY IN	FORMAT	ION		
METHOD/APPARATUS/PROC	EDURF		SOUR	CE AND PUP	ITY OF MATERIALS.	
Isothermal method		ed. Con-		stated.		
ditions of saturatio						
Na ⁺ was determined a		•		<u>•</u>		
sodium zinc uranyl a			1	MATED EPPO	R :	
		•	1			
vimetrically by p nitron; Cl ⁻ mercuri:				. stated.		
		- •	REFI	RENCES		

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ORIGINAL MEASUREMENTS: COMPONENTS: Andronova, N.P. (1) Sodium perchlorate; NaClO4; [7601-89-0] Uch. Zap. Yarosl. Gos. Ped. Inst. (2) Sodium nitrate; NaNO3; 1971, 95, 142-6. [7631-99-4] (3) Water; H₂O; [7732-18-5] PREPARED BY: VARIABLES: Temperature: 298 and 323 K N.A. Kozyreva Composition

EXPERIMENTAL VALUES:

Solubility system NaNO3-NaClO4-H2O at 298 K:

		a .					
	kg 1	∽/mo	molality	Xu	mol	ss X	ma
		(1	(2)	(1)	(2)	(1)	(2)
NaNO3			10.782	-	16.27	-	7.82
"	53	1.	10.296	2.02	15.33	8.12	2.88
**	23	з.	8.626	5.35	12.73	20.38	3.68
"	43	4.	7.590	6.58	11.24	24.85	9.47
**	20	7.	7.866	10.61	11.10	35.56	5.82
**	22	11.	6.883	15.82	9.29	47.52	9.37
"	30	15.	6.288	20.19	8.12	55.50	5.50
+ NaClO4.H2C	44	16.	4.667	21.56	6.08	59,19	1.59
	86	16.	4.647	21.61	6.06	59.28	1.53
aC104.H20	57	17.	3.091	22.55	4.09	62.32	7.84
"	56	16.	1.897	22.80	2.55	64.13	4.98
	68	17.	-	23.73	-	67.89	-

^A Compiler's calculation.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Isothermal method was used. Saturation conditions were not given. The composition of solid phases was determined graphically by Schreinemakers' ESTIMATED ERROR: method of "residues". The solutions Not stated. and solid "residues" were analysed for the nitrate ion by Devarda's method. The perchlorate ion was precipitated REFERENCES: with nitron.

SOURCE AND PURITY OF MATERIALS: Not stated.

(continued next page)

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COMPONENTS:
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- Sodium perchlorate; NaClO4; [7601-89-0]
 Sodium nitrate; NaNO3; [7631-99-4]
- (3) Water; H₂O; [7732-18-5]

ORIGINAL MEASUREMENTS: Andronova, N.P.

Uch. Zap. Yarosl. Gos. Ped. Inst. 1971, 95, 142-6.

EXPERIMENTAL VALUES: (continued)

Solubility system NaNO3-NaClO4-H2O at 323 K:

	Liqu	id phase	compos	ition		Solid phase
ma	ss %	mol	xa	molality	$a/mol kg^{-1}$	
(2)	(1)	(2)	(1)	(2)	(1)	
53.27	-	19.46	-	13.412	-	NaNO3
48.42	6.50	18.23	1.70	12.637	1.178	
41.70	18.30	17.15	5.23	12.265	3.737	"
33.41	31.78	15.21	10.04	11.292	7.456	"
24.40	43.67	11.88	14.76	8.991	11.170	"
18.14	57.23	10.42	22.82	8.665	18.977	"
16.98	59.07	9.93	23.98	8.341	20.144	$NaNO_3 + NaClO_4$
16.98	59.07	9.93	23.98	8.341	20.144	*
14.81	60.82	8.61	24.55	7.150	20.383	NaClO ₄
10.05	65.17	5.84	26.27	4.772	21.479	*
5.70	69.20	3.31	27.90	2.672	22.517	
3.37	70.84	1.93	28.23	1.537	22.434	NaClO4.H2O
-	73.53	-	29.01	-	22.687	**

^a Compiler's calculation.

COMPONENTS :		ORIGINAL MEASUREMENTS:			
(1) Sodium perchle	orate; NaClO ₄ ;	Freeth, F.A.			
[7601-89-0]					
(2) Sodium sulfat	e; Na ₂ SO ₄ ;	Rec. Trav. Chim. Pays-Bas <u>1924</u> ,			
[7757-82-6]	[77 00 10 5]	43, 475			
(3) Water; H ₂ O;	[//32-18-5]				
VARIABLES:		PREPARED BY:			
Two temperatures:	298 K and 333 K.	C.Y. Chan			
Composition.					
	a.				
EXPERIMENTAL VALUE	S: NaClO ₄ -Na ₂ SO ₄ -H ₂ O	at 25 °C .			
	Naci04-Na2304-N20				
Liq	uid phase compositi	on Solid			
mass X	mol % ^a mo	lality ^a / mol kg ^{~1} phase			
(1) (2)	(1) (2)	(1) (2)			
67.60 -	23.49 -	17.04 - NaClO ₄ .H ₂ O			
67.67 0.26	23.67 0.08	17.23 0.06 $NaClO_4.H_2O + Na_2SO_4$			
53.58 1.24	14.81 0.296	9.69 0.193 Na2SO4			
41.68 4.28		6.30 0.558 2,4			
31.27 9.07 31.21 9.07	7.034 1.759 7.015 1.757.	$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
	3.761 2.180	2.225 1.287 NB ₂ SO ₄ .10H ₂ O			
5.79 18.15 - 21.71	1.075 2.906 - 3.398	0.622 1.671 "" - 1.952 "			
^a Compiler's calcu	ulations.				
**************************************	AUXILIARY	INFORMATION			
METHOD/APPARATUS/PI	ROCEDURE:	SOURCE AND PURITY OF MATERIALS:			
	paratus was similar	NaClO ₄ was prepared from very pure			
to that used by N	Van't Hoff (ref.1)	ammonium perchlorate (% purity not			
	lear satd sln were	stated) and an aqueous sln of pure			
-	ight-pipette. Na ⁺	NaOH. Source and other details			
	Na_2SO_4 by addition	not given. NaSO ₄ was recrystall-			
silica basins and	acid to the sln in d evaporating at a	ized from the reagent grade salt.			
	Sulfate was deter-	1. Van't Hoff, J.H. Zur Bildung			
mined gravimetric	ally as BaSO ₄ .				
Solid phase compos	sitions were deter-				
_	einemakers' method.				
	stats were used and				
	e checked against				
carried out in du	All analyses were plicates.				
Sattion one th du					
		(continued next page)			
		(continued next page)			

COMPONENT	S :			ORIGINAL	MEASUREMI	ENTS:	
(1) Sodium perchlorate; NaClO4;				Loseva, G.K.			
	[7601-89-0]			Tr. Novocherkassk. Politekhn. Inst.			
	(2) Sodium chlorate; NaClO3; [7775-09-9]				266, 78-8		
(3) Water; H ₂ O; [7732-18-5]							
VARIABLES	:	· _ · _ · <u>, </u>		PREPARED BY:			
One temp	erature: 3	333 K		E.S. Gr	yzlova		
Composit	ion						
EXPERIMEN	TAL VALUES	5:					
Solubil	ity system	n NaClO ₄ -N	/aClO ₃ -H ₂ O a	t 333 K:			
Liquid phase composition						Solid phase	
ma	ss %	mol	x	molality	/mol kg ⁻¹		
(2)	(1)	(2)	(1)	(2)	(1)		
			2.74			NaClO3	
	23.00				5.091		
	35.90 47.70	11.96 9.93			8.831 13.480	"	
	55.10		22.33		18.146	**	
16.80	59.90	8.13	25.21	6.774	20.996		
15.30	62.70	7.66	27.28	6.534	23.277	NaClO ₃ + NaClO ₄	
14.80	62.90	7.35	27.17	6.235	23.037	NaClO ₄	
	63.50	6.99	27.38	5.914	23.153	"	
7.90	68.30	3.80	28.56	3.118	23.438	"	
^a Compi	ler's calc	culation.					
<u></u>		A	UXILIARY IN	FORMATION			
METHOD/AP		OCEDURE		SOURCE AND PURITY OF MATERIALS:			
	al method		The com-				
	of the l						
-	by chemi					stance was 99.6-99 %	
	•		hase was de-	1	main sub:	scance was boro bo w	
-		-	s' method.	pure			
	•		electrical	ESTIMATED ERROR:			
	vity we	•					
	-		-				
powder analysis and optical crystallo- graphy methods were used.							
				REFERENCES:			

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 COMPONENTS:
 ORIGINAL MEASUREMENTS:

 (1) Sodium perchlorate; NaClO4;
 Freeth, F.A.

 [7601-89-0]
 Freeth, F.A.

 (2) Sodium sulfate; Na2SO4;
 Rec. Trav. Chim. Pays-Bas 1924,

 [7757-82-6]
 43, 475

 (3) Water; H2O; [7732-18-5]
 Image: Component of the section of the sec

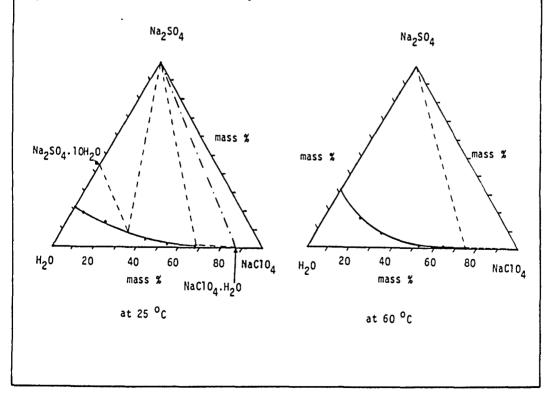
EXPERIMENTAL VALUES:(continued)

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Solubility system $NaClO_4-Na_2SO_4-H_2O$ at 60 ^oC :

	Li	quid phas	se compos	sition		Solid
ma	ss X	mol	x ^a	molality ^a /	mol kg^{-1}	phase
(1)	(2)	(1)	(2)	(1)	(2)	
74.30	-	29.84	-	23.61	-	NaClO4
74.40	0.290	30.16	0.101	24.01	0.081	$NaClO_4 + Na_2SO_4$
54.65	0.370	21.36	0.105	15.095	0.074	Na2SO4
52.47	1.11	14.22	0.259	9.232	0.168	2, 4
31.55	6.95	6.93	1.315	4.181	0.796	14
7.70	14.90	3.622	2.629	2.145	1.556	**
-	31.2	-	5.44		3.19	

a Compiler's calculations.



COMPONENTS: (1) Sodium perchlo [7601-89-0] (2) Sodium chromat [7775-11-3] (3) Water; H ₂ O; [7	ce; Na ₂ CrO ₄ ;	ORIGINAL MEASUREMENTS: Karnaukhov, A.S.; Guseva, A.D. Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1966</u> , 59, 96-103		
VARIABLES: One temperature: 2 Composition	98 K	PREPARED BY: N.A. Kozyreva		
EXPERIMENTAL VALUES Solubility system		I-H2O at	. 308 K:	
Ligui	d phase compos	ition		Solid phase
mass %	mol %		ity/mol k	-
(2) (1)	(2) (1)			
47.63 0.00	0 10 0 00	6 616	0 000	Na ₂ CrO ₄ .4H ₂ O
45.69 2.82	8.92 0.73	5.478	0.447	
40.63 10.20 38.07 13.39	8.19 2.72 7.73 3.60	5.101 4.842		••
00 14 00 05	C 02 E C2	4.399		11
30.60 24.04	6.51 6.76	4.165		
33.14 20.35 30.60 24.04 27.84 28.22 24.81 33.26 20.43 39.60 15.82 46.45 13.80 49.77 .80 50.17	6.05 8.11 5.57 9.87	3.912 3.653		
20.43 39.60	4.73 12.12	3.156	8.092	**
15.82 46.45	3.80 14.75 3.39 16.17		10.055	14
12.02 53.15	3.04 17.78		12.463	**
10.44 56.41	2.72 19.48		13.898	
9.38 59.27 8.63 61.62	2.54 $21.212.41$ 22.79	1.847	15.441	$Na_2CrO_4.4H_2O + NaClO_4.H_2O$
8.61 61.48	2.40 22.66	1.777	16.788	
8.62 61.52 8.60 61.68	2.40 22.70 2.41 22.83	1.782	16.827	
8.61 61.63	2.41 22.79		16.914	u
5.63 64.32	1.56 23.58		17.481	NaClO4.H20
2.40 67.01 0.00 69.80	0.66 24.22 0.00 25.38	0.484	17.891	
^a Compiler's calcu	lation.			
Solution composi	tion at the is	sotherma	al double	saturation point
(solid phases N	aClO4.H20 and	Na ₂ Cr($0_4.4H_20$)	:
61.58 mass % N	aclo ₄ , 8.61	mass ×)	Na ₂ CrO ₄ ,	and 29.81 mass % H ₂ O.
	AUXILI	LARY INF	ORMATION	
METHOD/APPARATUS/PR	OCEDUPE .		SOURCE	ND DUDITY OF MATERIALS.
Isothermal method		SOURCE AND PURITY OF MATERIALS: The initial salts (reagent grade)		
brium was reached		were purified by recrystallization.		
		were pu	ALLIEU OF FEETYSLALLIZATION.	
was determined gra		PONTHAN		
uranyl acetate; Cr	•	ESTIMATED ERROR:		
ClO ₄ by differenc	:е.	Not stated.		
		REFERENCES :		

COMPONENTS: **ORIGINAL MEASUREMENTS:** Druzhinina, G.V. (1) Sodium perchlorate; NaClO4; [7601-89-0] (2) Sodium chromate; Na₂CrO₄; Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1966</u>, *59*, 73-82. [7775-11-3] (3) Water; H₂O; [7732-18-5] VARIABLES: PREPARED BY: One temperature: 323 K N.A. Kozyreva Composition EXPERIMENTAL VALUES: Solubility in the system $NaClO_4-Na_2CrO_4-H_2O$ at 323K: Liquid phase composition Solid phase mol %^a molality^a/mol kg⁻¹ mass % (2) (1) (2) (1) (2) (1)50.76 10.29 6.364 $Na_2CrO_4.4H_2O$ 2.51 0.68 49.38 10.18 6.337 0.426 10.06 0.792 48.19 4.58 1.27 6.299 46.11 8.73 9.94 2.49 6.303 1.579 41.94 12.71 8.99 3.60 5.709 2.289 17.05 ., 38.84 8.48 4.92 5.436 3.157 35.40 21.83 7.89 6.43 5.110 4.169 31.91 26.44 7.23 7.92 4.730 5.185 6.35 10.43 .. 27.05 33.55 4.238 6.955 23.02 40.88 5.73 13.46 3.937 2.939 12 2.587 11.460 9.249 5.08 16.24 4.13 17.88 3.55 20.35 19.47 47.02 Na2CrO4 15.69 51.35 12.95 56.15 2.587 14.841 3.00 21.65 2.75 22.94 •• 10.82 58.98 2.212 15.950 61.16 9.69 2.052 17.136 2.25 24.96 7.71 64.58 1.718 19.034 Na₂CrO₄ 67.19 1.93 26.72 1.92 26.74 6.41 1.499 20.786 6.38 67.23 1.493 20.806 $Na_2CrO_4 + NaClO_4.H_2O$ 1.93 26.82 67.28 1.507 6.42 20.893 67.20 1.488 6.37 1.91 26.70 20.766 67.21 1.497 6.40 1.92 26.73 20.800 NaCl04.H20 0.71 27.72 0.551 70.73 2.40 21.499 78.20 34.55 29.297 -_ -^a Compiler's calculation. AUXILIARY INFORMATION SOURCE AND PURITY OF MATERIALS: METHOD/APPARATUS/PROCEDURE: The solubility was studied by the Chemically pure grade (1) and (2) method of isothermal recrystallization | were purified by recrystallization from supersaturated solutions. Condiand dehydrated. tions of saturation are not stated. Na⁺ was determined as sodium zinc uranyl acetate and by flame photometry ESTIMATED ERROR: CrO_4^{-2} iodimetrically and ClO_4^{-} by Not stated. difference. **REFERENCES:** None.

COMPONENTS :			0	RIGINAL ME	ASUREMENTS:			
(1) Sodium perc	hlorate; N	aC104 :		Molchanov,	S.N.			
[7601-89-0]	·							
(2) Sodium chro	mate; Na ₂ C	r04;		Tr. po Kimii i Khim. Tekhnolog.				
[7775-11-3]	_	- • •		<u>1965</u> , 3(14), 27-9.			
(3) Water; H ₂ O;		5]						
					· · · · · · · · · · · · · · · · · · ·			
VARIABLES:			P	REPARED BY	:			
Temperature: 29	8, 323, 33	5.8 K		E.S. Gryzl	ova			
Composition								
EXPERIMENTAL VAL	1155.		l					
Solubility syst		Ne - CrO .	-H-O:					
	4							
Lig At_298_K	uid phase	composit	tion		Solid phase			
mass %		1 x ^a	molal	ity ^a /mol k	g ⁻¹			
(2) (1)		(1)	(2)	• •				
45.78 -	8.58		5.21		Na ₂ CrO ₄ .4H ₂ O			
7.82 53.91 6.18 60.71		16.85 20.90		1 11.505 2 14.975				
- 67.70	-	20.90	-		Naclo ₄ .H ₂ O Naclo ₄ .H ₂ O			
					4 2 -			
<u>At 323 K</u>					_1			
mass X				ty ^a /mol kg	-1			
(2) (1) 50,76 -			(2) 6.36	(1) 4 -	Na ₂ CrO ₄ .4H ₂ O			
15.98 52.1								
6.39 67.8								
- 73.2	0 -	28.67	-	22.308	NaCLO4.H20			
At 335.8 K								
mass %	mo	1 %	molal	ity/mol kg	-1			
(2) (1)			-) (1)				
55.01 - 4.55 73.1	11.97 3 1.51		7.5	49 - 59 26.759	Na ₂ CrO ₄			
- 74.3			1.2		2 4 4			
	-							
^a Compiler's ca	lculation.							
		AUXILIAF	RY INFOR	MATION				
HETHOD/APPARATUS	/PROCEDURE	:		SOURCE AND	PURITY OF MATERIALS:			
Isothermal met	,							
of equilibrium					details). The salts were			
hours at 62.8°C				•	rystallized. Analysis			
Na ⁺ was determi		•) 99.78 %;			
nyl acetate; Cr				-) 99.92 - 100.00 x .			
Solid phase wa	•		1					
cally, the dec	-		-	ESTIMATED	ERROR:			
recorded with K	-			Not state				
REFERENCES:								

.

COMPONE	INTS:				ORIGIN	AL MEASUREMENTS:		
(1) S	odium pe	rchlorate	; NaClO	47	Karna	ukhov, A.S.; Sal'nikova, L.N.		
ני	7601-89-	0]						
(2) Sodium dichromate; Na ₂ Cr ₂ O ₇ ;						Uch. Zap. Yarosl. Gos. Ped. Inst.		
[10558-01-9]						<u>0</u> , <i>78</i> , 65-70.		
(3) Wa	ater; H ₂	0; [7732-	18-5]					
VARIABL	LES:				PREPAR	RED BY:		
One te	emperatu	re: 298.2	К		N.A.	Kozyreva		
Compos	ition							
EXPERIM	ENTAL VA	ALUES :			4			
			0 ₄ -Na ₂ C	r207-H20	at 298.	2 K:		
		Liquid	phase	compositi	on	Solid phase		
ma	ss %	mol		molality,		•		
	(1)	(2)			(1)			
65.16	-	11.40	-	7.139	-	Na2Cr207.2H2O		
64.06 62.68	1.78 4.69	$11.35 \\ 11.45$	0.67 1.83	7.158 7.332	0.426	ت _{۱۱} مر ۱۱		
53.26	15.50		6.13	6.508	4.052	"		
45.63 36.16	27.95 36.87	9.32 7.13	12.21		8.640	**		
	40.80	6.72			12.901	"		
31.89	42.90	6.50	18.72	4.829	13.898	•1		
32.02	42.98	6.57	18.86	4.889	14.041	$Na_2Cr_2O_7.2H_2O + NaClO_4.H_2O$		
	49.04	4.37			14.444	NaClO4.H2O		
	53.26 57.94		20.74 22.02		16.139	M		
4.15	59.90		19.56		13.608	17 17		
0.87	67.14 67.80		23.56 23.65		17.141 17.197			
a Compi		alculatio	n					
compi	ier a co	ICUIACIO						
			AUX	ILIARY IN	FORMATT			
					1	•••		
		IS/PROCED			SOURCE AND PURITY OF MATERIALS:			
				Equili-	Not stated			
brium	was reac	hed in 4	-6 days					
determined with zinc uranyl acetate.								
						ATED ERROR:		
ence. Solid compositions were deter-						erature: <u>+</u> 0.1 K		
mined	by Schre	inemaker	s' meth	od.				
					REFER	ENCES:		
	·							

OMPONENTS	5:				ORIGINA	L MEASUR	EMENTS:			
		chlorate;	NaClO	17	Babaya	an, G.G.;	Darbinyan, G.M.			
<pre>[7601-89-0] (2) Sodium phosphate; Na3PO4; [7601-54-9]</pre>						Khim. Zh.	, <u>1972</u> , <i>25</i> ,			
						-7.				
(3) Wate	r; H ₂ O	; [7732-1	.8-5]							
ARIABLES					PREPARE	ED BY:				
One tempe Compositi		: 293 K			E.S. 0	iryzlova				
				·····			······			
XPERIMENT	TAL VAL	UES:								
Solubilit	y syst	em NaClO	4-Na ₃ PO	$_4$ -H ₂ O at	293 K:					
										
	mag	Liqui s %		composi 1 % ^a		ty ^a /mol 1	Solid phase			
	(2)					(1)	*8			
	• •			17.24	0.058	11.574	NaClO ₄ .H ₂ O			
	0.40	52.80	0.08	14.23	0.052	9.214	solid solutions			
	$0.47 \\ 2.14$	47.70 41.60	0.09 0.38	11.92	0.055 0.232	7.516 6.039	99 49			
		41.35	0.31		0.193	5.940	69			
	2.54 2.90			7.86 7.53	0.252 0.283	4.757 4.542	81 11			
		26.00 21.80	0.47 0.68	5.10 4.16	0.276 0.399	2.999 2.426	Na3P04.12H20			
	12.46	9.80		1.79		1.030	"			
	18.42	4.48	2.54	0.83	1.457	0.475				
	14.46 23.90	8.20 1.60	1.98 3.39		1.140 1.957	0.866 0.175				
8 Co.		s calcul		0.30	1.957	0.175				
۲.		on not k								
			AUXI	LIARY IN	FORMATIC	N				
THOD/APF	ARATUS	/PROCEDU	RE:		SOURCE	AND PURI	TY OF MATERIALS:			
Isotherma	l met	hod was	used.	Periods	The original salts were reagent					
of equilibration were 5-7 days. Phos-					grade					
phate ion	was d	etrmined	by pr	ecipita-						
ting with	ammon	ium moly	bdate i	n acıdic						
solution;	perc	hlorate	ion gra	vımetri-	ESTIMA	TED ERROF	l :			
cally.	The co	mpositio	n of th	e solid	Not s	tated.				
phase wa	s det	ermined	by S	chreine-						
					1					

crystallographic and X-ray diffraction

methods.

COMPONENTS :	ORIGINAL MEASUREMENTS:					
(1) Sodium perchlorate; NaClO4;	Marshall, P.R.; Hunt, H.					
[7601-89-0]						
(2) Sodium Chloride;	J. Chem. Eng. Data <u>1959</u> , 4,					
[7647-14-5]	217-22.					
(3) Ammonia; NH3; [7664-41-7]						
VARIABLES:	PREPARED BY:					
Temperature: 240 - 323 K.	C.Y. Chan					
	L					
EXPERIMENTAL VALUES:						
Solubility system NaCl-NaClO ₄ -H ₂ O at						
phase being a mixture of the anhydrous	saits :					
t/ ^o C g / 100g(3) molality/	mol kg ⁻¹ mol % (compiler)					
(2) (1) (2)	(1) (2) (1)					
-33 1.88 236 0.322 0 0.20 298.4 0.0343						
25 0.222 299 0.038	24.4 0.041 $29.3224.4$ 0.046 29.36					
50 - 310.0 -	25.3 - 30.13					
AUXILIARY IN	FORMATION					
METHOD/APPARATUS/PROCEDURE:						
The solubility determinations were						
constructed apparatus (diagram given : gas line connected to the saturation c						
compartments separated by a sintered g						
which was connected to the gas line in						
inverted, with either one of the compa						
Weighed amts of the salts were sealed						
cell which was then connected to the g	-					
Excess of dry ammonia was condensed in						
dissolved at the set temperature. The coolants used were dry ice and CC_1 The coll was thereestated in a liquid NU bath for -32 C_2 dataged						
CCl_4 . The cell was thermostated in a liquid NH ₃ bath for -33 ^o C determinations, in an ice + water bath for 0 ^o C, and in a water bath for th						
other temperatures. Ammonia was bled from the solution until sal						
crystals were formed, and the cell inverted so that the solution filter						
through the partition into the larger	•					
ammonia in the solution was all remove	•					
in the apparatus and determined quanti						
sln and back-titrated with std. base.	-					
solids removed for analysis. Chlorid						
AgNO ₃ using dichlorofluorescein as in	dicator.					
COUSE AND DUBLEY OF MATERIALS.						

SOURCE AND PURITY OF MATERIALS: Not stated. Ammonia was dried with sodium.

ESTIMATED ERROR: Reproducibility (3 detn) is within \pm 2 % of the mean value in most cases.

COMPONENT	5:			ORIGINAL M	EASUREMENTS:			
	um perchlora 1-89-07]	te; NaClO	0 ₄ ;	Marshall, P.R.; Hunt, H.				
	nium perchlo	rate; NH ₄	J. Chem. Eng. Data <u>1959</u> , 4,					
-	0-98-9] nio: NV : (7	664-41-71	217-22.					
(J) AMMOI	nia; NH ₃ ; [7	004-41-7						
VARIABLES	:			PREPARED B	Y :			
Temperatu	ure: 240 - 3	23 К.		C.Y. Chan				
EXPERIMEN	TAL VALUES:							
	ty system N ing a mixtur				temperatures	, the solid		
t/ °C	g / 100)g(3)	molalit	y/ mol kg ⁻¹	mol % (compiler)		
	(1)	(2)	(1)	(2)	(1)	(2)		
-33 0	210.3 241.7	42.5 45.7	$17.1 \\ 19.75$	3.6 3.89	21.60 23.97	4.55 4.72		
25	267.0	47.0	21.8	4.00	25.80	4.73		
50	292.2	49.6	23.8	4.22	4.86			
		AUX	(ILIARY IN	FORMATION		- 		
gas line compartme which was inverted Weighed a cell which Excess of dissolved CCl ₄ . The minations other te crystals through a ammonia a in the ap sln and solids re	connected t ents separat s connected , with eithe amts of the ch was then f dry ammoni d at the se he cell was s, in an ice emperatures. were formed the partitio in the solut pparatus and back-titrate	to the satisfied by a site to the gas to the gas r one of salts we connected ia was cont temperative t	turation of sintered g as line in the compa ere sealed i to the g ndensed i ture. The sted in a bath for a was bl cell inv te larger all remove ned quantit td. base.	eell. The class partit such a way rtments very in the sma as line via n the cell The coolants liquid NH ₃ N 0 °C, and ed from the erted so the compartment d by conden tatively by The cell	cell consi ion, the l that the ce tically above aller compar the larger until the s used were bath for -3 in a water e solution at the solut . After fi issation into absorption was then op	involving a sted of two arger one of all could be the other. thent of the compartment. alts had all dry ice and 3 ^O C deter- bath for the until salt ion filtered ltration the a reservoir in std. HCl ened and the y a standard		
	D PURITY OF ed. Ammonia			dium.		11-1-1-1		
ESTIMATED	ERROR: Repr	oducibili	ty (3 det	n) is within	n <u>+</u> 2 % of t	he mean		

value in most cases.

COMPONENTS: (1) Sodium perchlorate; NaClO₄ [7601-89-0]

(2) Water; H_2O ; [7732-18-5] (3) Alcohols: (A) Methanol (methyl alcohol); CH40; [67-56-1]

- (B) Ethanol (ethyl alcohol); C₂H₆O; [64-17-5] (C) 1-Butanol (n-butyl alcohol):
- $C_4H_{10}O; [71-36-3]$ (4) Ethyl acetate; $C_4H_8O_2$; [141-78-6]

VARIABLES: One temperature: 298.2 K

PREPARED BY: C.Y. Chan

ORIGINAL MEASUREMENTS:

J. Am. Chem. Soc. <u>1925</u>, 47,

Smith; G.F.

762-9.

EXPERIMENTAL VALUES:

Solubility of sodium perchlorate in alcohol-ethyl acetate mixtures at 25.0 °C :

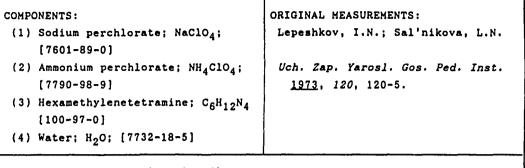
			Vol	ume %			
Alcohol : Ethyl acetate :	0 100	5 95	10 90	20 80	30 70	40 60	50 50
Alcohol used			mass X	(NaClO ₄)	b		
methanol	8.80	-	19.39	23.37	25.85	27.81	29.38
ethanol (abs.)	*	13.83	16.05	18.55	19.66	20.08	20.07
ethanol (93 %)	••	14.12	16.92	20.00	21.75	22.79	23.30
1-butanol	**	-	12.34	13.16	-	12.82	11.99
1-butanol ^a	**	11.97	13.00	14.32	14.75	14.71	13.98
			mass X	(NaClO ₄ .)	H ₂ 0) ^c		
ethanol (abs.)	26.32	-	29.32	31.16	32.44	33.26	33.63

(continued next page)

AUXILIARY INFORMATION

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COMPONENTS:
                                         ORIGINAL MEASUREMENTS:
 (1) Sodium perchlorate; NaClO<sub>4</sub>
                                          Smith, G.F.
     [7601-89-0]
 (2) Water; H<sub>2</sub>O; [7732-18-5]
                                          J. Am. Chem. Soc. 1925, 47,
 (3) Alcohols:
                                            762-9.
     (A) Methanol (methyl alcohol);
         CH4O; [67-56-1]
     (B) Ethanol (ethyl alcohol);
         C_{2}H_{6}O; [64-17-5]
     (C) 1-Butanol (n-butyl alcohol);
         C_{4}H_{10}O; [71-36-3]
 (4) Ethyl acetate; C_4H_8O_2; [141-78-6]
EXPERIMENTAL VALUES: (continued)
Solubility of sodium perchlorate in alcohol-ethyl acetate mixtures
 at 25.0 °C :
                                    Volume X
                    60
                             70
                                       80
                                                90
Alcohol
                                                         95
                                                                   100
 Ethyl acetate :
                             30
                    40
                                       20
                                                10
                                                         5
                                                                     0
                                 mass %(NaClO<sub>4</sub>)<sup>b</sup>
Alcohol_used
                   30.50
                                      32.56
methanol
                            31.61
                                               33.44
                                                                  34.33
                  19,67
                                             15.82
                                                         14.80
                                                                  12.83
ethanol (abs.)
                            18.78
                                      17.53
 ethanol (93 %)
                  23.39
                            22.73
                                     21.92 20.96
                                                         21.31
                                                                  20.60
                                                          -
 1-butanol
                  10.54
                             -
                                     6.70
                                               4.35
                                                                  2.19
 1-butanol<sup>a</sup>
                  13.09
                            11.66
                                     9.85
                                               7.87
                                                          6.97
                                                                   4.27
                                 mass (NaClO_4.H_2O)^{C}
                                               31.56
ethanol (abs.)
                   33.61
                            33.20
                                      32.56
                                                         31.10
                                                                  29.80
 a
   Same quality as that reported in ref. 1.
<sup>b</sup> Solute and solid phase were the anhydrous salt.
 <sup>C</sup> Solute and solid phase were the monohydrate.
                            AUXILIARY INFORMATION
SOURCE AND PURITY OF MATERIALS: (continued)
as that reported in ref.2. Analysis yielded 12.87 % water of crystalliza-
tion for the hydrate prepared, compared to the theoretical value of
12.82 X for the monohydrate.
                                Ethyl acetate and 1-butanol were prepared
as reported in ref.2. Technical methyl alcohol was dried over solid KOH
 and distilled before used (2). 93 % ethanol was dehydrated with lime to
 99.6 % before being made anhydrous by reaction with a slight excess of Ca
           B.p. of the ethanol thus obtained was 78.29 - 78.31 °C.
 metal.
ESTIMATED ERROR: Precision in soly not stated. Temperature \pm 0.1 °C.
REFERENCES:
 1. Smith, G.F. J. Am. Chem. Soc. 1923, 45, 2072.
 2. Willard, H.H.; Smith, G.F. J. Am. Chem. Soc. 1923, 45, 286.
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COMPONENTS :	ORIGINAL MEASUREMENTS:					
<pre>(1) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>	Lepeshkov, I.N.; Sal'nikova, L.N.					
<pre>(2) Ammonium perchlorate; NH₄ClO₄; [7790-98-9]</pre>	Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1973</u> , 120, 120-5.					
(3) Hexamethylenetetramine; $C_6H_{12}N_4$ [100-97-0]						
(4) Water; H_2O ; [7732-18-5]						
VARIABLES:	PREPARED BY:					
Temperature: 298 K Composition	N.A. Kozyreva					
EXPERIMENTAL VALUES: Solubility system NaClO ₄ -NH ₄ ClO ₄ -C ₆	H ₁₂ 0 ₄ -water at 25 ^{. o} C :					
Liquid phase compositio	n					
	molality ^a / mol kg ⁻¹ Solid					
(1) (2) (3) (1) (2) (3						
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	86 - 1.190 6.202 B + C 84 - 1.081 6.881 C + D 59 3.323 - 7.714 D + E					
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$					
14.15 3.71 41.12 4.25 1.162 10 42.39 3.23 15.95 13.21 1.049 4 50.87 3.58 12.79 17.64 1.294 3 61.38 2.21 5.45 22.01 0.826 1 65.18 1.95 2.58 23.67 0.738 0	.79 2.817 0.770 7.151 B + D + E .34 9.009 0.715 2.961 A + B + E .87 12.682 0.930 2.785 A + E + F .707 16.192 0.608 1.256 A + F + G .818 17.575 0.548 0.608 A + G + H					
A Compiler's calculations.						
^b $A = NH_4ClO_4$; $B = NH_4ClO_4.C_6H_{12}N_4$						
$D = C_6H_{12}N_4; E = NaClO_4 \cdot C_6H_{12}N_4; G = NaClO_4 \cdot H_2O; H = n(NH_4ClO_4).$						
AUXILIARY I	VFORMATION					
	· · · · · · · · · · · · · · · · · · ·					
METHOD/APPARATUS/PROCEDURE: Method of "invariant points" used; to the satd slns corresponding to	SOURCE AND PURITY OF MATERIALS: Not stated. ESTIMATED ERROR:					
the eutonic and transition points of the ternary systems, relevant						
salt or hexamethylenetetramine was added until a new solid phase	Not stated.					
appeared. Periods of equilibration varied from 2 weeks to 1 month.	REFERENCES :					
	(continued next page)					

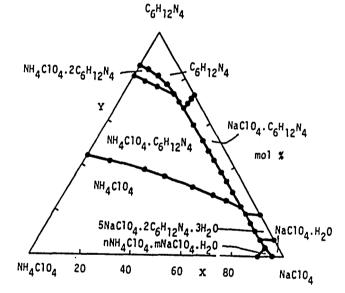


EXPERIMENTAL VALUES: (continued)

COMMENTS AND/OR ADDITIONAL DATA

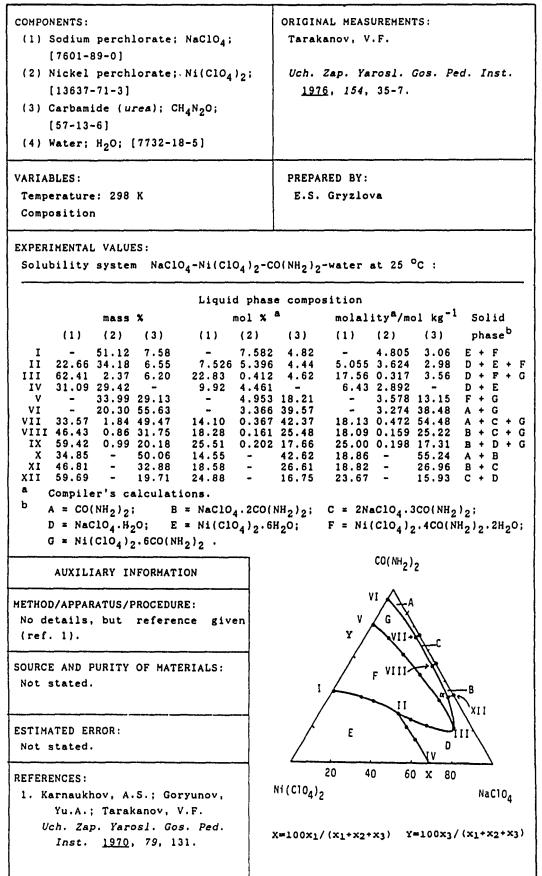
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The diagram given below, in which solute mol X values are plotted, shows eight crystallization fields: NH_4ClO_4 ; $NH_4ClO_4.C_6H_{12}N_4$; $NH_4ClO_4.2C_6H_{12}N_4$; $C_6H_{12}N_4$; $NaClO_4.C_6H_{12}N_4$; $5(NaClO_4).2(C_6H_{12}N_4).3H_2O$; $NaClO_4.H_2O$; and solid solutions represented by $n(NH_4ClO_4).m(NaClO_4)$.



 $X=100x_1/(x_1+x_2+x_3)$ $Y=100x_3/(x_1+x_2+x_3)$

COMPONENTS: ORIGINAL MEASUREMENTS:					
	1				
(1) Sodium perchlorate; NaClO ₄ ; Bestuzheva, M.M.; Kinderov	. A.P. 1				
•	Karnaukhov, A.S.				
(2) Copper perchlorate; $Cu(ClO_4)_2$;					
[13770-18-8] Sb. Tr. Yarosl. Gos. Ped.	Inst				
(3) Benzamide; C_7H_7NO ; [55-21-0] <u>1978</u> , 169, 47-51.	11130.				
(4) Water; H_2O ; [7732-18-5]	1				
(4) water, n ₂ 0; [//32-10-5]					
VARIABLES: PREPARED BY:					
Composition.					
EXPERIMENTAL VALUES:					
	1				
Solubility system $NaClO_4-Cu(ClO_4)_2-C_6H_5CONH_2$ -water at 25 °C :					
Liquid phase composition					
	Solid				
	pnase				
66.71 - 1.33 23.38 - 0.471 17.05 - 0.344 A	+ B + C				
- 47.35 4.93 - 6.286 1.42 - 3.781 0.853 C	+ B				
62.73 5.20 9.85 27.74 1.073 4.40 23.06 0.892 3.659 A 49.63 15.99 0.74 17.32 2.604 0.26 12.05 1.811 0.182 A	+ C + C				
35.71 27.41 0.55 12.07 4.321 0.19 8.03 2.875 0.125 A	+ C				
27.57 36.07 0.89 9.63 5.876 0.31 6.35 3.875 0.207 A 18.12 43.83 0.76 6.19 6.984 0.26 3.97 4.479 0.168 A	+ C + B + C				
6.00 50.65 0.95 1.88 7.413 0.30 1.156 4.552 0.185 B	+ č				
8.17 48.50 0.72 2.54 7.046 0.23 1.566 4.337 0.139 B	+ 0				
12.76 45.51 0.82 4.08 6.786 0.26 2.547 4.239 0.165 B	+ č				
16.61 43.85 0.77 5.51 6.789 0.26 3.499 4.310 0.164 B	+ C				
mass \times mol \times amolality a/mol kg ⁻¹ (1)(2)(3)(1)(2)(3)17.6845.62-6.137.380-3.9354.736-66.71-1.3323.38-0.47117.05-0.344-47.354.93-6.2861.42-3.7810.853C62.735.209.8527.741.0734.4023.060.8923.659A49.6315.990.7417.322.6040.2612.051.8110.182A35.7127.410.5512.074.3210.198.032.8750.125A27.5736.070.899.635.8760.316.353.8750.207A18.1243.830.766.196.9840.263.974.4790.168A6.0050.650.951.887.4130.301.1564.5520.185B8.1748.500.722.547.0460.231.5664.3370.139B10.2447.280.653.236.9530.211.9994.3070.128B12.7645.510.824.086.7860.262.5474.2390.165B16.6143.850.775.516.7890.263.4994.3100.164BaCompiler's calculations.bA = NaClO4·H2O;B = C					
^D A = NaClO ₄ ·H ₂ O; B = Cu(ClO ₄) 2·5H ₂ O; C = C ₆ H ₅ CONH ₂					
AUXILIARY INFORMATION <u>COMMENTS_AND/OR_ADDITIONAL</u>	_DATA:				
The diagram below shows t	hree				
METHOD/APPARATUS/PROCEDURE: crystallization fields: N	aC104.H20,				
Details of saturation method not $C_6H_5CONH_2$, and $Cu(ClO_4)_2$.	5H ₂ O.				
given. Benzamide was determined NaClO ₄					
by the Kjeldahl method; Cu ²⁺ iodi-					
metrically; ClO ₄ by nitron pptn.;					
Na ⁺ by difference.					
SOURCE AND PURITY OF MATERIALS:					
Not stated.	j				
mass X	mass %				
ESTIMATED ERROR:	\land				
Not stated.					
B 104)2	20				
//					
The eutonic composition (mass x): 20 40 60 x 80	<u> </u>				
$\begin{array}{c cccc} 10 & ccm positivin (mass x) \\ 18.12 \times NaClO_4, 43.83 \times Cu(ClO_4)_2, & Cu(ClO_4)_2 \\ \end{array} \qquad \begin{array}{c ccccccccccccccccccccccccccccccccccc$	C6H5CONH2				
$0.76 \times C_6 H_5 CONH_2$ and $37.29 \times H_2 O.$					
X=100x1/(x1+x2+x3) Y=100x3/	(x ₁ +x ₂ +x ₃)				



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COMPONENTS: (1) Sodium perch: [7601-89-0] (2) Sodium Chlor: [7775-09-9] (3) Sodium chlor: [7647-14-5] (4) Water; H2O;	ate; NaClO3; ide; NaCl;	 ORIGINAL MEASUREMENTS: 1. Il'in, K.G.; Loseva,G.K.; Semchenko, D.P. <i>Tr. Novoch. Politekhn. Inst.</i> <u>1969</u>, 197, 37-44. 2. Loseva, K.G.; Semchenko, D.P.; Il'in, K.G. <i>Tr. Novoch. Politekhn. Inst.</i> <u>1969</u>, 197, 45-49. 3. Loseva, G.K. <i>Tr. Novoch. Politekhn. Inst.</i> <u>1969</u>, 197, 78-81. 				
ARIABLES: Temperature: 313.; Composition.	2 K and 333.2 K.	PREPARED BY: E.S. Gryzlova				
mass X	mol	Solid x ^a molality ^a /mol kg ⁻¹ phase ^b				
	(1) (3) (2)					
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	7.20 5.04 8.86 0.90 4.83 8.87 2.40 4.63 8.61 3.90 4.26 8.66 3.90 4.26 8.62 2.30 3.48 8.12 3.70 3.09 5.86 7.60 3.40 8.16 0.70 2.91 7.82 0.70 2.93 5.92 0.70 1.98 6.32 3.90 1.65 6.22 8.60 1.46 5.83 1.20 1.21 5.54 1.20 1.12 5.22 1.40 1.19 5.06 3.30 1.11 5.73 5.40 0.97 5.26 5.50 0.89 4.98 3.70 1.39 0.00 3.40 1.47 1.22 2.40 1.01 1.31 1.60 0.94 1.86	1 1.10 3.50 5.99 0.73 $A + B$ 8 1.75 3.31 5.85 1.15 $A + B$ 7 2.73 3.21 5.89 1.81 $A + B$ 1 3.11 3.07 5.71 2.07 $A + B$ 8 3.53 2.83 5.77 2.35 $A + B$ 8 3.53 2.83 5.77 2.35 $A + B$ 2 5.98 2.35 5.47 4.03 $A + B$ 2 5.98 2.35 5.47 4.03 $A + B$ 0 5.92 2.01 3.78 3.86 $A + B$ 2 8.91 2.01 5.40 6.15 $A + B$ 1 8.94 1.50 3.96 5.99 $A + B$ 2 12.43 1.39 4.43 8.70 $A + B$ 3 16.11 1.06 4.23 11.67 $A + B$ 3 16.11 1.06 4.23 11.67				

a Compiler's calculations.

b A = NaCl; B = NaClO₃; C = NaClO₄.H₂O.

(continued next page)

ORIGINAL MEASUREMENTS: 1. Il'in, K.G.; Loseva,G.K.;

- Semchenko, D.P. Tr. Novoch. Politekhn. Inst. <u>1969</u>, 197, 37-44.
- 2. Loseva, K.G.; Semchenko, D.P.; Il'in, K.G. Tr. Novoch. Politekhn. Inst. <u>1969</u>, 197, 45-49.
- Loseva, G.K.
 Tr. Novoch. Politekhn. Inst. 1969, 197, 78-81.

EXPERIMENTAL VALUES: (continued)

(1) Sodium perchlorate; NaClO4;

(2) Sodium Chlorate; NaClO₃;

(3) Sodium chloride; NaCl;

(4) Water; H2O; [7732-18-5]

[7601-89-0]

[7775-09-9]

[7647-14-5]

COMPONENTS:

1

Solubility system NaClO₄-NaClO₃-NaCl-water at 60.0 $^{\circ}$ C :

									Soli	d
	mass	x		mol X4	R	molali	ty ^a /mo	ol kg ⁻¹	phas	e ^b
(3)	(2)	(1)	(3)	(2)	(1)	(3)	(2)	(1)		
6.30	45.80	4.80	3.63	14.49	1.32	2.50	9.98	0.91	A + 3	В
5.00	41.00	12.90	2.99	13.48	3.69	2.08	9.37	2.56	A +	B
4.10	36.40	21.40	2.60	12.66	6.47	1.84	8.98	4.59	A +	В
3.20	32.90	27.70	2.11	11.89	8.70	1.51	8.54	6.25	A +	В
2.80		32.30	1.91	11.37	10.50	1.39	8.28	7.65	A +	В
2.30	27.50	37.60	1.63	10.70	12.72	1.21	7.93	9.42	A +	В
2.00		40.10		10.16		1.07		10.20	A +	
1.80	24.00	42.60	1.31		14.75	0.97		11.01	A +	
1.40		48.50	1.09		17.96	0.84		13.90	A +	
1.20		52.20	0.96		19.93	0.75		15.67	A +	
1.10	18.40	53.70	0.89		20.71	0.70		16.36	A +	
1.00		55.10	0.83		21.84	0.67		17.58	A +	
0.90	17.00	57.60	0.77		23.46	0.63		19.20	A +	
0.80		59.60	0.70		24.83	0.58		20.63	A +	
		61.50	0.63		26.34	0.53		22.32	A + 1	
0.80		69.80			27.94			22.27	A +	
		65.20	0.65		29.05	0.57		25.36	A + 1	-
		calculat		0111	20.00	0.01	5.00	20100	n ' '	-

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Saturation details not given.	Chemically pure and reagent grade
Satd. slns. reached equilibrium in	salts were recrystallized twice;
24 h at 40 $^{\circ}$ C. Clo ₃ was deter-	99.6 - 99.9 % pure.
mined by titration with KMnO ₄ std. sln. in the presence of Mohr's salt; perchlorate determined chro- matographically (no details). The	ESTIMATED ERROR: \pm 0.1 °C in temperature.
composition of the solid phase was determined by Schreinemakers' me- thod and optical crystallography and X-ray powder analysis were employed.	COMMENTS: The eutonic composition at 40 ^O C (mass X): 1.05X NaCl, 11.68X NaClO ₃ and 58.40X NaClO ₄ .

COMPONENTS: (1) Sodium chloride; NaCl; [7647-14-5] (2) Sodium perchlorate; NaClO ₄ ; [7601-89-0] (3) Potassium chloride; KCl; [7447-40-7] (4) Potassium perchlorate; KClO ₄ ; [7778-74-7]	ORIGINAL MEASUREMENTS: Karnaukhov, A.S.; Troitskii, E.N. Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1966</u> , 59, 8-21.
[7778-74-7], (5) Water; H ₂ O; [7732-18-5] VARIABLES: Temperature: 363 K. Composition.	PREPARED BY: I.S. Bodnya

EXPERIMENTAL VALUES:

Solubility system Na⁺, K⁺ [] ClO_4^- , Cl^- - water at 90 $^{\circ}C$:

		Li	quid pha	se compo	sition			Solid			
	maa	S X		mol	ality ^a /	mol kg	-1	phaseb			
(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)				
0.84	72.75	-	2.71	0.606	25.07	-	0.825	A + B + (
0.83	72.71	-	2.70	0.598	24.99	-	0.820	A + B + 0			
0.79	72.70	-	2.69	0.567	24.93	-	0.815	A + B + 0			
0.84	72.75	-	1.56	0.578	23.91	-	0.453	A + B			
6.13	47.83	-	2.32	2.399	8.94		0.383	A + C			
10.20	36.38	-	2.55	3.431	5.841	-	0.362	A + C			
12.52	30.41	• -	2.74	3.943	4.571	-	0.364	A + C			
17.04	19.28	-	3.01	4.806	2.595	-	0.358	A + C			
19.73	14.91		3.53	5.460	1.969	-	0.412	A + C			
23.22	5.70	-	4.48	5.966	0.699	-	0.485	A + C			
23.32	-	5.55	4.47	5.986	-	1.117	0.484	A + C			
22.02	-	7.82	3.91	5.687	-	1.583	0.426	A + C			
20.96	-	10.55	1.96	5.391	-	2.127	0.213	A + C			
16.89	-	13.47	0.84	4.201	-	2.626	0.088	A + C			
15.71	-	19.96	1.19	4.257	-	4.240	0.136	A + C + I			
15.97	~	20.05	1.21	4.353	-	4.284	0.139	A + C + I			
15.82	-	20.04	1.20	4.301	-	4.271	0.138	A + C + I			
12.23	-	23.27	1.53	3.323	-	4.957	0.175	C + D			
8.42	-	26.39	1.67	2.268	-	5.573	0.190	C + D			
4.57	-	30.15	1.72	1.230	-	6.362	0.195	$\tilde{C} + D$			
-	73.83	-	2.36	-	25.33	_	0.715	C + B			
0.88	67.17	-	-	0.471	17.17	-	-	A + B			
16.90	-	20.80	-	4.642	-	4.478	-	A + E			
	-	34.11	2.42	_	_	7.208	0.275	C + E			

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Method of invariant points used; to a satd eutonic sln of a ternary system a third salt was added until a new solid phase appeared. K⁺ was determined by the tetraphenylborate gravimetric method; Na⁺ gravimetricSOURCE AND PURITY OF MATERIALS: Not stated.

ESTIMATED ERROR:

Temperature: \pm 0.05 °C.

(continued next page)

COMPONENTS :	ORIGINAL MEASUREMENTS:
<pre>(1) Sodium chloride; NaCl; [76474~5]</pre>	Karnaukhov, A.S.; Troitskii, E.N.
(2) Sodium perchlorate; NaClO ₄ ; [7601-89-0]	Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1966</u> , 59, 8-21.
<pre>(3) Potassium chloride; KCl; [7447-40-7]</pre>	
<pre>(4) Potassium perchlorate; KClO₄; [7778-74-7]</pre>	
(5) Water; H ₂ O; [7732-18-5]	

EXPERIMENTAL VALUES: (continued)

.

					101	mol X ⁴		pn	ase	
	mol %	a		Ca	ation	An	lon			
(1)	(2)	(3)	(4)	Na ⁺	к+	C1_	C104			
0.74	30.57	-	1.006	96.89	3.11	2.29	97.71	A +	B	+ C
0.73	30.51	-	1.001	96.89	3.11	2.26	97.74	A +	B	+ C
0.69	30.47		0.996	96.90	3.10	2.16	97.84	A +	B	+ C
0.72	29.72	-	0.563	98.18	1.82	2.32	97.68	A +	В	
3.57	13.29		0.570	96.73	3.27	20.48	79.52	A +	С	
5.27	8.97	-	0.555	96.24	3.76	35.61	64.39	A +	С	
6.12	7.10	-	0.565	95.90	4.10	44.41	55.59	A +	С	
7.60	4.10	-	0.566	95.39	4.61	61.94	38.06	A +	С	
8.62	3.11	-	0.650	94.75	5.25	69.63	30.37	A +	С	
9.52	1.12	-	0.775	93.21	6.79	83.43	16.57	A +	С	
9.49	-	1.77	0.767	78.90	21.10		6.38	A +		
9.00	-	2.50	0.674	73.89	26.11	94.47		A +	С	
8.52	-	3.36	0.336	69.73	30.27	97.25	2.75	A +	С	
6.73	-	4.21	0.141	60.75	39.25	98.73	1.27	A +	С	
6.64	-	6.61	0.212	49.31	50.69	98.42	1.58	A +		
6.77	-	6.66	0.216	49.60	50.40	98.41	1.59	A +		
6.70	-	-6.65	0.214	49.38	50.62	98.42	1.58	A +		+ D
5.20	-	7.75	0.274	39.30	60.70	97.93	2.07	C +		
3.57	-	8.77	0.299	28.24			2.36	C +	-	
1.94	-	10.1	0.309	15.80		97.49	2.51	C +		
-	31.06	-	0.877	97.25	2.75	-		B +	С	
0.64	23.47	-	-	100.00	-	2.67	97.33	A +		
7.18	-	6.93	-	50.90	49.10	100.00	-	A +		
-	-	11.44	0.437	-	100.00	96.32	3.68	C +	Е	

```
a Compiler's calculations.
b A = NaCl; B = NaClO<sub>4</sub>; C = KClO<sub>4</sub>; D = m(KCl).n(KClO<sub>4</sub>)
E = KCl
```

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: ally as sodium uranyl acetate; per- clorate gravimetrically with nitron	REFERENCES :
and chloride mercurimetrically. Optical crystallographic and differ- ential thermal analyses of the solid	
phases were carried out.	

COMPON	ENTS :					ORIGINAL	MEASURE	MENTS :		
		chrome	e; Na ₂ C	-0.t			ina, G.V			
	[7775-1]		., na201	.~4.		<i>»</i> 1 u21111		•		
(2) 5	odium ;	perchi	orate; Na	C104;		Uch. Za	p. Yaros	l. Gos.	Ped. Inst.	
(7601-8	9-0]		•		<u>1966</u> ,	59, 73-	82.		
(3) E	Potassi	um chro	omate; K	,Cr04;	ł					
	[7789-0		•							
	-	-	chlorate	KC10.:						
	7778-7			,						
	-	-	7732-18-	< 1						
	ateri	ⁿ 2 ⁰ , t		· · ·				<u></u>		
VARIA	BLES:					PREPARED	BY:			
Tempe	erature	: 323	ι.		ļ	N.A. Ko	zyreva			
Compo	osition	•								
					l.					
EXPERI	IMENTAL	VALUE:	5:							
			ou. +	+				50 Q-	_	
501ut	oility :	system	ZNA',	2K. 2		uro 4 -	water at	50 °C	:	
			Liquid	phase c	omposi	tion			Solid	
Poir	nt	mai	15 X			olality ^a	/ mol k	s ⁻¹	phaseb	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)		
I	-	-	40.95	0.55	-	_	3.605	0.068	A + B	
	2.59		37.66	0.46		0 -	3.271	0.056		
II	6.04	-	37.32	-	0.65	в –	3.393		B + C	
III	5.78	-		0.49	0.61	1 -			A + B + C	
	7.64			0.44				0.055		
	15.56					1 -	2.630	0.075		
	20.86			0.49				0.061	A + C	
	27.62		13.40	0.52	2.91	7 -	1.180	0.064		
Ŧ1/	37.73		8.52 5.87	0.53	4.37	· -	0.824	0.072		
	44.35		5.87				0.607 0.290		C + D	
•								*****	A + C + D	
							(cont	inued n	ext page)	
				AUXILIA	RY INF	ORMATION				
METHO	APPAR	TUS/P	OCEDURE			SOURCE A	ND PURIT	Y OF MA	TERIALS:	
	•		udy invo						salts were	
		-	ization				d by rec			
	izatio	•		ersatura		-	•	•	salts were	
solut	ions.	Detai	ls of a	aturati	on	-	ted (no			
Were	not giv	/en.	Sodium	was det	er-					
mined	i gravi	netrica	lly as a	sodium z	inc					
urany	l ace	tate a	and by fl	ame pho	to- -					
metry	; potas	ssium a	s potass	ium tet	ra-	ESTIMATE	D ERROR:			
					. 1					

Not stated.

phenylborate; chromate iodimetrical-

ly and perchlorate by difference.

REFERENCES:

(continued next page)

COMPO	NENTS:				1.	ORIGINAL	MEASUR	EMENTS :		
(1)		chromat	e; Na ₂	Cr0 ₄ ;	Druzhinina, G,V.					
(2)	-	perchlo	rate;	NaClO ₄ ;			ap. Yard , 59, 73		. Ped. Inst	
		ium chro	mate;	K ₂ CrO ₄ :		<u></u> ,				
	[7789-0			2 T						
(4)	Potassi	ium perc	hlorat	e; KClO ₄						
	[7778-7	-								
(5)	Water;	н ₂ 0; [7	732-18	-5]		- · ·		<u>_</u>		
XPER	IMENTAI	L VALUES	: (con	tinued)						
Solu	bility	system	2Na ⁺ ,	2к+ 11	2C10 <mark>4</mark> ,	Cr04 ²⁻ -	water a	t 50 °C	:	
			-	d phase	composi		_	_1	Solid	
Poi			s %						phase ^b	
					(1)				A + D	
	48.15	2.61 5.14	-	0.49	6.40	5 0.430 9 0.905	5 -	0.072 0.051	A + D	
	42.59	13.42	-	0.33	6.02	3 2.510) -	0.055	A + D	
	39.58	18.21 31.06	-	0.25 0.36	5.82 4.63	4 3.544	-	0.043	A + D A + D	
		39.03		0.36	4.03	8 8.889 3 8.889		0.058	A + D A + D	
VI	19.69	47.82	-	0.27	3.77	3 12.12	-	0.060	A + D + E	
VII	19.47	47.02	-		3.58	7 11.46	-		D + E	
		51.64 58.54		0.31	2.96	2 12.99 4 15.83	-	0.069 0.076		
	7.87	64.06	-	0.40	1.75	6 18.91	-	0.104	A+E	
VIII	6.70	65.60 67.19	-	0.49		0 19.69	-	0.130	A + E + F	
IX				-	1.49	9 20.79		- 0.136	E + F	
x		72.65	-	0.61	-	22.19	-	0.165	A + F	
		L	iquid	phase co	mpositi				Solid	
			_			ion mo			phaseb	
		mol			Cat			ion		
Poin	-	(2)	(3)	(4)	2Na ⁺	2K ⁺	CrO_4^{2-}	20104		
I	- 0.46	-	6.09 5.53	0.115 0.095	- 7.56	100.00 92.44	99.07 99.22	0.93 0.78	A + B A + B	
II	1.11	-	5.70	-	16.25		100.00	-	B + C	
III	1.03	-	5.24	0.102	16.29	83.71	99.19	0.81	A + B + C	
	1.38 2.89	-	5.23 4.39	0.093 0.126	20.77 39.35	79.23 60.65	99.30 99.14	0.70 0.86	A + C A + C	
	3.71	-	3.02	0.102	54.71	45.29	99.25	0.75	A + C	
	4.89	-	1.98	0.108	70.64	29.36	99.22	0.78	A + C	
IV	7.20 8.93	-	1.36 0.99	0.118	83.57 90.06	16.43 9.94	99.31 100.00	0.69	A + C C + D	
v	10.61	-	0.46	0.263	94.70	5.30	98.82	1.18	A + C + D	
	9.78	0.70	-	0.117	99.43	0.57	95.98	4.02	A + D	
	10.19 9.40	1.44 3.92	-	0.082 0.085	99.63 99.63	0.37 0.37	93.06 82.44	6.94 17.56	A + D A + D	
	8.97	5.46	-	0.066	99.72	0.28	76.45	23.55	A + D	
	6.95	9.71	-	0.099	99.58	0.42	58.64	41.36	A + D	
	6.22	12.93	-	0.085	99.67	0.33	48.85	51.15	A + D	
							(co	ntinued	next page)	

216	
COMPONENTS:	ORIGINAL M
(1) Sodium chromate; Na ₂ CrO ₄ ;	ORIGINAL MI Druzhining
[7775-11-3]	
(2) Sodium perchlorate; NaClO ₄ ;	Uch. Zap.
[7601-89-0]	<u>1966</u> , 5

- (3) Potassium chromate; K₂CrO₄; [7789-00-6]
- (4) Potassium perchlorate; KClO₄ [7778-74-7]

EASUREMENTS: a, G.V.

Yarosl. Gos. Ped. Inst. 9, 73-82.

EXPERIMENTAL VALUES: (continued)

(5) Water; H₂O; [7732-18-5]

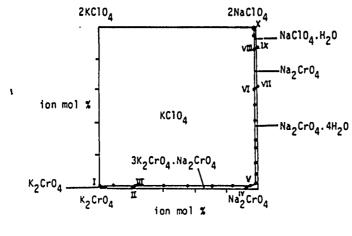
						ion m	ol % ^a		Solid	
		mol	x ^a					nion phase ^b		
Point	(1)	(2)	(3)	(4)	2Na ⁺	2K ⁺	$Cr0_4^{2-}$	20104		
VI	5.28	16.96	-	0.085	99.69	0.31	38.25	61.75	A + D + E	
VII	5.08	16.24	-	-	100.00	-	38.50	61.50	D + E	
	4.14	18.16	-	0.096	99.64	0.36	31.21	68.79	A + E	
	3.03	21.49	-	0.104	99.62	0.38	21.93	78.07	A + E	
	2.30	24.79	-	0.137	99.54	0.46	15.59	84.41	A + E	
VIII	1.98	25.62	-	0.169	99.43	0.57	13.30	86.70	A + E + F	
IX	1.93	26.72	-	-	100.00		12.61	87.39	E + F	
	0.97	27.00	-	0.176	99.40	0.60	6.65	93.35	A + F	
Х	-	28.50	-	0.211	99.26	0.74	-	100.00	A + F	

a Compiler's calculations

^b A = $KC10_4$; B = K_2Cr0_4 ; C = $Na_2Cr0_4 \cdot 3K_2Cr0_4$; D = $Na_2Cr0_4 \cdot 4H_2O$; $E = Na_2CrO_4$; $F = NaClO_4.H_2O$

COMMENTS / ADDITIONAL DATA

The Janecke diagram given below shows six crystallization fields : $KClO_4$; $NaClO_4$. H_2O ; Na_2CrO_4 ; Na_2CrO_4 . $4H_2O$, Na_2CrO_4 . $3K_2CrO_4$ and K_2CrO_4 . Points I, II, VII, IX and X correspond to the average compositions of the liquid phases of the isothermal double saturation points of the ternary systems, e.g. point II in the system $K_2CrO_4-Na_2CrO_4-H_2O$ and point VII in the system NaClO₄-Na₂CrO₄-H₂O. Compositions of triple saturation points III, V, VI, VIII are given in the preceding tables. Potassium perchlorate was nearly completely salted out from solution by all the other salts of the system. The equilibrium of the exchange reaction $2NaClO_4 + K_2CrO_4 = 2KClO_4 + Na_2CrO_4$ was shifted to the right.



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COMPONENTS: (1) Sodium chloride; NaCl; [7647-14-5] (2) Sodium perchlorate; NaClO ₄ ; [7601-89-0] (3) Cesium chloride; CsCl; [7647-17-8] (4) Cesium perchlorate; CsClO ₄ ; [13454-84-7] (5) Water; H ₂ O; [7732-18-5] VARIABLES: Temperature: 298.2 K and 348.2 K.	ORIGINAL MEASUREMENTS: Shklovskaya, R.M.; Arkhipov, S.M.; Kuzina, V.A. Zh. Neorg. Khim. <u>1974</u> , 19, 3128-33; *Russ. J. Inorg. Chem. Engl. Transl.) <u>1974</u> , 19, 1711-4. PREPARED BY: W.L. Ng					
Composition.						
EXPERIMENTAL VALUES: Solubility system Na ⁺ ,Cs ⁺ Cl ⁻ ,Cl	·					
Liquid phase composi	ition Solid phase ^b					
mass X	mol X ^a					
(1) (2) (3) (4) (1)) (2) (3) (4)					
	- 16.633 0.0919 A + B 2232 - 15.329 0.0570 B + C					
	9503 - 14.601 0.0465 B + C 5430 - 13.029 0.0433 B + C					
4.042 - 56.311 0.258 2.6	6691 - 12.908 0.0429 B + C					
	6155 - 11.120 0.0428 B + C 7891 - 9.472 0.0505 B + C					
	3170 - 9.155 - B + C					
10.034 - 41.502 0.220 5.5	5436 - 7.959 0.0306 C + D					
12.652 - 34.262 0.272 6.4	4569 - 6.070 0.0349 B + C + D					
AUXILIARY	INFORMATION					
No details of saturation method were given. A thermostat main-	SOURCE AND PURITY OF MATERIALS: The salts were at least 99.5 % pure.					
tained the temperature constant to within \pm 0.1°C. Equilibrium was attained after 2-3 weeks at 25°C and 7-15 days at 75°C. Cs ⁺ was analysed by precipita-	ESTIMATED ERROR: Temperature: \pm 0.1°C. Solubility : not stated.					
tion with sodium tetraphenyl- borate (ref. 1); Cl ⁻ by argen-	REFERENCES: 1. Yanson, E.Yu.; Ievin'sh, A.F.					
tometric method (ref. 2); ClO_4^- by precipitation with nitron	Uspekhi Khim. <u>1953</u> , 28,980. ² .Hillebrand, W. F.; Lundell					
(ref.3) for concentrations	G.E.F.; Bright, H.A.; Hoffman, J.I.					
higher than 1.5%, otherwise by photometry involving the use of	G.E.F.; Bright, H.A. ; Hoffman, J.I. Applied Inorganic Analysis, Gosk- himizdat, Moscow, <u>1964</u> , 745 (continued next page)					

OMPONEN				OF		MEASUREM		
	47-14-5	oride; N]	aci;	e I	Kuzina		M.; AFKD	ipov, S.M.
(2) Sod	ium per	chlorate	; NaClO ₄ ;					
[76	01-89-0]				rg. Khim		
(3) Ces	ium chl	oride; C	sCl;		3128-3	3; [*] <i>Russ</i>	. J. Ind	org. Chem.
[76	47-17-8]			Engl.	Transl.)	1974,	19, 1711-4
(4) Ces	ium per	chlorate	; CsClO ₄ ;					
{13	454-84-	7]						
(5) Wat	er; H ₂ 0	; [7732-	18-5]					
XPERIME	NTAL VA	LUES: (c	ontinued)	1				
Solubil	ity sys	tem Na ⁺	,Cs ⁺ C	21 ⁻ ,C10 <mark>-</mark> ,	water	at 25.0 ⁶	⁰ C : (co	ontinued)
		Liquid	phase co	mposition				Solid
	A		-1			mol X ^A		phase ^b
			g ⁻¹				nion	
(1)		(3)		Na ⁺			-	_
- 0.147	-	11.087	0.0612		100.00 98.57	99.45 99.63		
0.625	-		0.0375		93.91	99.70		
1.673	-		0.0285		83.71	99.72	0.28	B + C
1.756 2.355	-		0.0282	17.09	82.91	99.73		
			0.0279		75.54	99.71	0.29	B + C
	-		0.0327	33.46		99.65		
4.148 3.559	-	6.012	- 0.0196	40.83 40.96		100.00 99.77		B + C C + D
	-		0.0222	51.40				B + C + I
4.845	-		0.0203	70.67			0.30	
5.042	-		0.0191	76.91		99.71	0.29	B + D
5.333	-		0.0238	86.89	13.11	99.61	0.39 0.72	B + D
5.553			0.0424	94.08	5.92	99.28	0.72	B + D
5.672	-			97.60	2.40	97.60	2.40 8.29	B + D
	0.495 1.073		0.0449 0.0283	99.31 99.57	0.69	91.71	8.29	B + D B + D
4.710	1.776		0.0204	99.69		72.39		B + D B + D
	3.245		0.0343		0.48			B + D + E
1.898	4.985	-	0.0380	99.45	0.55	27.42	72.58	B + E
1.051	5.516	-	0.0419	99.37	0.63	15.91	84.09	B + E
-	6.362	-	0.0433	99.32	0.68	-	100.00	B + E
-	7.360	-	0.0454	99.39	0.61	~	100.00	E + F
0.243	6.109 4.813	-	0.0372 0.0261	99.42 99.56	0.58 0.44	3.80 18.69		E + F E + F
1.478	4.758	-	0.0223	99.64	0.36	23.61		E + F E + F
3.500	4.964	-	0.0280	99.67	0.33	41.22		D + E + F
2.797	6.847	-	0.0261	99.73	0.27	28.93		D + F
2.555	7.405	-	0.0210	99.79	0.21	25.60		D + F
_	9.544	-	0.0214	99.81	0.19	15.43		D + F
1.745	12.445	-	0.0233	99.83	0.17	8.75		D + F
1.195	16 705		0.0352	99.80	0.20	2.89	96.11	D + F + G
1.195 0.678	16.725					1 64	3 N R P	F + C
1.195	16.725 17.720 18.019	-	0.0379	99.79 99.90	0.21 0.10	1.54	98.46 100.00	F + G F + G

(continued next page)

COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Sodium chloride; NaCl; [7647-14-5]</pre>	Shklovskaya, R.M.; Arkhipov, S.M.; Kuzina, V.A.
<pre>(2) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>	Zh. Neorg. Khim. <u>1974</u> , 19,
<pre>(3) Cesium chloride; CsCl; {7647-17-8}</pre>	3128-33; [*] Russ. J. Inorg. Chem. Engl. Transl.) <u>1974</u> , 19, 1711-4.
<pre>(4) Cesium perchlorate; CsClO₄; [13454-84-7]</pre>	
(5) Water; H ₂ O; [7732-18-5]	

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EXPERIMENTAL VALUES: (continued) Solubility system Na^+, Cs^+ || Cl^-, ClO_4^- , water at 25.0 ^OC : (continued)

		Liguid	phase co	mposition		_		Solid			
	mas				mol	ת		phaseb			
(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)				
17.448		20.646	0.290	7.7694	-	3.191	0.0325	B + D			
9,001	-		0.286	8.1238	-	2.409					
1.515	-	9.075	0.381	8.6512		1.267					
3.412	-	3.731	0.710	9.0417		0.500	0.0690	B + D			
4.305		-	2.378	9.2503	-	-	0.2276	B + D			
4.567		-	0.734 0.451	9.6237	0.798	-	0.0723	B + D			
1.997	9.003	-	0.451	8.8418		-	0.0456	B + D			
8.381		-	0.316	7.5944	2.864	-	0.0328	B + D			
6.411	24.306		0.488			-	0.0547	B + D +			
3.518		-	0.511 0.558	3.040 1.693	7.984 8.879	-	0.0009	B T E			
3.510	43.540	-	0.558		0.013	-	0.0875				
	43.540		0.503	-	10.275 11.698 9.870	_	0.0690 0.2276 0.0723 0.0456 0.0328 0.0547 0.0609 0.0675 0.0700 0.0722 0.0601 0.0424 0.0360 0.0438 0.0400 0.0321 0.0321 0.0336	0 T E			
0.801	42.240	-	0.552 0.488 0.365	0.392	9.870	-	0.0601	6 - F			
3.916			0.365	1 010	7.831	-	0.0424	F + F			
5.158			0.309	2.392	9.870 7.831 7.704	-	0.0360	E + F			
1.247		-	0.309 0.358	5.469	7.756	-	0.0438	D + E +			
8.142	41.754	-	0 202	A 202	10.506	-	0.0400	D+F			
7.246	41.754 43.994	-	0.237	3.902	10.506 11.307	-	0.0321	D + F			
4.483	51.352	-	0.237	2.612	14.283	- ·	0.0321	D + F			
2.688	58.628	-	0.208	1.728 0.929 0.378	17.991	-	0.0336	D + F			
		-	0.264	0.929	22.928	-	0.0482	D + F +			
0.508	67.914	-	0.276	0.378	24.094	-	0.0516	F + G			
-	68.722	-	0.130	-	24.501	-	0.0244	F + G			
	64.144 ler's ca	-		0.945	17.991 22.928 24.094 24.501 21.279	-	0.0321 0.0336 0.0482 0.0516 0.0244	D + G			
						a 1.					
A = C	SCI; B	$= CSCIO_4$; C = C	⁸ 1-x ^{NA} x ^{CI}	; D = Na	CI;					
E = 3	CsClO ₄ .N	aC104;	F = CsCl	O_4 .NaClO ₄	; G = Na	с10 ₄ .н ₂ с	P; H = N	aClO4			
			AUXIL	IARY INFO	RMATION						
ETHOD/A	PPARATUS	/PROCEDU	RE :	REFERE	NCES :						
			benzene		ebich, O.	7 4	Jus OF-				
	r green			1			ilyt. Che	- M •			
			erence.	192	2 <u>6</u> , <i>68</i> , 34						
	,5); Na ⁺	by dill		4. Golonitskaia, V.A. ; Petrashen, V.I.							
efs. 4	,5); Na ⁺ phases	-	entified	4 · Go	lonitskai						
refs. 4 Solid	phases	were id	entified					3			
refs. 4 Solid by Schr	phases einmaker	were id s' metho						3			
refs. 4 Solid by Schr	phases	were id s' metho	entified	Zh	. Anal.Kh	im. <u>196</u>	2,17, 848				
Solid by Schr	phases einmaker	were id s' metho	entified	Zh 5. Go	. Anal.Kh Donitskai	im. <u>196</u> .a, V.A.	2,17, 848 ; Petras	hen, V.I			
refs. 4 Solid by Schr	phases einmaker	were id s' metho	entified	Zh 5. Go	. Anal.Kh	im. <u>196</u> .a, V.A.	2,17, 848 ; Petras	hen, V.I			

COMPONENTS:	ORIGINAL MEASUREMENTS:
Sodium chloride; NaCl;	Shklovskaya, R.M.; Arkhipov, S.M.;
[7647-14-5]	Kuzina, V.A.
<pre>(2) Sodium perchlorate; NaClO₄;</pre>	
[7601-89-0]	Zh. Neorg. Khim. <u>1974</u> , 19,
(3) Cesium chloride; CsCl;	3128-33; [*] Russ. J. Inorg. Chem.
[7647-17-8]	Engl. Transl.) <u>1974</u> , 19, 1711-4.
<pre>(4) Cesium perchlorate; CsClO₄;</pre>	
[13454-84-7]	
(5) Water; H ₂ O; [7732-18-5]	

Solubility system Na⁺,Cs⁺ || Cl⁻,ClO⁻₄, water at 75.0 $^{\circ}$ C :

Solid	Liquid phase composition									
phaseb	mol X ^a					x	mass %			
	(4)	(3)	(2)	(1)	(4)	(3)	(2)	(1)		
A + B	0.5247	19.476	-	-	2.518	67.717	-	-		
C + D	-	15.081	-	4.477	-	59.744	-	6.157		
B + C +	0.2560	14.551	-	4.928	1.402	57.734	-	6.787		
B + D	0.8663	-	-	9.795	8.446	-	-	24.021		
B + D +	0.4736	-	12.028	3.211	3.346	-	44.779	5.706		
B + F	0.5361	-	16.765	-	3.397	-	55.976	-		
F + H	0.1153	-	30.125	-	0.539	-	74.185	-		
D + H +	0.1200	-	30.219	0.763	0.56	-	73.798	0.889		
D + H	-	-	31.286	0.769	-	-	75.116	0.881		

		Liguid	phase c	ompositio	n				Se	oli	١d	
ion mol % ^a									pl	has	se	Ь
mo	lality ^a	/ mol k	g ⁻¹	cati	ion	an	ion					
(1)	(2)	(3)	(4)	Na ⁺	Cs ⁺	C1	C104					
-	-	13.513	0.364	-	100.00	97.38	2.62		A	+	В	
3.090	-	10.407	-	22.89	77.11	100.00	0.00		С	+	D	
3.408	-	10.063	0.177	24.97	75.03	98.70	1.30	В	+	С	+	D
5.086	-	-	0.538	91.87	8.13	91.87	8.13		B	+	D	
2.115	7.921	-	0.312	96.99	3.01	20.44	79.56	В	+	D	+	F
-	11.253	-	0.360	96.90	3.10	-	100.00		B	+	F	
-	23.971	-	0.092	99.62	0.38	-	100.00		H	+	F	
0.614	24.346	-	0.097	99.61	0.39	2.45	97.55	D	÷	H	+	F
0.628	25.559	-	-	100.00	-	2.40	97.60		D	+	H	

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a Compiler's calculations.
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<sup>b</sup> A = CsCl; B = CsClO<sub>4</sub>; C = Cs<sub>1-x</sub>Na<sub>x</sub>Cl; D = NaCl;
    E = 3CsClO_4.NaClO<sub>4</sub>; F = CsClO_4.NaClO<sub>4</sub>; G = NaClO_4.H<sub>2</sub>O; H = NaClO_4
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2
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COMPONENTS:	ORIGINAL MEASUREMENTS:					
<pre>(1) Sodium chloride; NaCl; [7647-14-5]</pre>	Karnaukhov, A.S.; Kudryakova, S.A.					
<pre>(2) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>	Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1970</u> , 79, 43-52.					
<pre>(3) Ammonium chloride; NH₄Cl; [12125-02-9]</pre>						
<pre>(4) Ammonium perchlorate; NH₄ClO₄; [7790-98-9]</pre>						
(5) Water; H ₂ O; [7732-18-5]						

EXPERIMENTAL VALUES: (continued)

Solubility system Na⁺, NH₄⁺ [| ClO_4^- , Cl^- - water at 25 $^{\circ}C$:

		Liqu	id phase	composi	tion			Solid
	m	ol % ^a			ior	n mol 🗙	a	phase ^b
(1)	(2)	(3)	(4)	Na ⁺	NH4+	c1 ⁻	c10 ₄ -	
808.0	-	10.74	1.123	6.38	93.62	91.13	8.87	A + B
.609	-	10.09	0.859	12.81	87.19	93.16	6.84	A + B
2.205	-	9.75	0.813	17.27	82.73	93.64	6.36	A + B
.415	-	10.02	0.749	18.32	81.68	94.32	5.68	A + B
.052	-	8.39	0.658	30.94	69.06	94.98	5.02	A + B
5.066	-	7.35	0.919	42.33	57.67	93.59	6.41	A + B
5.561	-	7.02	0.965	45.12	54.88	93.37	6.63	A + B
3.759	-	6.64	1.018	46.89	53.11	92.94	7.06	A + B +
5.740	-	6.63	0.975	46.98	53.02	93.20	6.80	A + B +
5.725	-	6.62	0.962	47.01	52.99		6.72	A + B +
.524	-	5.02	1.315	54.29	45.71	90.51	9.49	B + C
1.111	-	3.68	1.302	61.97	38.03	90.06	9.94	B + C
9.511	-	0.207	2.664		23.18	78.49	21.51	B + C
	2.60	-	1.783	85.41	14.59	64.11	35.89	B + C
3.856	4.42	-	1.495	88.30	11.70	53.68	46.32	B + C
.938	5.49	-	1.247	90.16	9.84	46.84	53.16	B + C
	5.82		1.228	90.42	9.58	45.00	55.00	B + C
	9.92		1.310	91.56	8.44	27.66	72.34	B + C
	12.35	-	1.109	93.28	6.72	18.47	81.53	B + C
	15.09	-	0.948	94.78		11.76	88.24	B + C
.983		-	1.002	95.00		9.89	90.11	B + C +
	17.79	-	1.000	95.11	4.89	8.07	91.93	B + D +
	18.25	- - -	1.032	95.06	4.94	7.77	92.23	B + D +
. 593		-	1.070	95.00	4.94 5.00	7.45	92.55	B + D + B + D +
.270		-	0.879	95.57	4.43	1.36	98.64	B + E
.906		-	0.952	95.57	4.43		95.78	B + E
5.37	-	7.061	0.337	46.27	53.73	97.55	2.45	$\bar{A} + \bar{C}$
5.75	-	6.673	0.948	46.97	53.03	93.40	6.60	A + C

^a Compiler's calculations.

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^b A = NH_4C1 ; B = NH_4C1O_4 ; C = NaC1; D = $NaC1O_4$. H_2O ; E = $n(NH_4C1O_4)$. $m(NaC1O_4$. $H_2O)$

(continued next page)

2	2	2
4	L	2

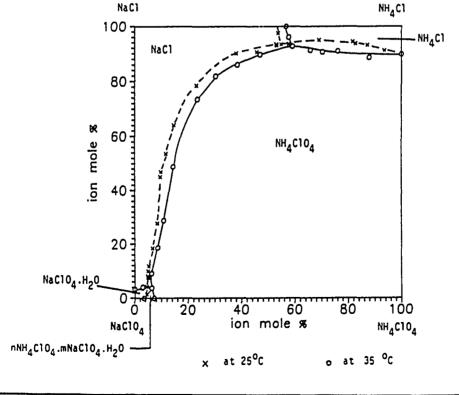
COMPONEN	TS·			····	OPTOT		UREMENTS :		
		oride; 1	NaCl;					lryakova, S.A	
-	47-14-5	-							
		chlorat	e; NaClO	4	Uch. Zap. Yarosl. Gos. Ped. Inst.				
	01-89-0)] :hloride			19	<u>70</u> , 79,	43-52.		
	125-02-		, na ₄ er,						
		erchlor	ate; NH ₄	C104:					
•	90-98-9	•	•	•					
(5) Wat	er; H ₂ C); [7732-	-18-5]						
VARIABLE	ABLES:					RED BY:			
Tempera	ture: 2	98 K and	1 308 к.		N.A.	Kozyrev	A		
Composi	tion.								
EXPERIME	NTAL VA	LUES:							
Solubil	ity sys	tem Na	+, NH ₄ 1	C10 ₄ ⁻ ,	C1 ⁻ - 1	water at	25 °C :		
		Lie	uid pha	se compo	sition			Solid	
	mas	s %	• •			/ mol kg	-1	phaseb	
(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)		
2.03	-	24.68 23.37 22.51	5.67 4.37	0.514	-	6.823 6.407	0.714	A + B A + C C C C C C C C C C C C C C C C C C C	
4.07	-	22.51	4.12	1.403	-	6.206	0.517	A + B	
5.56 6.06 10.17 14.78 15.90 16.38 16.37 16.35	-	23.01 19.27	3.78	1.544	-	5.358	0.479	A + B A + B	
14.78	-	16.38 15.56	4.50	3.931 4.262	-	4.759	0.595	A + B A + B	
16.38	-	14.72	4.96	4.383	-	4.304	0.660	A + B + C	
16.37	-	$14.74 \\ 14.73$	4.76	4.368	-	4.297	0.632	A + B + C A + B + C	
10.71		11.12 8.23	6.40	4.848		3.235	0.848	B + C	
19.84 22.61	-	0.45	12.73	6.025	-	0.131	0.831 1.687	B + C B + C	
17.83	12.41 20.13	-	8.16	4.953 4.363 3.775 3.672	1.645	-	1.127 0.951	B + C	
12.67	24.55	-	5.35	3.775	3.491	-	0.793	B + C	
12.19		-	5.22	3.672	3.706	-	0.782	B + C B + C	
7.99 5.36	38.67 45.48	-	4.90 3.92	2.822 2.027	6.520 8.211	-	0.861 0.738	B + C B + C	
3.51	51.93	-	3.13	1.450 1		-	0.643	B + C	
3.08 2.52	55.50 56.94	-	3.13 3.07	1.376 1		-	0.696 0.697	B + C + D $B + D + E$	
2.45	57.65	-	3.13	1.140 1		-	0.725	B + D + E	
2.37 0.41	58.37 59.46	-	3.20 2.68	1.125 1		-	0.755 0.609	B + D + E B + E	
1.33	60.34	-	2.81	0.641 1	3.874	-	0.673	B + E	
15.89 16.40	-	16.12 14.84	1.69 4.63	4.101 4.376	-	4.545 4.326	0.217 0.614	A + C A + C	
						(continued	next page)	
			AUX	ILIARY IN	FORMAT	ION			
ETHOD/A	PPARATU	S/PROCEI	OURE:	· · · ·	SOUR	CE AND P	URITY OF	MATERIALS.	
No deta	ils of	methodig	given.		Not	stated.			
					ESTIN	ATED ER	ROR :		
					i i	ot state			
							(continue	d next page)	

	COMPONENTS:	ORIGINAL MEASUREMENTS:					
ļ	(1) Sodium chloride; NaCl;	Karnaukhov, A.S.; Kudryakova, S.A.					
	[7647-14-5]						
	(2) Sodium perchlorate; NaClO ₄ ;	Uch, Zap. Yarosl. Gos. Ped. Inst.					
	[7601-89-0]	<u>1970</u> , <i>79</i> , 43-52.					
	(3) Ammonium chloride; NH ₄ Cl;						
	[12125-02-9]						
	(4) Ammonium perchlorate; NH ₄ ClO ₄ ;	[7790-98-9]					
	(5) Water; H ₂ O; [7732-18-5]						
	· ·						

EXPERIMENTAL VALUES: (continued) Solubility system Na⁺, NH⁺₄ || ClO₄⁻, Cl⁻ - water at 35 $^{\circ}$ C :

		Liq	uid phas	-					olid
	mass	3 %		mola	lity ^a /	mol k	g ⁻¹	F	haseb
(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)		
1.10	68.64	-	-	0.622	18.53	-	-		C+D
1.30	64.55	-	1.95		16.373	-	0.51	5	C+D
2.83	55.66	-	3.98		12.113	-	0.90		B+C+D
-	60.75	-	4.50		14.278	-	1.10		B+E
-	67.66	-	2.29	-	18.389	-	0.64	9	D + E
1.17	59.35	~	3.98	0.564	13.654	-	0.95	4	B + D + E
5.60	45.80	-	5.22	2.209	8.623	-	1.02		B + C
8.50	37.44	-	6.46	3.055	6.424	-	1.15		B+C
4.06	22.17	-	8.36	4.342	3.268	-	1.28		B+C
0.99	1.74		13.51	5.633	0.223	-	1.80		B+C
0.86	-		10.90	5.499	-	0.959	1.42		B+C
9.13 7.63	-	6.93 11.12	8.75 6.92	5.021 4.689		1.987 3.232	1.14 0.91		B + C B + C
4.88	-	17.26	5.35	4.073	-	5.162	0.72		A + B + C
5.24		17.75	2.87	4.066	-	5.102	0.38		A+C
5.20	-	18.15	-	3.902	_	5.091	-	-	A+C
2.77	-	19.50	6.61	3.575	-	5.964	0.92	0	A + B
0.88	-	20.49	6.95	3.018	-	6.210			A + B
8.42	-	21.58	6.46	2.267	-		0.86		A + B
4.24	-	24.48	8.02	1.147		7.234	1.07	9	A + B
-	-	28.11	7.12	-	-	8.113	0.93	6	A + B
		Lig	uid phas	e compos	ition				Solid
	mc	51 % ^a	• • • •	· ·		on mol	x a		phaseb
(1)	(2)	(3)	(4)	Na			c1"	c104 ⁻	
0.833	24.82	-	-	100.			3.3	96.8	C+D
0.945	22.40	-	0.70	5 97.	1 2.	9	3.9	96.1	C+D
1.85	17.35	-	1.29	3 93.	76.	3	9.0	91.0	B + C+ D
-	20.14	-	1.55		87. 63.	2		100.0	B + E
-	24.67	-	0.87		63.	4		100.0	D + E
0.798	19.32	-	1.35			3	3.7	96.3	B + D + E
3.279	12.80	-	1.52		48.	6	18.6	81.4	B+C
4.620	9.71	-	1.74				28.7	71.3	B+C
6.742	5.07 0.353		1.99		6 14. 5 23.		48.8 73.5	51.2 26.5	B + C B + C
8.674	0.353	1.51	2.25				73.5 81.9	18.1	B+C B+C
7.888	-	3.12	1.79				86.0	14.0	B+C B+C
7.288	-	5.02	1.42				89.6	10.4	B+C B+C
6.221	-	7.88	1.11				92.7	7.3	A+B+C
6.242	-	7.94	0.58				96.0	4.0	A+C
6.050	-	7.89	-	43.			00.0	-	A+C
5.419	-	9.04	1.39		2 65.		91.2	8.8	A + B
4.594	-	9.45	1.46				90.6	9.4	A + B.
3.489		9.77					90.9	9.1	A + B
1.765	-	11.15	1.66				88.6	11.4	A + B
-	-	12.57	1.44	9 -	100.	U	89.7	10.3	A + B
							(cont	inued	next page

224 COMPONENTS: ORIGINAL MEASUREMENTS: Karnaukhov, A.S.; Kudryakova, S.A. (1) Sodium chloride; NaCl; [7647 - 14 - 5](2) Sodium perchlorate; NaClO₄; Uch. Zap. Yarosl. Gos. Ped. Inst. 1970, 79, 43-52. [7601-89-0] (3) Ammonium chloride; NH₄Cl; [12125-02-9] (4) Ammonium perchlorate; NH₄ClO₄; [7790-98-9] (5) Water; H₂O; [7732-18-5] EXPERIMENTAL VALUES: (continued) Compiler's calculations. ь $A = NH_4C1; B = NH_4ClO_4; C = NaCl; D = NaClO_4.H_2O;$ $E = n(NH_4ClO_4) \cdot m(NaClO_4 \cdot H_2O)$ COMMENTS AND/OR ADDITIONAL DATA The phase diagrams shown below for both temperatures for this system show five crystallization fields: $NaClo_4 \cdot H_2O$; $NaCl; NH_4Cl; NH_4Clo_4$; and solid solutions of the type represented by $n(NH_4ClO_4).m(NaClO_4.H_2O)$. Increase in temperature causes a slight increase in the NaCl and $\rm NH_4Cl$ crystallization fields and a decrease in the $NaClO_4$. H_2O and NH_4ClO_4 crystallization fields. The equilibrium of the reaction $NaClO_{4} + NH_{4}Cl = NaCl + NH_{4}ClO_{4}$ is shifted in the direction of formation of ammonium perchlorate.



	ORIGINAL MEASUREMENTS:						
COMPONENTS:	ORIGINAL MEASUREMENTS:						
Sodium chloride; NaCl;	Karnaukhov, A.S.; Kudryakova, S.						
[7647-1+-5]							
(2) Sodium perchlorate; NaClO ₄ ;	Uch. Zap. Yarosl. Gos. Ped. Inst.						
[7601-89-0]	<u>1971</u> , <i>95</i> , 3-7.						
(3) Ammonium chloride; NH ₄ Cl;							
[12125-02-9]							
<pre>(4) Ammonium perchlorate; NH₄ClO₄;</pre>							
[7790-98-9]							
(5) Water; H ₂ O; [7732-18-5]							
VARIABLES:	PREPARED BY:						
Temperature: 363 K	N.A. Kozyreva						
Composition							
· .							

EXPERIMENTAL VALUES:

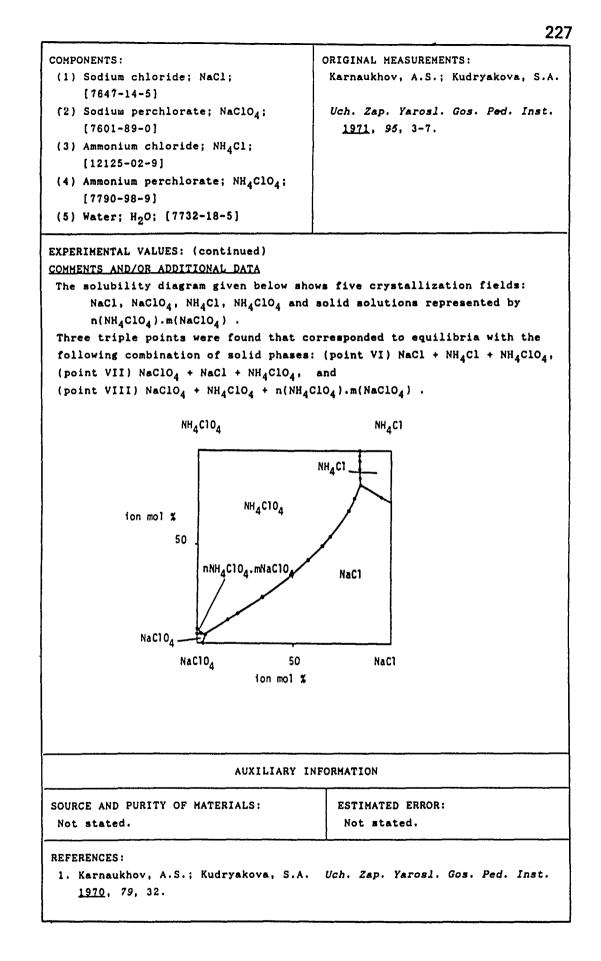
Solubility system Na⁺, NH⁺₄ [| ClO_4^- , Cl^- - water at 90 °C :

			-	phase	compositio			-1	Solid
Point	t	mas	s X		mola	lity" /	mol kg	- •	phase ^b
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	
1	0.56	-	33.54	17.36	0.197	-	12.92	3.044	A + B
2	2.14	-		17.50	0.756	_	12.33	3.076	A + B
3	5.24	-	28.89	17.48	1.85	-	11.16	3.075	A + B
4	7.50	-		17.36	2.69	-	10.77	3.099	A + B
5	8.67	-	26.63		3.07	-	10.32	2.902	A + B + C
6	8.83	-	26.75			-	10.24	2.720	A + B + C
7	9.33	-		15.80	3.30	-	10.20	2.776	A + B + C
8	9.33	-	25.77			-	10.23	3.222	A + B + C
	10.58	-		13.21	3.44	-	8.42	2.140	A + C
	12.23	-	17.10		4.13	-	6.31	3.355	A + C
	16.61	-		23.30		-	2.35		A + C
12	17.75	-		24.54	5.71	-	1.57	3.924	A + C
13		4.05	-	34.92	10.69	0.881	_	7.913	
	17.45	11.40	-	26.89	6.75	2.104	-	5.171	A + C
15	9.10	28.60	-	18.80	3.58	5.370	-	3.678	A + C
16	6.03	38.93	-	15.04		7.949	-	3.200	A + C
	4.61	43.99	-	13.06	2.06	9.371	-	2.899	A + C
18	1.20	69.03	-	3.72	0.79	21.64	-	1.215	A + C + D
19	0.97	71.48	-	4.44		25.26	-	1.635	A + E
20	1.11	70.34	-	4.10	0.78 0.84	23.50	-	1.427	A + D + E
21	1.17	70.52	-	4.44	0.84	24.13	-	1.583	A + D + E
22	11.62	-	30.35	4.27	3.70	-	10.55	0.676	B + C
I	-	-	34.12	17.46	-	-	13.17	3.069	A + B
II	12.70	-	31.50	-	3.89	-	10.55	-	B + C
III	0.87	67.31	-	-	0.47	17.28	-	-	C + D
IV		78.28	-	3.63		35.34	-	1.708	
v	-	68.13	-	6.28		21.74	-	2.089	
VI	9.16	-	24.16				8.99		A + B + C
	1.20		-	3.72	0.79	21.64	-	1.215	A + C + D
VIII	1.11	70.34	-	4.20	0.78	23.60	-	1.468	A + D + E
۵	0		1 1 - + +						
	-	er's ca							
Ъ					C = NaCl;				
	D = Na	.c10 ₄ ;	E = n	(NH4C10	D_4).m(NaClC) ₄) •			
	Points	I-VIII	are n	odal po	oints of th	is quat	ernary	aqueous	
	recipr	ocal sy	stem.						
							(co	ntinued	next page)

OMPONENTS :		OR	IGINAL	MEASURE	MENTS:			
(1) Sodium chloride;	NaCl;	к	Karnaukhov, A.S.; Kudryakova, S.A					
[7647-14-5]				••		. .		
<pre>(2) Sodium perchlora [7601-89-0]</pre>	te; Nacio ₄ ;	0		. Yaros 95, 3-7	l. Gos.	rea.	in.	5C.
(3) Ammonium chlorid	e: NH.Cl:			50, 5-7	•			
[12125-02-9]								
(4) Ammonium perchlo	rate; NH ₄ ClO	4:						
[7790-98-9]	•							
(5) Water; H ₂ O; [773	2-18-5]							
XPERIMENTAL VALUES: Solubility system N		10 ₄ ⁻ , c1 ⁻	- wate	r at 90	°c :			
L	iquid phase	compositi				Sol	id.	
Point mol		-		nol % ^a		pha		
(1) (2)	(3) (4)	Na ⁺	NH4	C1 ⁻	c104			
· 1 0.275 - 2 1.055 -	18.02 4.247 17.20 4.292	1.22 4.68	98.78		18.84 19.04			
3 2.588 -	15.59 4.294	11.52	88.48	80.89	19.11	A +	В	
	14.94 4.300 14.37 4.041	16.26	83.74		$18.72 \\ 17.81$			+ C
6 4.324 -	14.31 3.800	19.27	80.73	83.06	16.94	A +	B	⊦ c
8 4.687 -	14.21 3.868 14.14 4.453		79.75 79.87		17.06 19.12			
9 4.956 -	12.11 3.078 9.10 4.841				15.28 24.33			
11 7.960 -	3.52 5.554	46.73	53.27	67.39	32.61	A +	С	
12 8.553 - 13 14.257 1.174	2.36 5.882							
14 9.703 3.026 15 5.253 7.881	- 7.437 - 5.399	63.12	36.88 29.13		51.89 71.65			
16 3.726 11.481	- 4.622	76.69	23.31	18.79	81.21	A +	С	
17 2.946 13.418 18 0.996 27.342	- 4.152 - 1.54		20.24 5.14	14.36 3.33	85.64 96.67			D
19 0.864 30.390	- 1.97	94.08	5.92		97.40	A +	Е	
21 1.022 29.404	- 1.76 - 1.93		5.96	3.16	96.98 96.84			
	14.98 0.960 18.36 4.278	24.77		95.47 81.10	4.53 18.90	B + A +		
II 5.567 -	15.09 -	26.95	73.05	100.00	-	B +	С	
III 0.639 23.585 IV - 38.183	- 1.845	100.00 95.39		2.64	97.36 100.00			
V - 27.406 VI 4.430 -	- 2.633 12.77 3.950		8.76 79.05		100.00 18.68			
VII 0.996 27.342	- 1.536	94.86	5.14	3.33	96.67	A +	C +	D
/III 0.959 29.002 ^a Compiler's calcu	- 1.805 lations.	94.32	5.68	3.02	96.98	A +	D +	E
^b $A = NH_4ClO_4$; B		C = NaCl;						
$D = NaClO_4; E$	= $n(NH_4C10_4)$).m(NaClO	4) ·					
and a second	AUXILI	ARY INFOR	MATION					
ETHOD/APPARATUS/PROC	EDURE:							
No details of method		a ⁺ was (determin	ned by	precipi	tatir	ng	as

malin method (ref. 1).

(continued next page)



S	20	D
2	20	0

COMPONENT							SUREMEN	TS:	
(1) Sodi [760	um perc 1-89-0]		; NaClC	94;	Free	Freeth, F.A.			
(2) Sodi	um sulf	ate; Nø	2 ^{SO} 4;		Rec	. Trav.	Chim. P	ays-Bas <u>1924</u> ,	
-	7-82-6]				43,	475-50	7		
(3) Ammo [779	onium pe 0-98-9]		te; NH ₄	,c10 ₄ ;					
(4) Ammo			(NH4)25	50 ₄ ;					
[778 (5) Wate	3-20-2] r; H ₂ 0;		18-5]						
VARIABLES					PREPA	ARED BY	 !		
Two temp		s: 298	K and 3	изз к.	1	Chan			
Composit									
EXPERIMEN	TAL VAL	UES:					•		
								0.	
Solubili ————	ty syst	em 2NH	4, 2Na'	11 2010	04, S04	- н ₂ о	at 25	°C :	
			hase co	mpositic		x ^a		Solid phase ^b	
(1)	mass % (2)		(4)	(1)			(phase ⁻	
(1)			41.70	(1)			(4) 9.253	A + D	
-	- 3.47		39.55		0.727		9.253		
-	6.87	2.66	37.38	-	1.465	0.686	8.570	A + B + C	
-				-	1.750	-	8.880	B + C	
-	6.83	2.28	38.70 37.69 30.70	-	1.455	0.587	8.628	A + C	
-	9.82	2.84	30.70 22.47 15.08	-	1.993	0.697	6.696 4.726 3.137	A + C A + C	
_	20.39	4.30	15.08	-	3.946	0.823 1.006	3.137	A + C	
-	21.81	4.07	14.10	-	4 004				
-	24.38	4.36	$14.10 \\ 11.59$	-	4.756	1.028	2.431	$\begin{array}{c} A + C \\ A + D + C \end{array}$	
-	25.76		14.10	-	5.001		2.943	D + C	
-	24.97	1.60 3.85	13.15	-	4.836	0.375	2.738	D + C	
-	23.22	7.80	6.56	-	4.366	1.773	1.326	A A + D	
-	22.45		-	-	4.127	2.994	-	A + D	
12.71	15.79	9.41	-	2.774			-	A + D	
24.38	10.79		-	5.597	2.135	1.610	-	A + D	
31.21	9.07	-	-	7.015	1.757	-		D + E	
31.62	6.91 25.94	5.74	7 97	7.487	1.410		- 1.632	A + E	
67.67	25.94	6.09	7.83	23.673	5.028 0.078	1.427	-	D + E E + F	
67.42	-	1.51	-	24.065	-	0.562	-	A + F	
66.79	0.21	1.50	-	23.632	0.064		-	A + E + F	
			AUX	ILIARY I	NFORMAT	ION			
				-	1				
HETHOD/AP		• • • • • • • • • • • • • • • • • • • •						MATERIALS:	
The satu						•		from very pur	
to that used by Van't Hoff (ref.1)					ammon	ium per	chlorat	e (% purity no	
to that	ples of	clear	satd sl	n were	state	d) and	an aque	ous sin of pur	
and sam					NaOH.			other detail:	
and sam	sing a				F				
and sam taken u			0, hv =	ddition	not a	iven	NacSO .	WAS recruatell	
and sam taken u was dete	rmined	as Na ₂ S	•		F			was recrystall	
and sam taken u	rmined	as Na ₂ S	•		F		e reage	was recrystall nt grade salt. nued next page	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Sodium perchlorate; NaClO ₄ ; [7601-89-0]	Freeth, F.A.
<pre>(2) Sodium sulfate; Na₂SO₄; [7757-82-6]</pre>	Rec. Trav. Chim. Pays-Bas <u>1924</u> , 43, 475-507
<pre>(3) Ammonium perchlorate; NH₄ClO₄; [7790-98-9]</pre>	
(4) Ammonium sulfate; (NH ₄) ₂ SO ₄ ; [7783-20-2]	
(5) Water; H ₂ O; [7732-18-5]	

EXPERIMENTAL VALUES: (continued)

Solubility system $2NH_4^+$, $2Na^+$ || $2Clo_4^-$, SO_4^{2-} - H_2O at 25 °C :

2) - - - - - - - - - - - - - - - - - - -	ol kg ⁻¹ (3) 0.462 0.425 0.426 0.365 0.427 0.499 0.608 0.577 0.622 0.226	(4) 5.707 5.515 5.328 5.516 5.361 4.102 2.865 1.895 1.778 1.470 1.774	2Na ⁺ - 7.29 14.12 16.47 14.02 22.05 35.88 52.02 55.32 61.76 62.96	ion m 2NH4 100.00 92.71 85.88 85.98 77.95 64.12 47.98 44.68 38.24	ol x * 2ClO4 3.89 3.44 3.30 2.83 3.85 5.14 6.63 6.24 6.68	96.11	A + B A A A A A A A A	+++++	B B + C C
- - 450 - 911 - 087 - 904 - 221 - 742 - 383 - 558 - 876 - 876 - 016	0.462 0.425 0.426 0.365 0.427 0.499 0.608 0.577 0.622	5.707 5.515 5.328 5.516 5.361 4.102 2.865 1.895 1.778 1.470 1.774	7.29 14.12 16.47 14.02 22.05 35.88 52.02 55.32 61.76	100.00 92.71 85.88 83.53 85.98 77.95 64.12 47.98 44.68	3.89 3.44 3.30 2.83 3.85 5.14 6.63 6.24	96.11 96.56 96.70 100.00 97.17 96.15 94.86 93.37 93.76	A + A - A - A - A - A - A - A	+ B + + + + + +	B+CCCCC
0.450 0.911 1.087 0.904 1.221 1.742 2.383 2.558 2.876 3.016	0.425 0.426 0.365 0.427 0.499 0.608 0.577 0.622	5.515 5.328 5.516 5.361 4.102 2.865 1.895 1.778 1.470 1.774	7.2914.1216.4714.0222.0535.8852.0255.3261.76	92.71 85.88 83.53 85.98 77.95 64.12 47.98 44.68	3.44 3.30 2.83 3.85 5.14 6.63 6.24	96.56 96.70 100.00 97.17 96.15 94.86 93.37 93.76	A + A - A - A - A - A - A - A	+ B + + + + + +	B+CCCCC
0.911 1.087 0.904 1.221 1.742 2.383 2.558 2.876 3.016	0.426 0.365 0.427 0.499 0.608 0.577 0.622	5.328 5.516 5.361 4.102 2.865 1.895 1.778 1.470 1.774	14.12 16.47 14.02 22.05 35.88 52.02 55.32 61.76	85.88 83.53 85.98 77.95 64.12 47.98 44.68	3.30 2.83 3.85 5.14 6.63 6.24	96.70 100.00 97.17 96.15 94.86 93.37 93.76	A + B A A A A A	B + + + + +	+ 0 0 0 0 0
1.087 0.904 1.221 1.742 2.383 2.558 2.876 3.016	0.365 0.427 0.499 0.608 0.577 0.622	5.328 5.516 5.361 4.102 2.865 1.895 1.778 1.470 1.774	16.47 14.02 22.05 35.88 52.02 55.32 61.76	83.53 85.98 77.95 64.12 47.98 44.68	2.83 3.85 5.14 6.63 6.24	100.00 97.17 96.15 94.86 93.37 93.76	B A A A A A	+++++	00000
1.087 0.904 1.221 1.742 2.383 2.558 2.876 3.016	0.365 0.427 0.499 0.608 0.577 0.622	5.361 4.102 2.865 1.895 1.778 1.470 1.774	14.02 22.05 35.88 52.02 55.32 61.76	85.98 77.95 64.12 47.98 44.68	2.83 3.85 5.14 6.63 6.24	97.17 96.15 94.86 93.37 93.76	A A A A	++++++	C C C C C C C C
221 742 383 558 2.876 3.016	0.427 0.499 0.608 0.577 0.622	4.102 2.865 1.895 1.778 1.470 1.774	22.05 35.88 52.02 55.32 61.76	77.95 64.12 47.98 44.68	3.85 5.14 6.63 6.24	96.15 94.86 93.37 93.76	A A A	+++++++++++++++++++++++++++++++++++++++	C C C
221 742 383 558 2.876 3.016	0.499 0.608 0.577 0.622	2.865 1.895 1.778 1.470 1.774	35.88 52.02 55.32 61.76	64.12 47.98 44.68	5.14 6.63 6.24	94.86 93.37 93.76	A	++	C C
1.742 2.383 2.558 2.876 3.016	0.608 0.577 0.622	2.865 1.895 1.778 1.470 1.774	52.02 55.32 61.76	47.98 44.68	6.63 6.24	93.37 93.76	A	+	č
2.558 2.876 3.016	0.577 0.622	1.778 1.470 1.774	55.32 61.76	44.68	6.24	93.76	A		-
2.876	0.622	1.778 1.470 1.774	61.76					+	С
3.016	-	1.774		38.24	6.68	93.32			
			62 06			50106	- A +	D	+
910	0 226		02.50	37.04		100.00	D	+	С
	0.460	1.651	62.31	37.69	2.41	97.59	D	+	C
.207	0.571		22.76	77.24	5.38	94.62			
2.619	1.064	0.795	66.37	33.63	13.48	86.52	A	+	D
2.466	1.789	-	73.38	26.62	26.62	73.38	A	+	D
.790	1.290	-	80.28	19.72	45.27	54.73		+	D
1.307	0.986	-	85.97	14.03	62.79	37.21	A	+	D
1.069	-		100.00	-	66.62	33.38	D	+	Ε
0.873	0.877	-	87.92	12.08	75.94	24.06			Е
3.037	0.862	0.985	68.19	31.81	9.68	90.32	I) +	Ε
0.057	-	-	100.00	-	99.34	0.66	E	+	F
-	0.414	-	97.72	2.28	100.00	-	A	+	F
.047	0.405	-	97.73	2.27	99.47	0.53	A +	E	+
c104		B = (-	• • •	:0 ₄ .4	H2 ⁽¹)
	.069 .873 .037 .057 - .047 r's c ClO ₄	.069 - .873 0.877 .037 0.862 .057 - - 0.414 .047 0.405 r's calculat ClO ₄	.069 .873 0.877 - .037 0.862 0.985 .057 - 0.414 - .047 0.405 - r's calculations. ClO ₄ B = (.069 100.00 .873 0.877 - 87.92 .037 0.862 0.985 68.19 .057 100.00 - 0.414 - 97.72 .047 0.405 - 97.73	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE: (continued)

silica basins and evaporating at a low red heat. Sulfate was determined gravimetrically as BaSO₄. To determine ammonia content, the slns were distilled with excess NaOH and the ammonia distillate absorbed in excess of standard acid solution, followed by back-titration of the acid. All analyses were duplicated. Solid phase compositions were determined using Schreinemakers' method. Gas-heated thermostats were used and thermometers were checked against N.P.L. Standards.

(continued next page)

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Сомр	ONENTS :		
(1)	Sodium	perchlorate;	NaClO ₄ ;

[7601-89-0]

ORIGINAL MEASUREMENTS: Freeth, F.A.

Rec. Trav. Chim. Pays-Bas 1924, 43, 475-507

[7757-82-6] (3) Ammonium perchlorate; NH₄ClO₄; [7790-98-9]

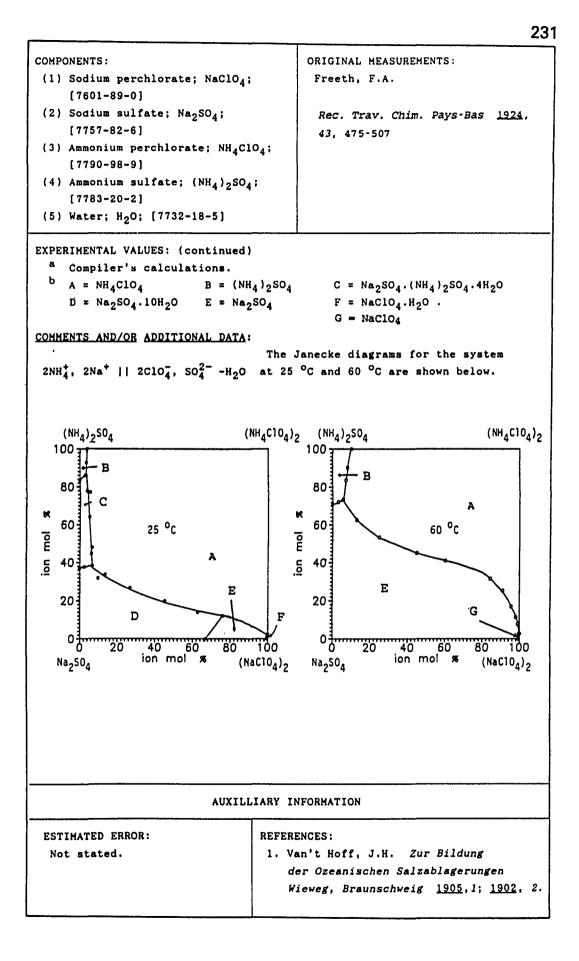
(2) Sodium sulfate; Na₂SO₄;

(4) Ammonium sulfate; (NH₄)₂SO₄; [7783-20-2] (5) Water; H₂O; [7732-18-5]

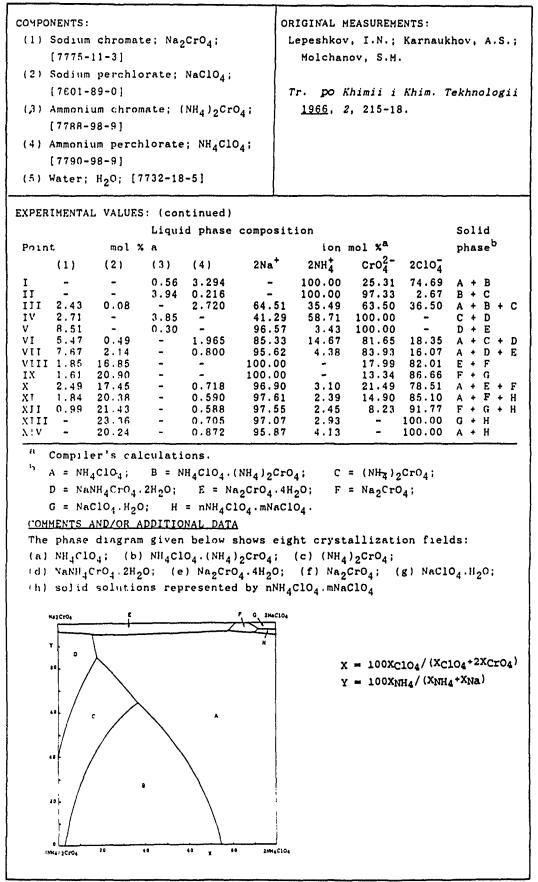
EXPERIMENTAL VALUES: (continued)

Solubility system $2NH_4^+$, $2Na^+$ || $2C10\frac{-}{4}$, $S0\frac{2^-}{4}$ - H_2O at 60 °C :

L	iquid phase co	omposition	2		Solid
0A88	x		mol % ^a		phase ^b
(1) (2)	(3) (4)	(1)	(2) (3)	(4)	•
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	- - - - - - - - - - - - - - - - - - -	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	8.899 A 8.924 9.342 5.001 2.344 - - - - - - - - - - - - - - - - - -	A A + + B B + + E E E E E E G G G G G G G G G G G G
molality ^a / r (1) (2) - 0.720 - 1.263 - 2.235 - 2.256 - 2.302 - 2.459 - 2.359 - 2.354 - 2.354 - 2.334 1.530 1.584 4.105 0.609 5.758 0.397 7.902 0.223 13.05 0.145 14.98 0.078 23.92 0.068 23.55 - 24.01 0.081	Liquid phase nol kg ⁻¹ (3) (4) 1.374 6.088 1.168 5.917 1.111 5.840 0.953 5.738 0.921 5.733 0.505 5.714 - 5.974 1.628 3.132 2.520 1.449 3.838 - 3.277 - 2.455 - 2.216 - 1.691 - 1.706 - 1.275 - 0.635 - 0.630 - -	Compositi 2Na ⁺ 9.97 16.50 26.45 26.70 27.84 29.16 37.41 46.49 54.88 58.91 68.44 74.72 83.15 88.66 92.23 97.43 97.39 100.00	ion mol % 2NH ⁺ 2CL 100.00 10 90.03 8 83.50 7 73.55 5 73.30 5 72.16 3 70.84 62.59 12 53.51 24 45.12 45 41.09 60 31.56 84 25.28 90 16.85 95 11.34 98 7.77 99 2.57 99 2.61 100	$O_4^ SO_4^{2-}$.14 89.86 .09 91.91 .25 92.75 .64 94.36 .45 94.55 - 100.00 .91 87.09 .89 75.11 .12 54.88 .27 39.73 .33 15.67 .94 9.06 .56 4.44 .07 1.93 .05 0.95	B + E B + E A + E A + E E A + E E A + E E A + E E A + E E E E E E E E E E E E E E E E E E E
				(continue	d next page)



232					
<pre>COMPONENTS: (1) Sodium chromate; Na2CrO4; (7775-11-3] (2) Sodium perchlorate; NaClO4; [7601-89-0] (3) Ammonium chromate; (NH4)2CrO4; [7788-98-9] (4) Ammonium perchlorate; NH4ClO4; [7790-98-9] (5) Water; H2O; [7732-18-5]</pre>	ORIGINAL MEASUREMENTS: Lepeshkov, I.N.; Karnaukhov, A.S.; Molchanov, S.M. Tr. po Khimii i Khim. Tekhnologii <u>1966</u> , 2, 215-18.				
VARIABLES:	PREPARED BY:				
Temperature: 298 K.	N.A. Kozyreva				
Composition.					
EXPERIMENTAL VALUES: Solubility system 2Na ⁺ , 2NH ⁺ 2C10	$\frac{1}{4}$, CrO ₄ ²⁻ - water at 25 °C :				
Liquid phase compo					
Point mass %	molality ^a / mol kg ⁻¹ phase ^b				
(1) (2) (3) (4) (
	0.322 1.902 A + B 2.284 0.125 B + C				
	.426 0.045 - 1.593 A + B + C				
IV 16.19 - 21.61 - 1	.607 - 2.285 - C + D				
	.182 - 0.184 - D + E .296 0.297 - 1.184 A + C + D				
	.760 1.326 - 0.497 A + D + E				
	.262 11.505 E + F				
	.152 14.968 F + G .740 12.211 - 0.502 A + E + F				
XI 6.99 58.68 - 1.63 1	.320 14.656 0.424 A + G + H				
XII 3.77 61.88 - 1.63 O XIII - 66.35 - 1.92	.711 15.446 - 0.424 F + G + H - 17.078 - 0.515 G + H				
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$					
^A Compiler's calculations. ^b A = NH ₄ ClO ₄ ; B = NH ₄ ClO ₄ .(NH ₄) ₂ D = NANH ₄ CrO ₄ .2H ₂ O; E = Na ₂ CrO ₄ G = NaClO ₄ .H ₂ O; II = nNH ₄ ClO ₄ .mN	$.4H_2O;$ F = Na ₂ CrO ₄ ;				
AUXILIARY I	NFORMATION				
METHOD/APPARATUS/PROCEDURE: Method of "invariant points" used, Periods of equilibration varied	SOURCE AND PURITY OF MATERIALS: Not stated.				
from 3 to 10 days. Na ⁺ was deter-					
mined gravimetrically as	ESTIMATED ERROR:				
$N_{\rm H}Zn(UO_2)_3(C_2H_3O_2)_3; NH_4^+$ by the	Not stated.				
"formalin method"; chromate iodi-					
metrically and perchlorate by dif- ference.	REFERENCES:				
- A Y I V II V Y I					
	(continued next page)				



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COMPONENTS :	ORIGINAL MEASUREMENTS:
<pre>(1) Sodium chromate; Na₂CrO₄; [7775-11-3]</pre>	Guseva, A.D.; Druzhinina, G.V.
(2) Sodium perchlorate; NaClO ₄ ; [7601-89-0]	Uch. Zap. Yarosl. Gos. Ped. Inst. <u>1970</u> , 78, 32-8.
(3) Ammonium chromate; $(NH_4)_2CrO_4$; {7788-98-9}	
(4) Ammonium perchlorate; NH ₄ ClO ₄ ; [7790-98-9]	
(5) Water; H ₂ O; [7732-18-5]	
VARIABLES:	PREPARED BY:
Temperature: 308 K.	I.S. Bodnya

EXPERIMENTAL VALUES:

Composition.

.

Solubility system $2Na^+$, $2NH_4^+$ [| $2C10_4^-$, $Cr0_4^{2-}$ - water at 35 °C :

			Liguid	phase	composit	ion			Solid	
Poin	t	mass	*		mol	ality ^a /	mol kg	-1	phase ^b	
ļ	(1)	(2)	(3)	(4)					-	
l ı	-	-	3.62	20.45		-	0.314	2.292	A + B	
1	3.84		1.11	18.04	0.308		0.095	1.994	A + B	
1	10.53	-	0.71	22.40	0.980	-	0.070	2.873	A + B	
11	17.05			14.42		-	0.081	1.813	A + B + C	
	24.10	- - -	1.76		2.399		0.187	1.662	B+C	
111	31.24	-	2.88	7.30	3.292	-	0.323	1.061	B+C+D	
}	-	-		1.19	-	-	2.600	0.143	A+C	
	2.61					-	2.387	0.134	A+C	
	4 70	÷	25.64	2.40	0.394		1.551	0.272	A+C	
	11.27	-	4.82	13.87	0,993	-	0.453	1.686	A+C	
	11.27	-		14.59	1.432		0.380	1.875	A+C	
v	20.36	-	20.45	-	2.124	-	2.272	-	C+D	
	26.35	-	11.37	2.93		-	1.260	0.420	C + D	
VI	45.92		2.18	-	5.462		0.276	-	D+E	
_	44.66	3.25	-	4.04	5.738		-	0.716	D+E	
VII	36.66	12.67	-	2.57			-	0.455	B+D+E	
	25.43	26.79	-	4.82	3.655		-	0.955	B+E	
	16.16	36.32	-	4.95	2.344		-	0.990	B+E	
VIII	14.19	40.90	-	5.67	2.233	8.513	-	1.230	B + E + F	
	8.38	47.67	-	4.04	1.296	9.755	-	0.862	B+F	
IX	-	60.75	- - -	4.50	-	14.278	-	1.102	B+F	
	11.52	47.24	-	3.91	1.905	10.335	-	0.891	E + F + G	
XI	8.63	61.62	-	-		16.916	-	-	E+O	
XII	-	67.64	-	2.33	-	18.396	-	0.660	F + G	
a	Connilo	r's calo								•
					_			-		
								C = (1)	NH ₄) ₂ CrO ₄ ;	
	D = NaN	H ₄ CrO ₄ .2	2н ₂ 0;		E =	Na ₂ CrO ₄ .4	4H ₂ Ο;			
	F = n(N)	iH ₄ ClO ₄)	.m(NaClC	0 ₄ .H ₂ 0); G =	NaClO ₄ .H	20			
		······································		AUXTL	LARY INFO	RMATION				_
										_
метно	D/APPAR	ATUS/PRO	OCEDURE	: Meth	nod of "i	nvariant	points	" used	. Details	
									odium zinc	
								-		
			-		tion and	titrimet	ry; CrO	ā iodu	netrical-	
ly a	nd $C10_4$	by dif	ference	,			(con	tinued a	next page)	
	•									

MPONENTS :			DRIGINAL	MEASURE	MENTS:	
1) Sodium chromate;	Na ₂ CrO ₄ ;		Guseva,	A.D.; D:	ruzhinin	a. G.V.
[7775-11-3]	2 4					•
•	NACIO	.	Uab Zam	Vanaa	1 Car	Ped. Inst.
2) Sodium perchlorat	e; Nacio ₄	•	-			rea. Inst.
[7601-89-0]			1970,	78, 32-1	8.	
3) Ammonium chromate	; (NH ₄) ₂ Cı	r ⁰ 4;				
[7788-98-9]						
4) Ammonium perchlor	ate; NH ₄ Cl	104;				
[7790-98-9]	-					
5) Water; H ₂ O; [7732	-18-5]					
<u> </u>						
(PERIMENTAL VALUES: (continued)				
Li	quid phase	e composi	tion			Solid
oint mol%a			ion	mol % ^a		phase ^b
) (4)	2Na ⁺				•
	39 3.945		•	21.48	-	A + B
0.532 - 0.1	64 3.443	22.00	78.00	28.77	71.23	A + B
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	18 4.834	39.40	60.60	42.23	57.77	A + B
II 2.637 - 0.1	37 3.075	61.17	38.83	64.34	35.66	A + B + C
4.014 - 0.3	12 2.781	70.22	29.78	75.68	24.32	B + C
III 5.471 - 0.5	37 1.762	79.41	20.59	87.21	12.79	B + C + D
4.4	64 0.246	-	100.00	97.32	2.68	A+C
0.392 - 4.0	97 0.230	8.51	91.49	97.51	2.49	A+C
0.682 - 2.6	86 0.471	18.93	81.07	93.46	6.54	A+C
1.694 - 0.7	72 2.874	43.41	56.59	63.18	36.82	A+C
2.419 - 0.6	42 3.168	52.07	47.93	65.90	34.10	A+C
V 3.545 - 3.7	93 -	48.31	51.69	100.00		C+D C+D
4.574 - 2.1	02 0.701	65.09	34.91	95.01	4.99	
9.18 0.884 -	1 1/6	95.19	4.81 5.62	100.00	9.95	D+E D+E
3110 01004 -	*****	96.22	2 7 9	79 21	21 60	B + D + E
/II 7.49 3.425 - 5.60 7.81 -	1.464			54.72	45.28	B+E
3.56 10.59 -	1.504		7.83	37.07	62.93	B+E
/111 3.31 12.62 -	1.822		8.66	31.43	62.93 68.57	B + E + F
1.92 14.47 -	1.278		6.52	19.63	80.37	B + F
/III 3.31 12.62 - 1.92 14.47 - IX - 20.14 - X 2.78 15.06 -	1.555	93.48 92.83 94.07	7.17	-	80.37 100.00	B + F
X 2.78 15.06 -	1.299	94.07	5.93	25.34	74.66	E + F + G
	-	100.00	-		82.53	
XI 2.41 22.79 -		96.53			100.00	F + G

 $F = n(NH_4ClO_4).m(NaClO_4.H_2O); G = NaClO_4.H_2O.$

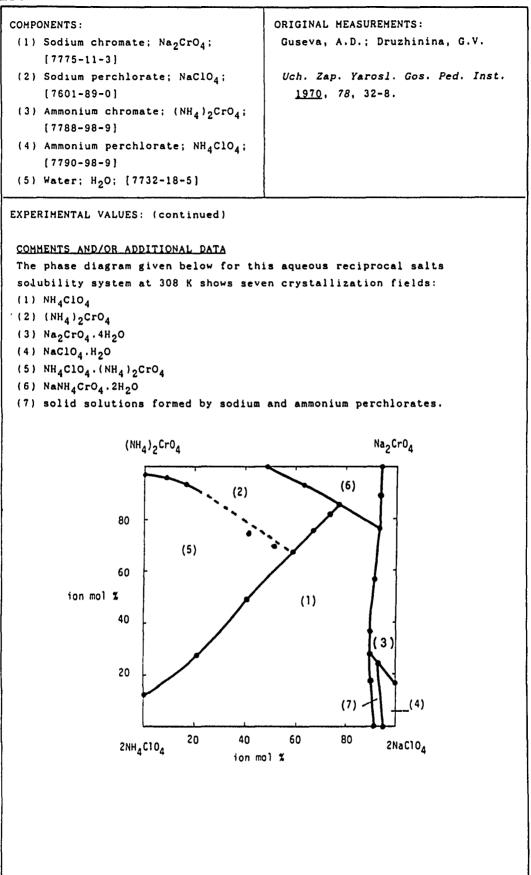
REFERENCES:

AUXILIARY INFORMATION

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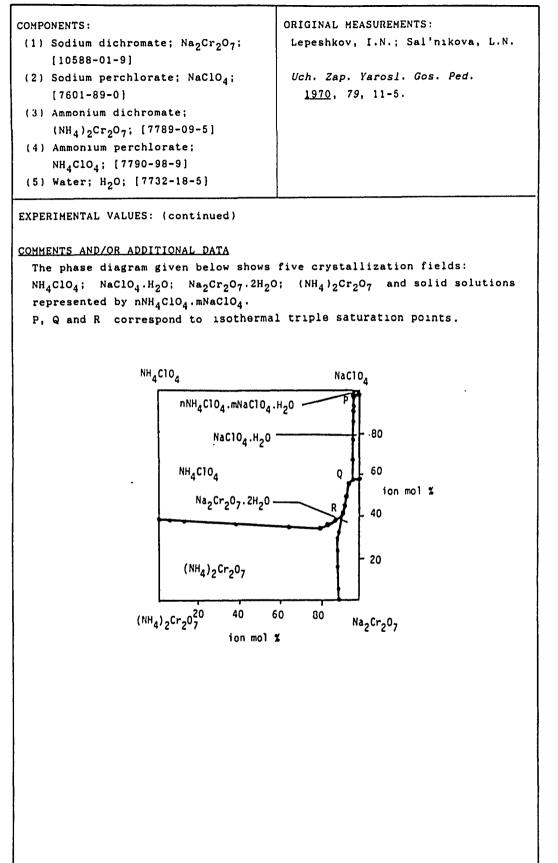
SOURCE AND PURITY OF MATERIALS:	ESTIMATED ERROR:
Not stated.	Not stated.

(continued next page)



	23
COMPONENTS: (1) Sodium dichromate; Na ₂ Cr ₂ O ₇ ; [10588-01-9]	ORIGINAL MEASUREMENTS: Lepeshkov, I.N.; Sal'nikova, L.N.
 (2) Sodium perchlorate; NaClO₄; [7601-89-0] (3) Ammonium dichromate; 	Uch. Zap. Yarosi. Gus. Ped. <u>1970</u> , 79, 11-5.
$(NH_4)_2Cr_2O_7; [7789-09-5]$ (4) Ammonium perchlorate; $NH_4ClO_4; [7790-98-9]$	
(5) Water; H ₂ O; [7732-18-5]	
VARIABLES: Temperature: 298 K. Composition.	PREPARED BY: N.A. Kozyreva
EXPERIMENTAL VALUES: Solubility system 2Na ⁺ , 2NH ₄ ⁺ 2ClO	$\bar{4}$, $Cr_2 O_7^{2^-}$ - water at 25 °C :
Liquid phase compo Point mass %	sition Solid molality ^a / mol kg ^{~1} phase ^{b, c}
(1) (2) (3) (4) (1)	
22.44 37.16 - 3.46 2.3 24.87 44.26 - 3.26 3.4 Q 32.29 38.50 - 2.72 4.6 29.66 39.82 - 3.51 4.1 39.06 28.47 - 4.15 5.2 R 44.27 24.07 - 5.08 6.3 45.17 21.52 - 5.41 6.1 52.98 14.22 - 7.20 7.9 55.30 11.77 - 9.31 8.9 56.77 8.81 - 7.10 7.9 62.29 3.25 - 7.29 8.7 64.70 - 3.42 3.51 8.7 2.10 - 20.78 12.96 0.1 5.00 - 18.70 12.75 0.3 17.07 - 10.88 15.05 1.1 35.23 - 0.89 16.61 2.8 39.13 7.08 - 11.07 3.4 38.08 7.83 - 9.96 3.2 38.67 12.41 - 8.08 3.6 39.17 14.11 - 7.68 3.8 a Compiler's calculations.	27 16.25 - 0.657 A + B 21 17.05 - 0.747 A + B 94 12.98 - 0.719 A + B 79 12.81 - 0.849 A + B 13 8.22 - 0.797 A + B 38 13.09 - 1.005 A + B 53 11.87 - 0.874 A + B + D 92 12.04 - 1.106 A + D 55 7.40 - 1.627 A + D + F 56 7.40 - 1.650 D + E 57 4.07 - 3.355 D + E 51 0.98 - 2.284 D + E 52 $- 1.285$ 1.719 A + E 53 $- 0.757$ 2.247 A + E 54 $- 0.757$ 2.247 A + E 54 $- 0.757$ 2.206 A + E 54 $- 0.757$ 2.206 A + E 54 $- 0.921$ A + E 55 $- 1.684$ A + E 56 $- 0.478$ $- 1.684$ A + E 57 $- 1.684$ A + E 59 $- 1.674$ A + E 50 $- 2.955$ - 1.674 A + E 50 $- 0.95$ - 1.674 A + E 50 $- 0.955$ - 1.674 A + E
^b A = NH ₄ ClO ₄ ; B = NaClO ₄ .H ₂ O; D = Na ₂ Cr ₂ O ₂ .2H ₂ O; E = $p(NH_4)$	
$\frac{1}{2} = \frac{1}{2} $	$Cr_2O_7.mNH_4ClO_4$; F = $(NH_4)_2Cr_2O_7$.
AUXILIARY I	NFORMATION
METHOD/APPARATUS/PROCEDURE: Method of "invariant points" used; the third salt is added to the sat- urated sln. corresponding to the	SOURCE AND PURITY OF MATERIALS: Not stated.
eutonic composition of the ternary	(continued next page)

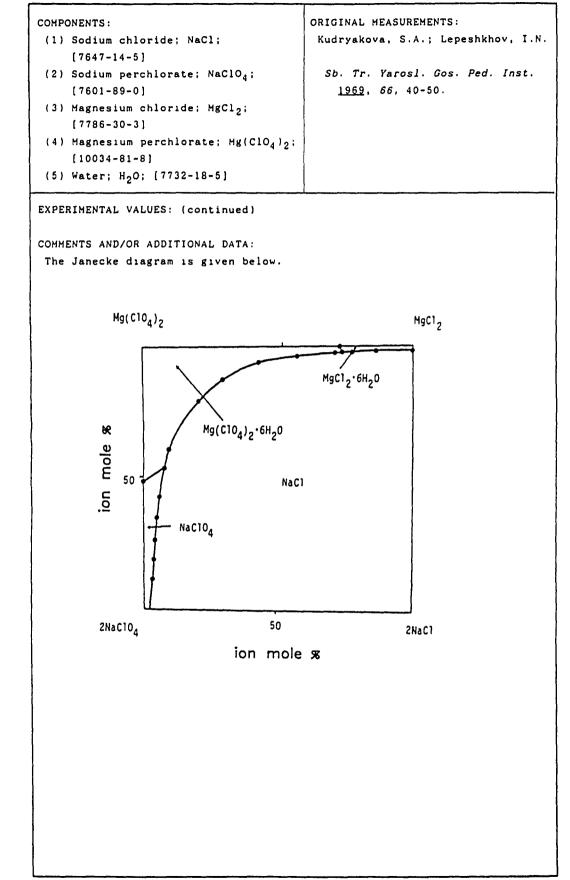
238										
СОМРС	ONENTS:					DRIGINAL	MEASURE	MENTS:	•	
(1)	Sodium	dichrom	ate; N	a ₂ Cr ₂ 07	:	Lepeshk	ov, I.N.	; Sal'n:	ikova, L.N	1.
	[10588	-01-9]								
(2)		perchlo	rate;	NaC104;			p. Yaros		Ped.	
	{7601-	-				<u>1970</u> ,	79, 11-	5.		
(3)		um dichr								
		Cr ₂ 0 ₇ ; (
(4)		um perch		;						
(5)	•	4; {7790 H ₂ 0; [7		-51						
	"ater,									
EXPER	RIMENTA	L VALUES	S: (con	tinued)						
			-	d phase	compos				Solid	
Poir		mol X			•••		ol % ^a	• • • • •	phase ^b , c	;
-		(2)		(4)		-	$Cr_2 O_7^{2-}$			~
P		23.93 22.25	-	1.00 0.90	96.2 96.4	3.8 3.6	4.3 6.9	95.7 93.1	A + B + A + B	C
	1.240	22.97	-	1.01	96.2 95.5		9.4 14.8	90.6 85.2	A + B A + B	
		18.44	-	1.02	95.5	4.5 4.7		85.2 75.8		
	3.469	12.29 17.92	-	1.19 1.38	95.3 94.2	5.8 4.8	24.2 . 34.0 . 32.8	66.0 67.2	A + B A + B	
ବ	6.382	16.28	-	1.20	95.2 96.0	4.0	42.2	57.8	A + B +	D
		16.53 11.69	-	1.52 1.78	94.9 93.8	5.1 6.2	38.9 52.7	61.1 47.3	A + D A + D	
R	8.969	10.43	-	2.29	92.5	7.5	58.5	41.5	A + D +	F
1	8.875	9.05 6.45	-	2.37 3.40	91.9 89.5	8.1 10.5	60.9 69.5	39.1 30.5	D + E D + E	
1	2.435	5.66	-	4.67	86.7	13.3	70.7	29.3	D + E	
	1.616	3.86 1.45	-	3.24 3.38	89.3 89.0	10.7 11.0	76.6 84.3	23.4 15.7	D + E D + E	
	3.241		0.727	1.60	89.7	10.3	94.6	5.4	D + F	
	0.213 0.512	-	$2.19 \\ 1.99$	2.93 2.91	5.5 12.9	94.5 87.1	62.1 63.2	37.9 36.8	A + E A + E	
	1.916 4.632	-	$1.27 \\ 0.122$	3.77	37.8 64.4	62.2 35.6	62.8 66.1	37.2 33.9	A + E A + E	
	5.589	2.16	-	3.53	79.1	20.9	66.3	33.7	A + E	
	5.298 5.711	2.33 3.92	-	3.09 2.66	80.7 85.2	19.3 14.8	66.2 63.4	33.8 36.6	A + E A + E	
	5.988	4.61	-	2.62	86.4	13.6	62.3	37.7	A + E	
-	Compile	er's cal	culatio	ons.	С	See cri	tical Eva	aluation	L	
р				•			H ₄ C10 ₄ .ml	-	-	
	D = N	a ₂ Cr ₂ O ₇ .	2H ₂ 0;	E = n	(NH ₄) ₂ C1	207.mNH	4 ^{C10} 4;	F = (NH	i ₄) ₂ Cr ₂ O ₇	•
				AUXIL	IARY INF	FORMATIO	N			
METUC		RATUS/PR	OCEDUR	F: 100-	* ś. 90.1 a ad 1				····	
						i. Sodi	um was de	etermine	d by prec	i-
				-					tillation	
									L ⁻¹ H ₂ SO	
							ifference		olid phas	•
							microsco			
ESTIM	ATED E	RROR:				REFE	RENCES:			
	stated									
							(C	ontinuec	i next pag	(e)
		· · · · · · · · · · · · · · · · · · ·		<u>.</u>						



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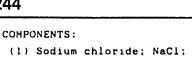
240	

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Sodium chloride; NaCl;	Kudryakova, S.A.; Lepeshkhov, I.N.
[7647-14-5]	
(2) Sodium perchlorate; NaClO ₄ ;	Sb. Tr. Yarosl. Gos. Ped. Inst.
[7601-89-0] (3) Magnesium chloride; MgCl ₂ ;	<u>1969</u> , <i>66</i> , 40-50.
(3) Aughesium chioride, Agoi ₂ , [7786-30-3]	
(4) Magnesium perchlorate; Mg(Cl)2:
[10034-81-8]	
(5) Water; H ₂ O; [7732-18-5]	
VARIABLES:	PREPARED BY:
One temperature: 363 K	E.S. Gryzlova
Composition	
EXPERIMENTAL VALUES:	
Solubility system : NaClO ₄ -	$Cl-Mg(ClO_4)_2-MgCl_2-H_2O$ at $90^{\circ}C$
Liquid phase c	position Solid
biquid phase co	Phase ^b
mass X	mol X ⁸
(1) (2) (3) (4) (1	
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	
0.69 - 25.29 22.76 0.3	- 8.237 3.162 A + B + C - 6.690 4.619 A + C
1.60 - 12.98 39.38 0.94	- 4.708 6.093 A + C
3.65 - 5.54 48.69 2.33 0.54 5.62 - 52.82 0.33	
3.34 19.51 - 38.19 2.2	6.248 - 6.709 A + C
2.39 23.59 - 32.89 $1.532.24$ 25.45 - 27.68 1.39	
1.85 39.20 - 23.23 1.2	13.13 - 4.268 A + D
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	17.10 - 3.691 A + D 18.71 - 2.719 A + D
1.22 57.46 - 9.19 0.9	20.27 - 1.779 A + D
^a Editors' calculations.	
^b A = NaCl; B = MgCl ₂ .6H ₂ O ; C	$Mg(ClO_4)_2.6H_2O ; D = NaClO_4.$
AUXILIA	Y INFORMATION
METHOD/PROCEDURE/APPARATUS:	
	e solubility was studied by the method
-	urated solution corresponding to the
	y system, a third salt is added until a was determined with Trilon B; Na^+ , by
	tate, ClO_4 gravimetrically by nitron
precipitation, and Cl mercurime	•
SOURCE AND PURITY OF MATERIALS:	ESTIMATED ERROR:
Not stated.	Not stated.
	(continued next page)

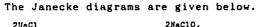


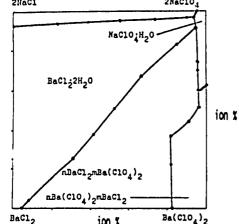
COMPONEN	NTS:				ORI	GINAL M	EASUREM	ENTS	:			
	dium chl		NaCl;		1.	Zaitse	va, S.N	.: к	arn	auk	chov,	A. S.
	847-14-5			•		llah 7			0.	-	Ded	
	dium per 501-89-0		e; NaCl	0 ₄ ;			ap. Yar . <u>1969</u> ,					
	rium chl		BaCl.:			1	• • • • • • • • • •	,	••	•		
	0361-37-		520121		2.	Zaitse	VA. S.N	.: к	arn	auk	thov.	A . S .
-	rium per	•	e: Ba(C	10,);;		541050		• • •			,	
	3465-95-			4.2.		Uch. Z	ap. Yar	osi.	Go	s.	Ped.	
(5) Wat	ter; H ₂ O	; [7732	-18-5]			Inst	. <u>1970</u> ,	78,	86	-91	•	
VARIABLE					PRF	PARED B	v.					
	ature/K:	298.2	and 32	3.2	4	S. Gryz						
Composi						•						
EXPERIME	ENTAL VA	1.1155.	<u></u>									
GAFENINE			ystem :	Na ⁺ ,B	a ²⁺ //Clo	4 ,С1 ⁻ -Н	2 ⁰ at 2	5.0°	с			
•		Liquid	phase c	omposi	tion				 So	lid		
		Didaia	phase c	ompour						ase		
	ma	ss %			mo	1 x ^a			•			
(1)	(2)	(3)		(1)	(2)	(3)	(4)					
24.72	3.16 12.83 16.61 38.06 43.02 49.25	3.12	-	9.519		0.337			A +	B		
23.38	3.16 12.83	3.04 2.97	-	8.417	0.593 2.599	0.354						
17.77	16.61	3.18	-	7.755	3.460 9.504	0.389	-					
6.07	43.02	2.43	-	3.289	11.13	0.370	-		**			
4.96	49.25 53.08 61.76	1.66	-	2.882	11.13 13.66 15.01	0.271	-					
	61.76 66.18		-	0.892 0.976	20.22	0.312	-		+ B B +		С	
	61.39.	-	4.14		21.26	-	0.522		A +	С	_	
-	47.17 45.84	2.58 4.23	1.74 1.93	-		0.400 0.663			+ C A +		D	
-	38.07		1.49 1.84	-		0.840 0.989			**			
-	8.63	22.11	0.25	-	1.759	2.649	0.019		11 11			
-	1.54 0.48	23.87 24.78	1.18 1.70	-	0.299 0.094	2.726 2.845	0.083 0.121					
-	-	26.18	1.74	-	-	3.043	0.125		- "	~		
1.37 1.43	59.15 44.35	-	$10.11 \\ 21.76$	1.082	22.29 16.08	-	1.388 2.872		C + "	D		
1.57 1.52	40.84 35.67	-	25.75 34.84	1.219	$15.13 \\ 14.76$	-	3.474 5.250	c	" + D		F	
-	41.32	-	32.90	-	18.08	-	5.243			F	L	
-	32.53 28.01	2.61 1.91	27.74 32.68	-	10.97 9.488	0.518 0.380	3.407 4.031		D +	Е		
_	23.05	4.08	33.25	-	7.512	0.782	3.946		••			
-	18.42 8.84	7.84 6.84	29.84 33.71	-	5.544 2.395	1.387 1.090	3.270 3.326		••			
-	-	6.78	50.82	-	-	1.283			•1			
a Edit	tors' ca	lculati	ons.									
^b A =	BaC12.2	н ₂ о; в	= NaCl	; C =	NaClO4.	H ₂ ∩; D	= n(Ba	c1 ₂)	. m (Ba(c104) ₂] ;
E =	n[Ba(Cl	0 ₄) ₂].m	(BaCl ₂)	; F =	Ba(C104) ₂ .H ₂ O.						
							(co	ntin	ued	ne	ext p	age)

	243
COMPONENTS :	ORIGINAL MEASUREMENTS:
(1) Sodium chloride; NaCl;	1. Zaitseva, S.N.; Karnaukhov, A.S.
[7647-14-5]	
(2) Sodium perchlorate; NaClO ₄ ;	Uch. Zap. Yarosl. Gos. Ped.
[7601-89-0]	Inst. <u>1969</u> , 66, 107-12.
(3) Barium chloride; BaCl ₂ ;	
[10361-37-2]	2. Zaitseva, S.N.; Karnaukhov, A.S.
(4) Barium perchlorate; $Ba(ClO_4)_2$;	
[13465-95-7]	Uch. Zap. Yarosl. Gos. Ped.
(5) Water; H ₂ O; [7732-18-5]	Inst. <u>1970</u> , 78, 86-91.
EXPERIMENTAL VALUES: (continued)	
Solubility system : Na ⁺ , Ba ²⁺ //C	$10_{4}, C1^{-}H_{2}O$ at $50.0^{\circ}C$
Liquid phase compositi	ion Solid
	phase ^b
muss X	mol % ^a
	(2) (3) (4)
	- 0.735 - A + B
	D.655 0.665 - " 2.278 0.623 - "
15.12 16.13 5.25 - 6.566 3	3.343 0.640 - "
$ \begin{bmatrix} 10.85 & 27.74 & 5.19 & - & 5.218 & 6 \\ 9.35 & 28.49 & 3.65 & - & 4.374 & 6 \end{bmatrix} $	5.368 0.701 - " 5.361 0.479 - "
6.30 40.15 3.68 - 3.346 1	0.18 0.549 - "
	16.04 0.693 - " 16.17 0.634 - "
0.08 61.28 3.37 - 0.055 2	20.22 0.654 - "
	21.92 0.585 - A + B + C 25.40 - 0.400 B + C
	27.05 - 0.351 "
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
	17.38 0.522 0.446 (° + E + F
	14.99 0.692 0.579 A + F 10.76 0.909 0.297 "
- 32.53 8.60 3.38 - 7	7.821 1.216 0.296 "
- 17.84 16.82 6.88 - 4	5.780 1.722 0.531 " 1.173 2.313 0.586 "
-10.22 22.05 4.16 -2	2.238 2.838 0.332 "
$\begin{bmatrix} - & 0.75 & 25.19 & 3.97 & - & 0 \\ - & - & 27.24 & 4.14 & - \end{bmatrix}$	- 3.310 0.312 "
	25.38 - 2.016 C + D
	6.35 - 2.722 C + D + F 3.00 - 4.115 D + F
	6.78 0.553 6.334 D + F + G
	7.17 - 7.367 D + E 0.033 0.945 5.130 F + G
1	.326 1.053 6.765 " 545 1.015 6.931 "
	.405 1.077 6.784 "
	750 - 6.567 "
^a Editors' calculations.	
	$10_4 \cdot H_20$; D = NaClO ₄ ; E = BaCl ₂ · H ₂ U
$ = n(BaCl_2) \cdot m(Ba(ClO_4)_2) ; G = n(BaCl_2) \cdot m(Ba(ClO_4)_2) : m(Ba(ClO_4)_$	
- n(bast2), m(ba(oto4)2) , o = n[b	
	(continued next page)



- [7647-14-5] (2) Sodium perchlorate; NaClO₄;
- [7601-89-0] (3) Barium chloride; BaCl₂; [10361-37-2]
- (4) Barium perchlorate; Ba(ClO₄)₂; [13465-95-7] (5) Water; H₂O; [7732-18-5]
- EXPERIMENTAL VALUES: (continued)
- COMMENTS AND/OR ADDITIONAL DATA:





ion 1

Fig. 1. Solubility isotherm at 25°C

ORIGINAL MEASUREMENTS: 1. Zaitseva, S.N.: Karnaukhov, A.S. Uch. Zap. Yarosl. Gos. Ped. Inst. 1969, 66, 107-12. 2. Zaitseva, S.N.; Karnaukhov, A.S. Uch. Zap. Yarosl. Gos. Ped. Inst. 1970, 78, 86-91.

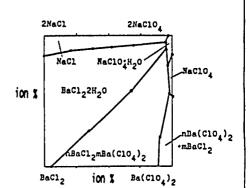


Fig. 2. Solubility isotherm at 50⁰C

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The method of nonvariant points. To the solution corresponding to the transition point of the ternary system a third salt was added until a new solid phase appeared. Conditions of saturation not stated. Ba $^{2+}$ was determined gravimetrically in the presence of picric acid; Na⁺ gravimetrically as sodium zinc uranyl acetate; Cl^{-} mercurimetrically; ClO_{d}^{-} by difference.

SOURCE AND PURITY MATERIALS: The starting saits are of reagent and chemically pure grades were recrystallized twice.

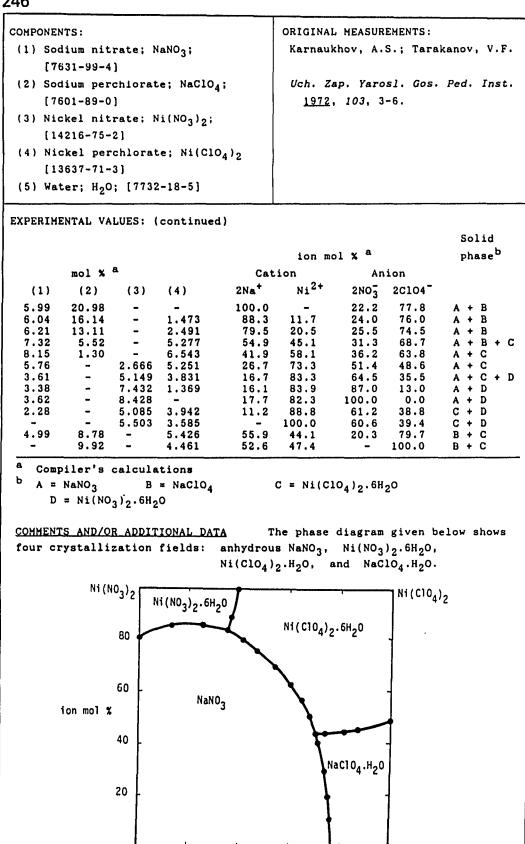
ESTIMATED ERROR: Temp.: $\pm 0.1^{\circ}C.$ ____

REFERENCES:

None.

	TS: ium nitr 31-99-4j		NO ₃ ;			L MEASURI khov, A.:		kanov, V.F.
(2) Sod:	•	hlorate	; NaClO ₄	;		ap. Yaros , 103, 3-		Ped. Inst.
	kel nitr 216-75-2		(NO ₃) ₂ ;					
[130	637-71-3	1	; Ni(ClO	4 ⁾ 2				
(5) Wate	er; H ₂ O;	[7732-	18-5]					
ARIABLES	5:				PREPAREI	D BY:		
Temperat Composit	ture: 29 tion.	8 K.			E.S. G	ryzlova		
XPERIME	NTAL VAL	UES:						
Solubil:	ity syst	em 2Na	⁺ , Ni ²⁺	2C10 ₄	-, 2NO3 ·	- water a	at 25 °C	:
		Lig	uid phas	e compos	ition			Solid
	mass	x		mola	lity ^a / 1	nol kg ⁻¹		phase ^b
(1)	(2)	(3)	(4)	(1)	(2)		(4)	
$11.58 \\ 12.10$	58.47 46.56	-	- 8,94	4.549 4.394	15.945		-	A + B A + B
12.61	38.38			4.406	11.737 9.310		1.769	A + B
$15.06 \\ 17.11$	16.36 3.92	-	32.89 41.61		3.744 0.857		3.577 4.323	A + B + C A + C
12.61	-	12.54	34.82	3.706	-	1.714	3.377	A + C
8.05 8.03	-	24.70 37.93	25.91 9.85	2.291 2.138		3.270 4.698		A + C + I A + D
8.96	-	44.87	-	2.283	-	5.319	-	A + D
5.18	- -	24.87 28.19	27.18 25.89	1.425	-	3.182 3.360		C + D C + D
9.74	24.71 31.09	-	32.11 29.42		6.035 6.430	-	3.727	B + C B + C
						(c c	ontinued	next page
			AUXI	LIARY IN	FORMATIO	4		
ETHOD/AI	PPARATUS	PROCED	URE:		SOURCE	AND PUR	TY OF M	ATERIALS:
To the s	satd. so	lutions	URE: corresp of the	-	1	AND PUR	ITY OF M	ATERIALS:
To the s to the points (satd. so compos (in the	lutions itions presenc	correspo of the e of an o	nodal excess	Not s	tated.		ATERIALS:
To the s to the points (of solid	satd, so compos (in the d phases	lutions itions presenc) a t	corresp of the e of an hird sa	nodal excess lt was	Not s	TED ERROF		ATERIALS:
To the s to the points (of solid added to peared.	satd. so compos (in the d phases until a Nitra	olutions sitions presenc) a t new sol	correspondent of the e of an hird satisfied id phase determine	nodal excess lt was e ap- ed us-	Not s	tated.		ATERIALS:
To the s to the points (of solid added (peared. ing Devi	satd. so compos (in the d phases until a Nitra arda's m	elutions elitions presenc e) a t new sol ate was method;	correspondent of the e of an of hird sa id phase determine perchlor	nodal excess lt was e ap- ed us- ate by	Not si ESTIMA' Not si	TED ERROF		ATERIALS:
To the s to the points (of solid added (peared. ing Deva gravime)	satd. so compos (in the d phases until a Nitra arda's m tric met	olutions presenc) a t new sol ate was method; .hod usi	corresp of the e of an hird sa id phase determine perchlor ng nitro	nodal excess lt was e ap- ed us- ate by n pre-	Not s	TED ERROF		ATERIALS:
To the s to the points (of solid added (peared, ing Deve gravime) cipitat:	satd. so compos (in the d phases until a Nitra arda's m tric met ion; nic	elutions presence) a t new sol ate was method; hod usi kel by	corresp of the e of an o hird sa id phase determine perchlor ng nitro complexo	nodal excess lt was e ap- ed us- ate by n pre- metric	Not si ESTIMA' Not si	TED ERROF		ATERIALS:
To the s to the points (of solid added (peared. ing Deva gravimet cipitat: titratic	satd. so compos (in the d phases until a Nitra arda's m tric met ion; nic on with	elutions presence) a t new sol ate was method; chod usi ckel by Trilon	corresp of the e of an hird sa id phase determine perchlor ng nitro complexo B. The	nodal excess lt was e ap- ed us- ate by n pre- metric solid	Not si ESTIMA' Not si	TED ERROF		ATERIALS:
To the s to the points (of solid added (peared. ing Deva gravime) cipitat: titratic phases (satd. so compos (in the d phases until a Nitra arda's m tric met ion; nic on with	elutions presence) a t new sol ate was method; chod usi ckel by Trilon	corresp of the e of an o hird sa id phase determine perchlor ng nitro complexo	nodal excess lt was e ap- ed us- ate by n pre- metric solid	Not si ESTIMA' Not si	TED ERROF		ATERIALS:
To the s to the points (of solid added (peared. ing Deva gravimed cipitat: titratic	satd. so compos (in the d phases until a Nitra arda's m tric met ion; nic on with	elutions presence) a t new sol ate was method; chod usi ckel by Trilon	corresp of the e of an hird sa id phase determine perchlor ng nitro complexo B. The	nodal excess lt was e ap- ed us- ate by n pre- metric solid	Not si ESTIMA' Not si	TED ERROF	} :	ATERIALS:

J.



2NaNO3

ion mol 🐒

2NaClO₄

COMPONENTS: (1) Sodium sulfate; Na ₂ SO ₄ ; [7757-82-6]	ORIGINAL MEASUREMENTS: Karnaukhov, A.S.; Leboschina, V.I.
<pre>(2) Sodium perchlorate; NaClO₄; [7601-89-0]</pre>	Tr. Yarosl. Gos. Ped. Inst. <u>1979</u> , 178, 24-7.
<pre>(3) Zinc sulfate; ZnSO₄; [7733-02-0]</pre>	
(4) Zinc perchlorate; $Zn(ClO_4)_2$ [13637-61-1] (5) Water; H ₂ O; [7732-18-5]	
VARIABLES: Temperature: 298 K. Composition.	PREPARED BY: I.S. Bodnya
EXPERIMENTAL VALUES: Solubility system 2Na ⁺ , Zn ²⁺ 2	$C10_{4}^{-}$, $S0_{4}^{2}^{-}$ - water at 25 ^o C :
Liquid phase c	
Point mass X	molality ^a / mol kg ⁻¹ phase ^b
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	(1) (2) (3) (4) 1.770 5.35 A + B
1 13.19 34.35 - - I 4.43 36.90 - 4.24 VII 0.82 41.02 - 6.34 2 0.58 49.87 - 2.58 II 0.79 67.42 - - 3 0.59 42.70 - 10.38 4 0.60 21.73 - 14.24	0.573 5.54 - 0.295 A + B
2 0.58 49.87 - 2.58 II 0.79 67.42	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	0.090 7.53 - 0.848 B + D
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	0.079 4.86 - 1.017 B + D - 4.79 - 1.841 B + D
VIII - 26.62 0.60 32.96	- 5.46 0.093 3.132 B + D + E
III - 24.92 - 35.39 IX 0.49 - 0.12 50.70	- 5.13 - 3.374 D + E 0.071 - 0.015 3.940 B + E + F
IV 0.55 53.43 6 2.50 - 0.22 34.45	0.074 4.393 E + F 0.280 - 0.022 2.075 B + F
7 6.14 - 2.71 27.33	0.677 - 0.263 1.620 B + F
X 7.42 - 8.24 21.00	0.825 - 0.806 1.255 B + F + G 1.277 - 1.111 0.694 B + G
8 11.75 - 11.61 11.88	
8 11.75 - 11.61 11.88 V 15.63 - 17.54 -	1.647 - 1.626 - B + G
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - a Compiler's calculations	
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - a Compiler's calculations b $A = Na_2SO_4$; $B = Na_2SO_4$.	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - a Compiler's calculations	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - a Compiler's calculations b $A = Na_2SO_4$; $B = Na_2SO_4$, $D = NaClO_4.H_2O$; $E = Zn(ClO_4$ $G = Na_2SO_4.ZnSO_4.4H_2O$.	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - Compiler's calculations b $A = Na_2SO_4$; $B = Na_2SO_4$. $D = NaClO_4.H_2O$; $E = Zn(ClO_4$ $G = Na_2SO_4.ZnSO_4.4H_2O$. AUXILIA	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - Compiler's calculations b $A = Na_2SO_4$; $B = Na_2SO_4$, $D = NaClO_4.H_2O$; $E = Zn(ClO_4$ $G = Na_2SO_4.ZnSO_4.4H_2O$. AUXILIA METHOD/APPARATUS/PROCEDURE: Method of "invariant points" u	1.647 - 1.626 - B + G 0.018 0.643 3.188 - F + G 0.506 - 3.474 - F + G 10H ₂ O; C = Na ₂ SO ₄ .H ₂ O;) ₂ .6H ₂ O; F = ZnSO ₄ .7H ₂ O; RY INFORMATION SOURCE AND PURITY OF MATERIALS: sed. Not stated.
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - Compiler's calculations b $A = Na_2SO_4$; $B = Na_2SO_4$, $D = NaClO_4.H_2O$; $E = Zn(ClO_4$ $G = Na_2SO_4.ZnSO_4.4H_2O$. AUXILIA AUXILIA 4ETHOD/APPARATUS/PROCEDURE: Method of "invariant points" u ClO ₄ was determined gravimetrica	1.647 - 1.626 - B + G 0.018 0.643 3.188 - F + G 0.506 - 3.474 - F + G 10H ₂ O; C = Na ₂ SO ₄ .H ₂ O;) ₂ .6H ₂ O; F = ZnSO ₄ .7H ₂ O; RY INFORMATION SOURCE AND PURITY OF MATERIALS: Not stated. 11y
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - Compiler's calculations b $A = Na_2SO_4$; $B = Na_2SO_4$, $D = NaClO_4.H_2O$; $E = Zn(ClO_4$ $G = Na_2SO_4.ZnSO_4.4H_2O$. AUXILIA METHOD/APPARATUS/PROCEDURE: Method of "invariant points" u ClO ₄ was determined gravimetrica with nitron; SO ₄ ² by precipitat	1.647 - 1.626 - B + G 0.018 0.643 3.188 - F + G 0.506 - 3.474 - F + G 10H ₂ O; C = Na ₂ SO ₄ .H ₂ O;) ₂ .6H ₂ O; F = ZnSO ₄ .7H ₂ O; RY INFORMATION SOURCE AND PURITY OF MATERIALS: Not stated. 11y ion
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - Compiler's calculations b A = Na ₂ SO ₄ ; B = Na ₂ SO ₄ , D = NaClO ₄ .H ₂ O; E = Zn(ClO ₄ G = Na ₂ SO ₄ .ZnSO ₄ .4H ₂ O . AUXILIA	1.647 - 1.626 - B + G 0.018 0.643 3.188 - F + G 0.506 - 3.474 - F + G 10H ₂ O; C = Na ₂ SO ₄ .H ₂ O;) ₂ .6H ₂ O; F = ZnSO ₄ .7H ₂ O; RY INFORMATION SOURCE AND PURITY OF MATERIALS: Not stated. 11y ion exo- ESTIMATED ERROR:
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - Compiler's calculations b $A = Na_2SO_4$; $B = Na_2SO_4$. $D = NaClO_4.H_2O$; $E = Zn(ClO_4$ $G = Na_2SO_4.ZnSO_4.4H_2O$. MUXILIA METHOD/APPARATUS/PROCEDURE: Method of "invariant points" u ClO ₄ was determined gravimetrica with nitron; SO ₄ ² by precipitat as barium sulfate; Zn ²⁺ by complemetric titration with Erioch	1.647 - 1.626 - B + G 0.018 0.643 3.188 - F + G 0.506 - 3.474 - F + G 10H ₂ O; C = Na ₂ SO ₄ .H ₂ O;) ₂ .6H ₂ O; F = ZnSO ₄ .7H ₂ O; RY INFORMATION SOURCE AND PURITY OF MATERIALS: Not stated. 11y ion exo- ESTIMATED ERROR: Not stated.
V 15.63 - 17.54 - 9 0.16 4.93 32.25 - VI 4.40 - 34.35 - a Compiler's calculations b $A = Na_2SO_4$; $B = Na_2SO_4$, $D = NaClO_4.H_2O$; $E = Zn(ClO_4$ $G = Na_2SO_4.ZnSO_4.4H_2O$. AUXILIA METHOD/APPARATUS/PROCEDURE: Method of "invariant points" u ClO ₄ was determined gravimetrica with nitron; SO_4^2 by precipitat as barium sulfate; Zn^{2+} by completion	1.647 - 1.626 - B + G 0.018 0.643 3.188 - F + G 0.506 - 3.474 - F + G 10H ₂ O; C = Na ₂ SO ₄ .H ₂ O;) ₂ .6H ₂ O; F = ZnSO ₄ .7H ₂ O; RY INFORMATION SOURCE AND PURITY OF MATERIALS: Not stated. 11y ion exo- ESTIMATED ERROR: Not stated.

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COMPONENTS:	ORIGINAL MEASUREMENTS:
<pre>(1) Sodium sulfate; Na₂SO₄; [7757-82-6]</pre>	Karnaukhov, A.S.; Leboschina, V.I.
(2) Sodium perchlorate; NaClO ₄ ;	Tr. Yarosl. Gos. Ped. Inst.
[7601-89-0]	<u>1979</u> , <i>178</i> , 24-7.
<pre>(3) Zinc sulfate; ZnSO₄; [7733-02-0]</pre>	
(4) Zinc perchlorate; Zn(ClO ₄) ₂	
[13637-61-1]	
(5) Water; H ₂ O; [7732-18-5]	
VARIABLES:	PREPARED BY:
Temperature: 298 K.	I.S. Bodnya
Composition.	
EXPERIMENTAL VALUES:	
Liquid phase	
Point mol X ^a	ion mol X ^a phase ^b
(1) (2) (3) (4)	$2Na^+$ Zn^{2+} $2C10\frac{1}{4}$ $S0^2_4$
1 2.826 8.54 - ,- I 0.925 8.94 - 0.470	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
VII 0.178 10.34 - 0.740	0 87.8 12.2 97.1 2.9 A + B + D
VII 0.178 10.34 - 0.74 2 0.135 13.45 - 0.32 II 0.240 23.73	0 87.8 12.2 97.1 2.9 A + B + D 2 95.5 4.5 98.1 1.9 A + D 100.0 - 98.0 2.0 A + D
3 0.140 11.77 - 1.32 4 0.129 7.91 - 1.65	5 82.0 18.0 98.1 1.9 B + D 5 71.1 28.9 97.8 2.2 B + D
4 0.129 7.91 - 1.65 5 - 7.71 - 2.96	3 56.5 43.5 100.0 - B + D
VIII - 8.51 Q.145 4.87 III - 8.01 - 5.27	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
IX 0.119 - 0.026 6.61	8 1.8 98.2 97.9 2.1 B + E + F
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	5 - 100.0 98.3 1.7 E + F 4 11.8 88.2 87.3 12.7 B + F
6 0.484 - 0.037 3.584 7 1.166 - 0.453 2.79 X 1.412 - 1.380 2.144	3 - 100.0 50.3 1.7 E F 4 11.8 88.2 87.3 12.7 B F 1 26.4 73.6 63.3 36.7 B F 8 28.6 71.4 43.5 56.5 B F F 5 41.4 58.6 22.5 77.5 B G 50 3 49.7 - 100.0 B G
8 2.180 - 1.895 1.18	8 28.6 71.4 43.5 56.5 B + F + G 5 41.4 58.6 22.5 77.5 B + G
V 2.801 - 2.766 - 9 0.030 1.083 5.371 -	0010 4011 - T0010 D + G
VI 0.850 - 5.840 -	9.6 90.4 9.1 90.9 F + G 12.7 87.3 - 100.0 F + G
^a Compiler's calculations ^b $A = Na_2SO_4$; $B = Na_2SO_4$	104-0: C ~ No. SO 4.0:
$D = NaClO_4 \cdot H_2O;$ $E = Zn(ClO_4)$	$(10 R_20; F = 2 R_2 S O_4 \cdot R_2 O_5)$
$G = Na_2 SO_4 \cdot Zn SO_4 \cdot 4H_2 O \cdot$	
COMMENTS AND/OR ADDITIONAL DATA	
Na ₂ SO ₄ .10H ₂ O (77.06%); ZnSO ₄ .7	shows six crystallization fields: 7H=0 (9.45%): N==SO. (3.88%):
Na_2SO_4 , $ZnSO_4$, $4H_2O$ (7.33%); NaCl	$LO_4.H_2O$ (1.59%); $Zn(ClO_4)_2.6H_2O$ (0.69%).
VII, VIII, IX and X are isother	
Na2504	ZnSO ₄
- \ /!	•
Na2504.10H20	- Na ₂ 50 ₄ . Zn50 ₄ . 4H ₂ 0
ion mol x	

ion mol x Na₂SO₄. 10H₂O Na₂SO₄. $ZnSO_4$. $ZnSO_4$. $ZnSO_4$. AH_2O Na₂SO₄. $ZnSO_4$. $ZnSO_4$. $ZnSO_4$. AH_2O Na₂SO₄. $ZnSO_4$. $ZnSO_4$. $ZnSO_4$. AH_2O Na₂SO₄. $ZnSO_4$. $ZnSO_4$. $ZnSO_4$. $ZnSO_4$. AH_2O Na₂SO₄. $ZnSO_4$. n

COMPC	ONENTS:				İ	ORIGINA	L MEASU	REMENTS:			
<pre>(1) Sodium chloride; NaCl; [7647-14-5]</pre>						Marsha	11, P.R	.; Hunt,	н.		
<pre>(2) Sodium percolorate; NaClO₄; [7601-89-07]</pre>						J. Che 217-	-	Data 1	<u>959</u> ,	4,	
(3) Ammonium chloride; NH ₄ Cl; [12125-02-9]											
(4)	Ammoni [7790-		hlorat	e; NH ₄ C	10 ₄ ;						
(5)	-	a; NH ₃ ;	[7664	-41-7]							
VARIA	BLES:					PREPARE	D BY:				
Temp	peratur	e: 240	- 323	к.		с.ү. с	han				
Composition					i i i i i i i i i i i i i i i i i i i						
Cout	031010	41									
		L VALUE	 S:		. <u></u>						
EXPER	RIMENTA	L VALUE									
EXPER	RIMENTA	L VALUE		NH4 [] (c1 ⁻ ,c10 ₄	,-H ₂ 0 at	variou	s temper	ature	:8 :	
EXPER	RIMENTA	L VALUE	n Na ⁺ ,	NH4 [] (.se comp		,-H ₂ 0 at	variou	s temper	Sol	id	
EXPER Solu	RIMENTA	L VALUE systen Liqu	n Na ⁺ , lid pha	se compo	osition				Sol pha		
EXPER Solu	RIMENTA	L VALUE system Liqu	n Na ⁺ , hid pha	se compo kg ⁻¹	osition 100X(c	ation) ^a	100x	(anion) ^b	Sol pha	id	
EXPER Solu	RIMENTA Ibility C m Na ⁺	L VALUE systen Liqu olality NH4	n Na ⁺ , nid pha 7/ mol Cl	se compo kg ⁻¹ Cl04	DSITION 100X(c Na ⁺	ation) ^a NH4	100X C1 ⁻	$(anion)^{b}$ ClO ₄ ^{- d}	Sol pha	id se ^c	
EXPER Solu t/ °	C m Na ⁺ 0.78	L VALUE system Liqu olality NH ⁴ 12.39	n Na ⁺ , nid pha 7/ mol Cl 2.1	se compo kg ⁻¹ Cl0 4 11.1	05ition 100X(c Na ⁺ 5.9	ation) ^a NH4 94.1 ^d	100x C1 ⁻ 15.8	(anion) ^b ClO ₄ ^{- d} 84.2	Sol pha (1)+	id se ^c	.(4)
EXPER Solu t/ °	C m Na ⁺ 0.78 0.32	L VALUE system Liqu olality NH ⁴ 12.39 20.51	n Na ⁺ , nid pha 7/ mol Cl 2.1 0.88	se compo kg ⁻¹ ClO ₄ 11.1 19.95	100X(c Na ⁺ 5.9 1.54	ation) ^a NH ⁴ 94.1 ^d 98.46 ^d	100x C1 ⁻ 15.8 4.22	(anion) ^b ClO ₄ - d 84.2 95.78	Sol pha (1)+ "	.id .se ^c (3)+	41
EXPER Solu t/ °	RIMENTA ability C m Na ⁺ 0.78 0.32 0.76	L VALUE system Liqu olality NH ⁴ 12.39 20.51 19.15	n Na ⁺ , nid pha c/ mol cl ⁻ 2.1 0.88 1.4	kg ⁻¹ ClO ₄ 11.1 19.95 18.5	100X(c Na ⁺ 5.9 1.54 3.84	ation) ^a NH4 94.1 ^d	100X C1 ⁻ 15.8 4.22 7.0	(anion) ^b ClO ₄ ⁻ d 84.2 95.78 93.0	Sol pha (1)+ "	id se ^C (3) "	41

(table continued next page)

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The solubility determinations were carried out using a specially constructed apparatus (diagram given in original paper), involving a gas line connected to the saturation cell. The cell consisted of two compartments separated by a sintered glass partition, the larger one of which was connected to the gas line in such a way that the cell could be inverted, with either one of the compartments vertically above the other. Weighed amts of the salts were sealed in the smaller compartment of the cell which was then connected to the gas line via the larger compartment. Excess of dry ammonia was condensed in the cell until the salts had all dissolved at the set temperature. The coolants used were dry ice and CCl_4 . The cell was thermostated in a liquid NH₃ bath for -33 °C determinations, in an ice + water bath for 0 °C, and in a water bath for the other temperatures.

(continued next page)

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COMPC	NENTS:					ORIGINA	L MEASUR	EMENTS:			
(1)	Sodium [7647-1		de; Na	Cl;		Marsha.	L1, P.R.	; Hunt,	Η.		
121	•	-		NaClO ₄ ;		T. Cha	n. Eng.	Data 1	050		
(2)	[7601-8		orale;	Nacio4;		217-:	-	Data 1	959,	4,	
(3)	Ammoniu		ride:	NH_C1:							
	[12125-		·	4							
(4)	Ammoniu	um perc	hlorat	e; NH ₄ Cl	.04;						
	[7790-9	98-9]		•	•						
(5)	Ammonia	ь; _{NH} 3;	[7664	-41-7]	Í						
EXPER	RIMENTAL	. VALUE	:S: (co	ntinued)							
Solu	bility	system	Na ⁺ ,	NH¦ II С	21 ⁻ ,C107	-H ₂ O at	various	, temper	atur	es :	
		Liqu	id pha	se compo	sition					olid hase ⁰	
t/ 0		lalitu	/ mol	kg-1	1008(0	ation) ^a	10011	nionib	pi	lase	
67	Na ⁺	NH [†]	C1	C107	Na ⁺	NH ⁺	C1 ⁻	c10.			
-33	17.4	3.06	-	20.46	85.0 ^d	15.0	-	100.0	(1)	+(2)	+{4}
0	19.45	4 1	0.086	23.33	95.9 ^d	4.1	0.366	99.6	**		
25	19.4	3.53	-	22.93	96.47 ⁰	4.1 ¹ 3.53 15.9	-	100.0	"	••	**
50	25.1	4.74	-	29.84	84.1 ^d	15.9	-	100.0	11	**	**
a X($Na^+) =$	n(Na ⁺)	/[n(Na	+) + n(N	H ⁺ 11:	X (NI	(†) = 1	$- X(Na^+)$):		
^b x(C104 =	n(C104)/[n(C	10_{4}^{-}) + n	(C1 ⁻)];	X(C)	(_) = 1	- X(C10	Ā)		
) = am								-		
	l compo										
d Co	mpiler'	s calc	ulatio	ns.							
					<u> </u>						
				AUXIL	IARY INF	ORMATION	1				
четно	D/APPAR	ATUS/P	ROCEDUI	RE:							
crys	tals we	re for	med, an	nd the c	ell inve	rted so	that th	e solut	ion f	lilte	ered
thro	ugh the	parti	tion in	nto the	larger o	compartme	ent. A	fter fi	ltrat	ion	the
						d by con					
						tatively					
						The cel					
				-		ion was		-			
-	dahl pr g dich			nioride ein as i		termined	ογ τι	LTACION	WICH	LAGN	···3 ·
						•					

SOURCE AND PURITY OF MATERIALS:	ESTIMATED ERROR:
Not stated. Ammonia was dried with	Reproducibility (3 detn) is within
sodium.	\pm 2 % of the mean value in most
	Cases.

SYSTEM INDEX

Page numbers preceded by E refer to evaluation text whereas those not preceded by E refer to compiled tables.

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+ 2-butanamine	E7, 30, 31
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+ 1,2-ethanediol	E7, 28, 29
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+ Ethanol	E7, 26, 27
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+ Ethyl benzoate	E8, 36, 37
+ Ethyl 3-oxobutanoate	E7, 36, 37
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+ Hydrogen peroxide		E8, 46
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+ 2-methyl-1-propanol		E7, 26, 27
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+ 1-octanol		E8, 28, 29
+ 2-octanol		E8, 28, 29
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+ 1,1'-oxybis-ethane		E7, 41
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+ propanal		E7, 35
+ 1-propanamine		E7, 30, 31
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+ Ethanol	+ Water	E10, 51, 52
+ Ethyl acetate	+ Water	E10, 54
+ Hexamethylenetetramine	+ Water	E11, 62, 63

+ Methanol	+ Water	E10, 5	51, 52	
+ 2-methyl-1-propanol	+ Water	E10, 5	51, 52	
+ N,N-dimethylcarbamide	+ Water	E11, 6	50, 61	
+ N,N-dimethylformamide	e + Water	E11, 5	6	
+ 1-propanol	+ Water	E10, 5	51, 52	
+ Propylene carbonate	+ Water	E11, 5	57	
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+ Barium perchlorate	+ Water	E14, 7	'5	
+ Calcium perchlorate	+ Water	E14, 7	74	
+ Cobalt perchlorate	+ Water	E14, 7	7	
+ Copper perchlorate	+ Water	E14, 7	19	
+ Manganese perchlorate	+ Water	E14, 7	/6	
+ Nickel perchlorate	+ Water	E14, 78		
+ Cerium perchlorate	+ Water	E15, 80		
+ Gadolinium perchlorate	+ Water	E15, 81, 82		
+ Terbium perchlorate	+ Water	E15, 8	3	
+ Lithium chromate	+ Water	E16, 8	37, 88	
+ Lithium nitrate	+ Water	E16, 8	4-86	
LiClO ₄ + Ethanol +	- Ethyl acetate	+ Water	E16, 89	
+ Copper perchlorate	N,N-dimethylcarbamide	+ Water	E17, 93-95	
+ Magnesium perchlorate+	- hexamethylenetetramine	+ Water	E17, 90-92	
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