COMPONENTS:	EVALUATOR:
(1) Methane; CH_4; [74-82-8] (2) Alkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January

CRITICAL EVALUATION:

The Solubility of Methane in Alkanes at Partial

Pressures up to 200 kPa (*ca.* 2 atm).

I.   The solubility of methane in normal alkanes.

The two methods most commonly used to determine the solubility of methane in alkanes are volumetric methods used at a total pressure of about one atmosphere and gas liquid chromatography methods in which retention times or volumes are measured when the solvent is the stationary phase. Also used was a gas pressure change method at very low methane partial pressure and a gas stripping method with the GLC used as a detector.

With two exceptions the volumetric methods used since 1960 give consistent results which appear to be reliable within several percent. The GLC methods used since 1974 also appear to give reliable results. Earlier work by both methods gave solubility values that appear to be too small sometimes by as much as 40 percent.

The volumetric methods used cover a variety of degassing and equilibration techniques. The solubility values from the early work of McDaniel (ref. 1) are consistently too small. This may be because of poor equilibration in the hand shaken apparatus or incomplete degassing of the solvent.

Guerry (ref. 2) used a modified van Slyke method. The small solvent volumes and large solvent vapor pressure gave problems which resulted in too small solubility values. Tilquin *et al.* (ref. 5) measured pressure changes at low methane partial pressures when degassed solvent and gas were contacted. When the methane solubility is calculated for 101.325 kPa partial pressure, the value appears to be too small for the normal alkane and too large for the branched alkane. It is possible that Henry's Law is not obeyed between the low partial pressure of the measurement and atmospheric pressure, but Henry's law is supported by the GLC results on solvents of higher carbon number. The results of Makranczy *et al.* (ref. 11) are often too large. Their volumetric technique appears to have problems when solvents of relatively large vapor pressure are studied. Both Lannung and Gjaldbaek (ref. 3) and Wilcock *et al.* (ref. 12) usually report reliable solubility values. However, both find a smaller temperature coefficient of solubility and enthalpy of solution for methane in hexane and octane than do most other workers which casts some doubts on their results for these systems. The other solubility values by volumetric methods (ref. 7, 9, 10, and 13) appear to show a consistent and reliable pattern of results.

The GLC retention time studies of Ng *et al.* (ref. 6) and Lenoir *et al.* (ref. 8) give methane solubility values that appear to be too small. The results obtained by Lin and Parcher (ref. 15) from GLC retention volume studies and by Richon and Renon (ref. 14) by gas stripping and GLC detector method appear to give reasonable methane solubility values.

The mole fraction solubility values at 298.15 K and 101.325 kPa methane pressure are given as a function of normal alkane carbon number in Fig. 1. Although the values show considerable scatter, we believe that there are enough reliable values measured by traditional volumetric methods near atmospheric pressure to allow a reliable line to be placed through the data. Octadecane melts at 301.33 K, thus the normal alkanes of C_{18} and larger melt at temperatures greater than 298.15 K. The solubility values of methane in hydrocarbons of carbon number 18 and greater are for a hypothetical liquid hydrocarbon. The values were estimated from solubility data at higher temperatures by assuming ln x_1 vs 1/(*T*/K) is linear. The

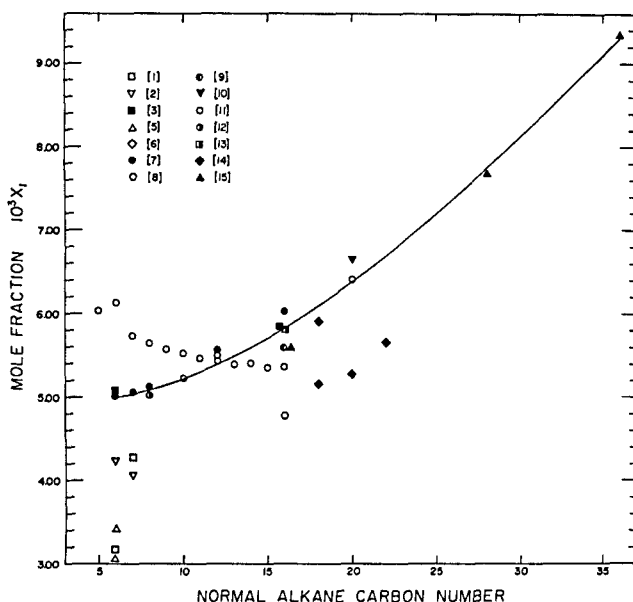| COMPONENTS:	EVALUATOR:
(1) Methane; CH_4; [74-82-8] (2) Alkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January

CRITICAL EVALUATION:

Figure 1. The mole fraction solubility of methane at 298.15 K and 0.1013 MPa partial pressure in the normal alkanes.

The C_{18} and above hydrocarbons are solids at 298.15 K. The solubility values are extrapolated from experimental values in the liquid state at higher temperatures.

The numbers refer to the references at the end of the evaluation.

solubility of Tilquin *et al.* (ref. 5) in hexane was adjusted assuming Henry's law and an average enthalpy of solution to estimate a 298 K value from the experimental value at 288 K.

The line drawn in Fig. 1 must be considered as only an approximation as to how the methane mole fraction solubility at 298.15 K and 101.325 kPa methane pressure changes with carbon number. The steady increase in solubility as the carbon number increases seems reasonable. The mole fraction solubility does increase more rapidly with carbon number than does the contact surface of the hydrocarbon.

The partial molal enthalpy of solution of methane in normal alkanes averages (-4.1 ± 0.5) kJ mol^{-1} at 298.15 K for hydrocarbons C_6 through C_{20}. The enthalpy values in heptane and hexadecane indicate the methane solubility values in these solvents are not quite consistent with the data on the other systems.

The work of Cukor and Prausnitz (ref. 9) and Chappelow and Prausnitz (ref. 10) indicate the enthalpy of solution decreases in magnitude as the temperature increases. Values of the partial molal enthalpies of solution of methane in normal alkanes from a three constant equation fitted to the data are about

T/K	298	323	373	473
$\Delta \overline{H}_1^\circ/$kJ mol^{-1}	-4.1	-3.1	-2.2	-0.4

The individual systems are discussed in more detail below.

Methane + Pentane; C_5H_{12}; [109-66-0]

The mole fraction solubility of 6.02×10^{-3} at 298.15 K and 101.32 101.325 kPa methane pressure of Makranczy *et al.* (ref. 11) is the only experimental value for the system. Although it is classed as tentative, we believe it may be as much as 15-20 percent too large.

Methane + Hexane; C_6H_{14}; [110-54-3]

The solubility of methane in hexane is reported from six laboratories. The early work of McDaniel (ref. 1) and Guerry (ref. 2) is rejected. Their solubility values at temperatures between 293 and 333 K are much too small. The single value of Tilquin *et al.* (ref. 5) at 288.15 is also rejected, however, it may have some validity as a distribution coefficient at small methane partial pressures. The single value of Makranczy *et al.* (ref. 11) at 298.15 K is classed as doubtful. It may be 15-20 percent too large.

The values of Lunnung and Gjaldbaek (ref. 3) at 291.15, 298.15, and 310.15 K and of Hayduk and Buckley (ref. 7) over the 273.15 to 323.15 K interval are classed as tentative. There is an inconsistency in the two data sets in that the Lannung and Gjaldbaek data gives an enthalpy of solution of -2.1 kJ mol^{-1} while the Hayduk and Buckley data gives a value of -4.7 kJ mol^{-1}. The Lannung, Gjaldbaek data extends over a much shorter temperature interval. The two studies appear internally consistent. Although the temperature coefficients of solubility differences casts some doubts on the results, the mole fraction solubility values from the two papers were combined in a linear regression to obtain the tentative equation for the mole fraction solubility over the 273.15 to 323.15 K interval.

$$\ln x_1 = -6.92496 + 4.85402/(T/100 \text{ K})$$

With a standard error about the regression line of 1.60×10^{-4}. From the equation, the temperature independent thermodynamic quantities are

$$\Delta \overline{H}_1^\circ/ \quad \text{kJ mol}^{-1} = -4.04 \quad \text{and} \quad \Delta \overline{S}_1^\circ/ \quad \text{J K}^{-1} \text{ mol}^{-1} = -57.6$$

COMPONENTS:	EVALUATOR:
(1) Methane; CH_4; [74-82-8] (2) Alkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January

CRITICAL EVALUATION:

Smoothed values of the mole fraction solubility and partial molar Gibbs energy of solution are in Table 1.

Table 1.   Solubility of methane in hexane at a methane partial pressure of 101.325 kPa (1 atm). Tentative mole fraction solubility and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ$/kJ mol^{-1}
273.15	5.81	11.691
283.15	5.46	12.267
293.15	5.15	12.843
298.15	5.01	13.131
303.15	4.87	13.418
313.15	4.63	13.994
323.15	4.41	14.570

Methane + Heptane; C_7H_{16}; [142-82-5]

McDaniel (ref. 1) reports the solubility of methane in heptane at 295.35, 303.25, and 313.15 K, Guerry (ref. 2) at 293.15 and 298.15 K, Hayduk and Buckley (ref. 7) at 298.15, 323.15 and 348.15 K, and Makranczy *et al.* (ref. 11) at 298.15 K. Again the McDaniel and the Guerry data are rejected as too small. The other data are classed as tentative, but the data of Hayduk and Buckley are preferred.

The tentative data below are based entirely on the three measurements of Hayduk and Buckley. The mole fraction solubility values were fitted by a linear regression to obtain the tentative equation for the 298.15 to 348.15 K temperature interval

$$\ln x_1 = -7.28446 + 5.95159/(T/100 \text{ K})$$

with standard error about the regression line of 2.18×10^{-5}. From the equation the temperature independent thermodynamic changes are

$$\Delta \bar{H}_1^\circ/\text{kJ mol}^{-1} = -4.95 \text{ and } \Delta \bar{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1} = -60.6$$

Smoothed values of the mole fraction solubility and partial molar Gibbs energy of solution are in Table 2.

Table 2.   Solubility of methane in heptane at a partial pressure of
           101.325 kPa (1 atm) methane. Tentative mole fraction
           solubility and partial molal Gibbs energy as a function
           of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^o/kJ \; mol^{-1}$
298.15	5.05	13.109
303.15	4.89	13.412
313.15	4.59	14.017
323.15	4.33	14.623
333.15	4.09	15.229
343.15	3.89	15.835

Methane + Octane; C_8H_{18}; [111-65-9]

     Hayduk and Buckley (ref. 7) report the solubility of methane in
octane at four temperatures between 273.15 and 348.15 K, Makranczy *et al.*
(ref. 11) report one solubility value at 298.15 K and Wilcock *et al.*
(ref. 12) report values 298.15 and 313.35 K. All are classed as tenta-
tive but the data from (ref. 7 and 12) are preferred.

     The temperature coefficients of solubility differ in the two studies.
Wilcock *et al.* data are consistent with an enthalpy of solution of
-2.97 kJ mol^{-1} and the Hayduk and Buckley a value of -4.16 kJ mol^{-1}. The
Wilcock *et al.* enthalpy is based on only two experimental points
15 degrees apart and thus subject to some error.

     The six experimental values from Hayduk and Buckley and from Wilcock
et al. were combined in a linear regression to obtain the tentative
equation

     $\ln x_1 = -6.94961 + 4.95903/(T/100 \; K)$

with a standard error around the regression line of 5.37 x 10^{-5}. The
temperature independent thermodynamic changes from the equation are

     $\Delta \bar{H}_1^o/kJ \; mol^{-1} = -4.12$ and $\Delta \bar{S}_1^o/J \; K^{-1} \; mol^{-1} = -57.8$

Smoothed values of the mole fraction solubility and partial molar Gibbs
energy of solution are in Table 3.

Table 3.   Solubility of methane in octane. Tentative values of the
           mole fraction solubility at 101.325 kPa (1 atm) partial
           pressure methane and partial molal Gibbs energy as a func-
           tion of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^o/kJ \; mol^{-1}$
273.15	5.89	11.660
283.15	5.53	12.238
293.15	5.21	12.815
298.15	5.06	13.104
303.15	4.92	13.393
313.15	4.67	13.971
323.15	4.45	14.549
333.15	4.25	15.127
343.15	4.07	15.705

COMPONENTS:	EVALUATOR:
(1) Methane; CH_4; [74-82-8] (2) Alkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January

CRITICAL EVALUATION:

Methane + Nonane; C_9H_{20}; [111-84-2]

The mole fraction solubility of 5.57×10^{-3} at 298.15 K and 101.325 kPa methane pressure of Makranczy *et al.* (ref. 11) is the only experimental value reported for the system. Although it is classed as tentative, the evaluator believes it may be as much as 10 percent too large.

Methane + Decane; $C_{10}H_{22}$; [124-18-5]

Makranczy *et al.* (ref. 11) report the solubility of methane in decane at 298.15 K, Wilcock *et al.* (ref. 12) report the solubility at 282.80 and 313.15 K. Both sets of data are classed as tentative but the Wilcock *et al.* data are preferred.

The tentative values are based on the Wilcock *et al.* data. The equation for the mole fraction solubility between 282.80 and 313.15 K is

$$\ln x_1 = -7.0050 + 5.2154/(T/100 \text{ K})$$

and the corresponding temperature independent thermodynamic changes are

$$\Delta \overline{H}_1^\circ/\text{kJ mol}^{-1} = -4.34 \quad \text{and} \quad \Delta \overline{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1} = -58.2$$

Tentative values of the mole fraction solubility and partial molal Gibbs energy are given in Table 4.

Table 4. The solubility of methane in decane. Tentative values of the mole fraction solubility at 101.325 kPa (1 atm) partial pressure methane and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \overline{G}_1^\circ/\text{kJ mol}^{-1}$
283.15	5.72	12.135
293.15	5.37	12.737
298.15	5.22	13.029
303.15	5.07	13.320
313.15	4.80	13.902

Methane + Undecane; $C_{11}H_{24}$; [1120-21-4]

The mole fraction solubility of 5.46×10^{-3} at 298.15 K and 101 101.325 kPa (1 atm) methane pressure of Makranczy *et al.* (ref. 11) is the only experimental value reported for the system. It is classed as tentative.

M—H

Methane + Dodecane; $C_{12}H_{26}$; [112-40-3]

Hayduk and Buckley (ref. 7) report four solubility values at temperatures between 273.15 and 348.15 K. Makranczy *et al.* (ref. 11) report one value at 298.15 K. All of the data are classed as tentative.

The data were fitted by a linear regression to obtain the equation for the 273.15 to 348.15 K temperature interval

$$\ln x_1 = -6.76819 + 4.63437/(T/100 \text{ K})$$

with a standard deviation about the regression line of 4.3×10^{-5}. The temperature independent thermodynamic changes from the equation are

$$\Delta \bar{H}_1^\circ/\text{kJ mol}^{-1} = -3.85 \quad \text{and} \quad \Delta \bar{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1} = -56.3$$

Smoothed values of the mole fraction solubility and partial molal Gibbs energy of solution are in Table 5.

Table 5. Solubility of methane in dodecane. Tentative values of the mole fraction solubility at 101.325 kPa (1 atm) methane partial pressure and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ/\text{kJ mol}^{-1}$
273.15	6.27	11.518
283.15	5.91	12.080
293.15	5.59	12.643
298.15	5.44	12.925
303.15	5.30	13.206
313.15	5.05	13.769
323.15	4.82	14.331
333.15	4.62	14.894
343.15	4.44	15.457

Methane + Tridecane; $C_{13}H_{28}$; [629-50-5]

Methane + Tetradecane; $C_{14}H_{30}$; [629-59-4]

Methane + Pentadecane; $C_{15}H_{32}$; [629-62-9]

Only Makranczy *et al.* (ref. 11) have reported data on these systems. They report the solubility at 298.15 K. The mole fraction solubility at 298.15 K and 101.325 kPa (1 atm) methane pressure from their measurements is as follows:

Tridecane	5.39×10^{-3}
Tetradecane	5.40×10^{-3}
Pentadecane	5.35×10^{-3}

The data are classed as tentative.

Methane + Hexadecane; $C_{16}H_{34}$; [544-76-3]

Seven papers report solubility data on the $CH_4 + C_{16}H_{34}$ system. The mole fraction solubility values at 298.15 K and 101.325 kPa methane pressure are

COMPONENTS:	EVALUATOR:
(1) Methane; CH_4; [74-82-8] (2) Alkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January

CRITICAL EVALUATION:

6.02×10^{-3}	Hayduk, Buckley (ref. 7)
5.841×10^{-3}	Richon, Renon (ref. 14)
5.824×10^{-3}	Rivas, Prausnitz (ref. 13)
5.75×10^{-3} (300K)	Cukor, Prausnitz (ref. 9)
5.59×10^{-3}	Lin, Parcher (ref. 15)
5.36×10^{-3}	Makranczy et $al.$ (ref. 11)
4.78×10^{-3}	Lenoir et $al.$ (ref. 8)

The larger five values average a mole fraction solubility of 5.81×10^{-3} with standard deviation 0.16×10^{-3}.

The data of Hayduk and Buckley, Richon and Renon, Rivas and Prausnitz, and Lin and Parcher were combined in a linear regression to obtain the equation

$$\ln x_1 = -10.68231 + 9.91533/(T/100 \text{ K}) + 2.02051 \ln (T/100 \text{ K})$$

for the 298.15 to 473.15 K temperature interval.

The equation gives the following thermodynamic changes for the solution process:

T/K	$\Delta \bar{H}_1^\circ/\text{kJ mol}^{-1}$	$\Delta \bar{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1}$	$\Delta \bar{C}_{p_1}^\circ /\text{J K}^{-1} \text{ mol}^{-1}$
298.15	−3.24	−53.7	16.8
323.15	−2.82	−52.3	16.8
348.15	−2.40	−51.1	16.8
373.15	−1.98	−49.9	16.8
398.15	−1.56	−48.8	16.8
423.15	−1.14	−47.8	16.8
448.15	−0.72	−46.8	16.8
473.15	−0.30	−45.9	16.8

The smoothed mole fraction solubility and partial molar Gibbs energy values are in Table 6.

Table 6.   Solubility of methane in hexadecane. Tentative values of the mole fraction solubility at 101.325 kPa (1 atm) methane partial pressure partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ/\text{kJ mol}^{-1}$
298.15	5.80	12.765
323.15	5.28	14.089
348.15	4.92	15.381
373.15	4.68	16.643
398.15	4.52	17.877
423.15	4.41	19.084
448.15	4.34	20.267
473.15	4.31	21.425

The smoothed solubility values differ only a few percent from the values of Cukor and Prausnitz and the enthalpies of solution are 3.5 to 7 percent less negative than the Cukor and Prausnitz values up to 400 K. The present evaluation does not show the change to a positive enthalpy of solution at 475 K. The Cukor and Prausnitz data are a good alternative to the tentative data presented here.

Methane + Octadecane; $C_{18}H_{38}$; [593-45-3]

Ng, Harris and Prausnitz (ref. 6) used gas liquid chromatography retention times to estimate the solubility of methane in octadecane at six temperatures between 308.2 and 423.2 K. Richon and Renon (ref. 14) report a mole fraction solubility value of 5.079×10^{-3} at 323.15 K and 101.325 kPa methane pressure. The Richon and Renon value is classed as tentative and the Ng *et al.* data as doubtful. Unfortunately there is some problem with the Ng *et al.* experiment and their results for this system as well as the methane + eicosane and docosane systems appear to be too small mole fraction solubilities by 15 to 30 percent.

Methane + Eicosane; $C_{20}H_{42}$; [112-95-8]

Both Ng *et al.* (ref. 6) and Chappelow and Prausnitz (ref. 10) report solubility data as a function of temperature. As discussed for the previous system the Ng *et al.* data are doubtful. The Chappelow and Prausnitz data are classed as tentative.

The Chappelow and Prausnitz data were treated by a linear regression to obtain the equation

$$\ln x_1 = -11.65137 + 11.01303/(T/100 \text{ K}) + 2.41842 \ln (T/100 \text{ K})$$

with a standard error about the regression line of 9.1×10^{-6} for the 323.15 to 473.15 K temperature interval.

The equation gives the following thermodynamic changes for the solution process:

T/K	$\Delta \bar{H}_1^\circ$/kJ mol^{-1}	$\Delta \bar{S}_1^\circ$/J K^{-1} mol^{-1}	$\Delta \bar{C}_{p_1}^\circ$/J K^{-1} mol^{-1}
298.15	-3.91[a]	-54.8[a]	20.1[a]
323.15	-3.41	-53.2	20.1
348.15	-2.90	-51.7	20.1
373.15	-2.40	-50.3	20.1
398.15	-1.90	-49.0	20.1
423.15	-1.40	-47.8	20.1
448.15	-0.88	-46.6	20.1
473.15	-0.39	-45.5	20.1

[a] Hypothetical liquid state. Eicosane melts at 310.0 K.

The smoothed mole fraction solubilities and partial molal Gibbs energy values are in Table 7.

Table 7. Solubility of methane in eicosane. Tentative mole fraction solubility at 101.325 kPa (1 atm) methane pressure and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ$/kJ mol^{-1}
298.15	6.65[a]	12.429[a]
323.15	5.93	13.778
348.15	5.45	15.089
373.15	5.12	16.363
398.15	4.90	17.358
423.15	4.76	18.813
448.15	4.67	19.992
473.15	4.63	21.143

[a] For hypothetical liquid state. Eicosane melts at 310.0 K.

COMPONENTS:	EVALUATOR:
(1) Methane; CH_4; [74-82-8] (2) Alkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January

CRITICAL EVALUATION:

Methane + Docosane; $C_{22}H_{46}$; [629-98-0]

The only data on this system is from the work of Ng *et al.* (ref. 6) which appears to give mole fraction values 15 to 30 percent too small with the octadecane and eicosane systems discussed earlier. Although the data are doubtful, they are presented because they are the only data on the system.

The data were fitted to a two constant equation by a linear regression

$$\ln x_1 = -7.29746 + 6.32687/(T/100 \text{ K})$$

with a standard error about the regression line at 1.50×10^{-4}.

The corresponding temperature independent thermodynamic changes are

$$\Delta H_1^\circ/\text{kJ mol}^{-1} = -5.26 \quad \text{and} \quad \Delta S_1^\circ/\text{J K}^{-1} \text{ mol}^{-1} = -60.8$$

Smoothed values of the mole fraction solubility and partial molal Gibbs energy are given in Table 8. The values are probably 15 to 30 percent smaller than the true values.

Table 8.   The solubility of methane in docosane. Smoothed values of the mole fraction solubility at 101.3 kPa (1 atm) and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ/\text{kJ mol}^{-1}$
298.15	5.65[a]	12.829[a]
323.15	4.80	14.346
348.15	4.17	15.863
373.15	3.69	17.380
398.15	3.32	18.897
423.15	3.02	20.414
448.15	2.78	21.930
473.15	2.58	23.447

[a] For hypothetical liquid state. Docosane melts at 317.6 K.

Methane + Octacosane; $C_{28}H_{58}$; [630-02-4]

Only Lin and Parcher (ref. 15) have reported solubility data on the system. They report three solubility values between 353.2 and 393.2 K by a GLC method. The three points were fitted to the two constant equation by linear regression

$$\ln x_1 = -6.06004 + 3.55025/(T/100 \text{ K})$$

with a standard error about the regression line of 2.00×10^{-5}. The equation gives the temperature independent thermodynamic changes

$$\Delta \bar{H}_1^\circ/\text{kJ mol}^{-1} = -2.95 \quad \text{and} \quad \Delta \bar{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1} = -50.4$$

The smoothed values of the mole fraction solubility and partial molal Gibbs energy are given in Table 9.

Table 9. Solubility of methane in octacosane. Tentative values of the
          mole fraction solubility at 101.325 kPa (1 atm) and partial
          molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ/kJ\ mol^{-1}$
298.15	7.68[a]	12.071[a]
353.15	6.38	14.842
363.15	6.20	15.346
373.15	6.04	15.849
383.15	5.90	16.353
393.15	5.76	16.857

[a] Extrapolated hypothetical liquid state. Octacosane melts at 337.7 K.

Methane + Hexatriacontane; $C_{36}H_{74}$; [630-06-8]

The system at temperatures between 353.2 and 413.2 K by a GLC method.
The results are classed as tentative. The data of Lin and Parcher were
treated by a linear regression to obtain the equation.

$$\ln x_1 = -5.93818 + 3.77226/(T/100\ K)$$

with a standard error about the regression line of 5.5×10^{-5}. The
temperature independent thermodynamic changes are

$$\Delta H_1^\circ/kJ\ mol^{-1} = -3.14 \quad and \quad \Delta S_1^\circ/J\ K^{-1}\ mol^{-1} = -49.4.$$

Smoothed values of the mole fraction solubility and partial molal Gibbs
energy of solution are in Table 10.

Table 10. Solubility of methane in hexatriacontane. Tentative mole
           fraction solubility at 101.325 kPa (1 atm) methane partial
           pressure and partial molal Gibbs energy of solution as a
           function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ/kJ\ mol^{-1}$
298.15	9.34[a]	11.584
353.15	7.67	14.299
363.15	7.45	14.793
373.15	7.25	15.287
383.15	7.06	15.780
393.15	6.88	16.274
403.15	6.72	16.768
413.15	6.57	17.202

[a] Extrapolated hypothetical liquid state. Hexatriacontane melts at 349.

II. The solubility of methane in branched alkanes.

The solubility of methane is reported for only four branched chain
alkanes. All of the available data are consistent with a larger solu-
bility of methane in the branched chain alkane than in the linear alkane
of the same number of carbon atoms. The data for the C_6 and C_{16} branched
hydrocarbon gives a branched/normal methane solubility ratio of greater
than 2 while the C_8 and C_{30} solubility branched/normal ratio is 1.06-1.12.
The smaller ratio appears to be more reasonable.

COMPONENTS:	EVALUATOR:
(1) Methane; CH_4; [74-82-8] (2) Alkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January

CRITICAL EVALUATION:

Methane + 2,2-Dimethylbutane; C_6H_{14}; [75-83-2]

Tilquin et al. (ref. 5) report measurements at low methane partial pressures from which we calculate a mole fraction solubility of 12.7×10^{-3} at 101.325 kPa methane pressure at 288.15 K. The C_6 branched/normal solubility ratio is 2.4 using the tentative hexane solubility value from this evaluation. Since there is no other value to compare with the present value, it is classed as tentative, but we believe the value is probably too large and that it should be used with caution.

Methane + 2,2,4-Trimethylpentane; C_8H_{18}; [540-84-1]

Hiroka and Hildebrand report the solubility of methane at four temperatures between 277.51 and 308.22 K. The data are classed as tentative. At 298.15 K the branched/normal solubility ratio is 1.06.

The solubility data were fitted by a linear regression to the equation

$$\ln x_1 = -7.29405 + 6.14129/(T/100 \text{ K})$$

with a standard error about the regression line of 3.3×10^{-5}.

The temperature independent thermodynamic changes are

$$\Delta \overline{H}_1^\circ/\text{kJ mol}^{-1} = 5.11 \quad \text{and} \quad \Delta \overline{S}_1^\circ/\text{J K}^{-1} \text{ mol}^{-1} = -60.6$$

Table 11. Solubility of methane in 2,2,4-trimethylpentane. Tentative values of the mole fraction solubility at 101.325 kPa methane partial pressure and partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \overline{G}_1^\circ/\text{kJ mol}^{-1}$
283.15	5.95	12.066
293.15	5.52	12.672
298.15	5.33	12.975
303.15	5.15	13.278

Methane + 2,2,4,4,6,8,8-Heptamethylnonane; $C_{16}H_{34}$; [4390-04-9]

Richon and Renon (ref. 14) report measurements from which a mole fraction solubility of 30.5×10^{-3} at 101.325 kPa methane pressure at 298.15 K can be calculated. The branched/normal C_{16} methane solubility ratio is 5.3. Since there is no other value with which to compare the solubility value it is classed as tentative. However, it is suspected that the value is too large and it should be used with caution.

Methane + 2,6,10,15,19,23-Hexamethyltetracosane; $C_{30}H_{62}$; [111-01-3]

Chappelow and Prausnitz (ref. 10) report eight solubility values over the 300 to 475 K temperature interval for this system. Taking the linear C_{30} hydrocarbon solubility from Fig. 1, the branched/normal methane solubility ratio is 1.12. The data are classed as tentative.

The data were fitted to a three constant equation by a linear regression

$$\ln x_1 = -10.32638 + 10.42056/(T/100\ \text{K}) + 1.9508 \ln (T/100\ \text{K})$$

The equation reproduces the experimental data so closely that there is reason to believe the data are smoothed data rather than experimental points.

The equation gives the following values of the thermodynamic functions:

T/K	$\Delta \bar{H}_1^\circ/\text{kJ mol}^{-1}$	$\Delta \bar{S}_1^\circ/\text{J K}^{-1}\text{ mol}^{-1}$	$\Delta \bar{C}_{p_1}^\circ/\text{J K}^{-1}\text{ mol}^{-1}$
298.15	-3.83	-51.9	16.2
323.15	-3.42	-50.6	16.2
348.15	-3.02	-49.4	16.2
373.15	-2.61	-48.2	16.2
398.15	-2.21	-47.2	16.2
423.15	-1.80	-46.2	16.2
448.15	-1.40	-45.3	16.2
473.15	-0.99	-44.4	16.2

The smoothed mole fraction solubility and partial molal Gibbs energy of solution are in Table 12.

Table 12.   Solubility of methane in 2,6,10,15,19,23-Hexamethylnonane. Tentative values of the mole fraction solubility at 101.325 kPa methane pressure and the partial molal Gibbs energy of solution as a function of temperature.

T/K	Mol Fraction $10^3 x_1$	$\Delta \bar{G}_1^\circ/\text{kJ mol}^{-1}$
298.15	9.09	11.651
323.15	8.12	12.933
348.15	7.45	14.183
373.15	6.98	15.404
398.15	6.65	16.597
423.15	6.41	17.766
448.15	6.25	18.910
473.15	6.15	20.031

REFERENCES:

1. McDaniel, A. S.   J. Phys. Chem. 1911, 15, 587.

2. Guerry, D. Jr. Ph. D. Thesis, 1944, Vanderbilt University, Nashville, TN.

3. Lannung, A.; Gjaldbaek, J. C.   Acta Chem. Scand. 1960, 14, 1124.

4. Hiraoka, H.; Hildebrand, J. H.   J. Phys. Chem. 1964, 68, 213.

5. Tilquin, B.; Decannière, L.; Fontaine, R.; Claes, P. Ann. Soc. Sc. Bruxelles (Belgium) 1967, 81, 191.

6. Ng, S.; Harris, H. G.; Prausnitz, J. M.   J. Chem. Eng. Data, 1969, 14, 482.

7. Hayduk, W.; Buckley, W. D.   Can. J. Chem. Eng. 1971, 49, 667.

8. Lenoir, J-Y.; Renault, P.; Renon, H.   J. Chem. Eng. Data 1971, 16, 340.

9. Cukor, P. M.; Prausnitz, J. M.   J. Phys. Chem. 1972, 76, 598.

COMPONENTS:	EVALUATOR:
(1) Methane; CH_4; [74-82-8] (2) Alkanes	H. Lawrence Clever Chemistry Department Emory University Atlanta, GA 30322 USA 1984, January

CRITICAL EVALUATION:

10. Chappelow, C. C.; Prausnitz, J. M. *Am. Inst. Chem. Engnrs. J.* __1974__, *20*, 1097.

11. Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* __1976__, *4*, 269.

12. Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. *J. Chem. Thermodyn.* __1978__, *10*, 817.

13. Rivas, O. R.; Prausnitz, J. M. *Ind. Eng. Chem. Fundam.* __1979__, *18*, 289.

14. Richon, D.; Renon, H. *J. Chem. Eng. Data* __1980__, *25*, 59.

15. Lin, P. J.; Parcher, J. F. *J. Chromatog. Sci.* __1982__, *20*, 33.

The evaluation of the solubility of methane in hydrocarbons at high pressure is given in separate sections later in the volume.

A useful paper to consult for additional information on methane + hydrocarbons systems is

Legret, D.; Richon, D.; Renon, H. *Fluid Phase Equilib.* __1984__, *17*, 323-50.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Pentane; C_5H_{12}; [109-66-0] Hexane; C_6H_{14}; [110-54-3]	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* <u>1976</u>, *4*, 269 - 280.

VARIABLES:
    T/K: 298.15
    p/kPa: 101.325 (1 atm)
	PREPARED BY:
	           S. A. Johnson
	           H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient $\alpha/cm^3(STP)cm^{-3}atm^{-1}$	Ostwald Coefficient $L/cm^3 cm^{-3}$
Pentane			
298.15	6.03	1.172	1.279
Hexane			
298.15	6.13	1.050	1.146

The Bunsen coefficient and mole fraction values were calculated by the compiler assuming that the gas is ideal and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric method. The apparatus described by Bodor, Bor, Mohai and Sipos was used (1).	Both the gas and the liquid were analytical grade reagents of Hungarian or foreign origin. No further information.

ESTIMATED ERROR:

$$\delta L/L = \pm\ 0.03$$

REFERENCES:

1. Bodor, E.; Bor, Gy.;
   Mohai, B.; Sipos, G.
   Veszpremi Vegyip. Egy. Kozl.
   <u>1957</u>, *1*, 55.
   Chem. Abstr. <u>1961</u>, *55*, 3175h.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8]	McDaniel, A. S.
(2) Hexane; C_6H_{14}; [110-54-3]	*J. Phys. Chem.* 1911, *15*, 587-610.

VARIABLES:	PREPARED BY:
T/K = 295.35 - 333.15 $\qquad p_1$/kPa = 101.3 (1 atm)	H. L. Clever

EXPERIMENTAL VALUES:

Temperature		Mol Fraction	Bunsen Coefficient[a]	Ostwald Coefficient[b]
$t/°C$	T/K	$10^3 x_1$	α	$L/cm^3\ cm^{-3}$
22.2	295.35	3.25	0.5585	0.6035
25.0	298.15	3.17	0.5422	0.5918[c]
40.2	313.35	2.77	0.4639	0.5320
49.7	322.85	2.66	0.4380	0.5180
60.0	333.15	2.51	0.4068	0.4964

[a] Bunsen coefficient, α/cm^3 (STP) $cm^{-3}\ atm^{-1}$.

[b] Listed as absorption coefficient in the original paper. Interpreted to be equivalent to Ostwald coefficient by compiler.

[c] Ostwald coefficient (absorption coefficient) estimated as 298.15 K value by author.

[d] Mole fraction and Bunsen coefficient values calculated by compiler assuming ideal gas behavior.

EVALUATOR'S COMMENT: McDaniel's data should be used with caution. His values are often 20 percent or more too small when compared with more reliable data.

AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE:	**SOURCE AND PURITY OF MATERIALS:**
The apparatus is all glass. It consists of a gas buret connected to a contacting vessel. The solvent is degassed by boiling under reduced pressure. Gas pressure or volume is adjusted using mercury displacement. Equilibration is achieved at atm pressure by hand shaking, and incrementally adding gas to the contacting chamber. Solubility measured by obtaining total uptake of gas by known volume of the solvent.	(1) Methane. Prepared by reaction of methyl iodide with zinc-copper. Passed through water and sulfuric acid. (2) Hexane.
	ESTIMATED ERROR:
	$\delta L/L \geq -0.20$
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Hexane; C_6H_{14}; [110-54-3]	Lannung, A.; Gjaldbaek, J. C. *Acta Chem. Scand.* <u>1960</u>, *14*, 1124 - 1128.

VARIABLES:	PREPARED BY:
T/K = 291.15 - 310.15 p_1/kPa = 101.325 (1 atm)	J. Chr. Gjaldbaek

EXPERIMENTAL VALUES:

T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient $\alpha/cm^3 (STP) cm^{-3} atm^{-1}$	Ostwald Coefficient $L/cm^3 cm^{-3}$
291.15	5.14	0.884	0.942
291.15	5.15	0.886	0.944
298.15	5.06	0.865	0.944
298.15	5.10	0.872	0.952
310.15	4.87	0.813	0.923
310.15	4.90	0.818	0.929

Smoothed Data: For use between 291.15 and 310.15 K.

$$\ln x_1 = -6.1312 + 2.5167/(T/100 \text{ K})$$

The standard error about the regression line is 2.75×10^{-5}.

T/K	Mol Fraction $10^3 x_1$
298.15	5.06
308.15	4.92

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A calibrated all-glass combined manometer and bulb containing degassed solvent and the gas was placed in an air thermostat and shaken until equilibrium (1). The absorbed volume of gas is calculated from the initial and final amounts, both saturated with solvent vapor. The amount of solvent vapor. The amount of solvent is determined by the weight of displaced mercury. The values are at 101.325 kPa (1 atm) pressure assuming Henry's law is obeyed.	(1) Methane. Generated from magnesium methyl iodide. Purified by fractional distillation. Specific gravity corresponds with mol wt 16.08. (2) Hexane. Kahlbaum. "Hexan aus petroleum". Fractionated by distillation. B.p. (760 mmHg)/ °C = 68.85, vapor pressure (25°C)/mmHg = 154.
	ESTIMATED ERROR: $\delta T/K = \pm 0.05$ $\delta x_1/x_1 = \pm 0.015$
	REFERENCES: 1. Lannung, A. *J. Am. Chem. Soc.* <u>1930</u>, *52*, 68.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Alkanes; C_6H_{14} and C_7H_{16}	Guerry, D. Jr. Ph.D. thesis, 1944 Vanderbilt University Nashville, TN Thesis Director: L. J. Bircher

VARIABLES:	PREPARED BY:
T/K: 293.15, 298.15 P/kPa: 101.325 (1 atm)	H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction x_1 x 10^4	Bunsen Coefficient α	Ostwald Coefficient L
Hexane; C_6H_{14}; [110-54-3]		
293.15	43.4	0.748	0.803
298.15	42.4	0.726	0.792
Heptane; C_7H_{16}; [142-82-5]		
293.15	46.7	0.718	0.771
298.15	40.7	0.622	0.679

The Ostwald coefficients were calculated by the compiler.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A Van Slyke-Neill Manometric Apparatus manufactured by the Eimer and Amend Co. was used. The procedure of Van Slyke (1) for pure liquids was modified (2) so that small solvent samples (2 cm³) could be used with almost complete recovery of the sample. An improved temperature control system was used.	Hexane. Eastman Kodak Co. B.p. (760.3 mmHg) t/°C 68.85 - 68.90. Heptane. B.p. (753.9 mmHg) t/°C 98.27 - 98.28 (corr.).

SOURCE AND PURITY OF MATERIALS:	
(1) Methane. Prepared by hydrolysis of crystaline methyl Grignard reagent. Passed through conc. H_2SO_4, solid KOH, and Dririte.	**ESTIMATED ERROR:** $\delta T/K = 0.05$

(2) Alkanes. Distilled from sodium in air. In addition to the solubility data the thesis contains data of the refractive index, density, vapor pressure, and b.p.	**REFERENCES:**
	1. Van Slyke, D. D.
	   J. Biol. Chem. 1939, 130, 545.
	
	2. Ijams, C. C.
	   Ph.D. thesis, 1941
	   Vanderbilt University

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4;]74-82-8] 2. Hexane; C_6H_{14}; [110-54-3]	Tilquin, B.; Decannière, L.; Fontaine, R.; Claes, P. *Ann. Soc. Sc. Bruxelles (Belgium)* <u>1967</u>, *81*, 191-199.

VARIABLES:	PREPARED BY:
T/K: 288.15 P/kPa: 4.11-8.13	C. L. Young

EXPERIMENTAL VALUES:

t/C	T/K	Ostwald coefficient,[a] L	Mole fraction[b] $/x_1$	Henry's constant[b] H/atm
15.0	288.15	0.56	0.00306	326

[a] Original data at low pressure reported as distribution co-
efficient; but if Henry's law and ideal gas law apply,
distribution coefficient is equivalent to Ostwald coefficient
as shown here.

[b] Calculated by compiler for a gas partial pressure of 101.325
kPa assuming that Henry's law and ideal gas law apply.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
All glass apparatus used at very low gas partial pressures, containing a replaceable degassed solvent ampule equipped with a breakable point which could be broken by means of a magnetically activated plunger. Quantity of gas fed into system determined by measuring the pressure change in a known volume. Quantity of liquid measured by weight. Pressure change observed after solvent released. Experimental details described by Rzad and Claes, ref. (1).	1. Source not given; minimum purity specified as 99.0 mole per cent. 2. Fluka pure grade; minimum purity specified as 99.0 mole per cent.

ESTIMATED ERROR:
$\delta T/K$ = 0.05; $\delta x_1/x_1$ = 0.01

(estimated by compiler).

REFERENCES:
1. Rzad, S.; Claes, P.
   Bull. Soc. Chim. Belges
   <u>1964</u>, *73*, 689.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Hexane; C_6H_{14}; [110-54-3]	Hayduk, W.; Buckley, W.D. *Can. J. Chem. Eng.* <u>1971</u>, *49*, 667-671.

VARIABLES:	PREPARED BY:
T/K: 273.15-323.15 P/kPa: 101.325	W. Hayduk

EXPERIMENTAL VALUES:

T/K	Ostwald Coefficient[1] L/cm^3 cm^{-3}	Bunsen Coefficient[2] α/cm^3(STP)cm^{-3}atm^{-1}	Mole Fraction[1] $10^4\, x_1$
273.15	1.004	1.004	57.1 (58.1)[3]
298.15	0.935	0.857	50.2 (48.7)
323.15	0.801	0.677	41.3 (41.9)

[1] Original data

[2] Calculated by compiler

[3] The original mole fraction solubility data were used to determine the following equations for $\Delta G°$ and $\ln x_1$ and table of smoothed values:

$$\Delta G°/J\ mol^{-1} = -RT \ln x_1 = 60.361\, T - 4795.3$$
$$\ln x_1 = 576.8/T - 7.260$$

Std. deviation for $\Delta G° = 66.9$ J mol^{-1}; Correlation coefficient = 0.9991

T/K	$10^{-4}\Delta G°$/J mol^{-1}	$10^4 x_1$
273.15	1.169	58.1
283.15	1.230	53.9
293.15	1.290	50.3
298.15	1.320	48.7
303.15	1.350	47.1
313.15	1.411	44.3
323.15	1.471	41.9

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A volumetric method using a glass apparatus was employed. Degassed solvent contacted the gas while flowing as a thin film, at a constant rate, through an absorption spiral into a solution buret. A constant solvent flow was obtained by means of a calibrated syringe pump. The solution at the end of the spiral was considered saturated. Dry gas was maintained at atmospheric pressure in a gas buret by mechanically raising the mercury level in the buret at an adjustable rate. Volumes of solvent injected and residual gas were obtained for regular time intervals. The solubility was calculated from the constant slope of volume of gas dissolved and volume of solvent injected. Degassing was accomplished using a two stage vacuum process described by Clever et al. (1).	1. Matheson Co. Specified as ultra high purity grade of 99.97 per cent. 2. Canlab. Chromatoquality grade of specified minimum purity of 99.0 per cent.

ESTIMATED ERROR:
δT/K   = 0.1 $\delta x_1/x_1$ = 0.01

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

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Hexane; C_6H_{14}; [110-54-3]	Yokoyama, C.; Masuoka, H. Aral, K.; Saito, S. *J. Chem. Eng. Data* <u>1985</u>, *30*, 177-9.
VARIABLES: $T/K = 311.0$ $p_t/MPa = 0.57 - 1.98$	PREPARED BY: H. L. Clever

EXPERIMENTAL VALUES:

Temperature		Total Pressure	Mol Fraction	
			Liquid	Vapor
$t/^0C$	T/K	p_t/MPa	x_1	y_1
37.8	311.0	0.57		0.9264
		0.59		0.9256
		0.83		0.9468
		1.06		0.9468
		1.20	0.0567	0.9607
		1.30	0.0616	0.9627
		1.53	0.0734	0.9680
		1.58	0.0757	
		1.77	0.0860	0.9696
		1.79	0.0892	
		1.81	0.0880	0.9724
		1.98	0.0965	

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The equipment consists of an equilibration system and an analysis system. The procedures are essentially the same as those used by King *et al.* (ref 1) and Kubota *et al.* (ref 2). The equilibration system is in a thermostated water bath. The analysis system is in an air bath at 100 C to avoid condensation problems. Details of the degassing, equilibration, and sampling procedures are not given in the paper. The composition analysis was made by a gas chromatograph and digital integrator. Calibration curves were obtained from mixtures of known composition.	(1) Methane. Takachio Kagaku Co., Ltd. Used as received. (2) Hexane. Takachio Kagaku Co., Ltd. Used as received. A trace anaylsis of the components found no measurable impurities. The samples were used without further purification.
	ESTIMATED ERROR: $\delta T/K = \pm 0.05$ $\delta p_t/MPa = \pm 0.01$ $\delta x_1/x_1 = \pm 0.015$
REFERENCES: 1.King,M.B.;Alderson,D.A.;Fallah,F.; Kassim,D.M.;Sheldon,J.R.;Mahmud,R. *"Chemical Engineering at Supercritical Conditions"*Paulatis,M.E.; Penninger,J.M.L.;Gray,R.D.,Jr.; Davidson,P, Editors; Ann Arbor Sci. Ann Arbor, MI <u>1983</u>, p. 31.	REFERENCES: (continued) 2. Kubota, H.; Inatome, H.; Tanaka, Y.; Makita, T. *J. Chem. Eng. Jpn.* <u>1983</u>, *16*, 99.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. 2,2'-Dimethylbutane (Neo-hexane); C_6H_{14}; [75-83-2]	Tilquin, B.; Decannière, L.; Fontaine, R.; Claes, P. *Ann. Soc. Sc. Bruxelles (Belgium)* 1967, *81*, 191-199.

VARIABLES:
      T/K: 288.15
      P/kPa: 2.05-2.11
	PREPARED BY:
	
	      C. L. Young

EXPERIMENTAL VALUES:

t/C	T/K	Ostwald coefficient,[a] L	Mole fraction[b] $/x_1$	Henry's constant[b] H/atm
15.0	288.15	2.30	0.01266	79.0

[a] Original data at low pressure reported as distribution coefficient; but if Henry's law and ideal gas law apply, distribution coefficient is equivalent to Ostwald coefficient as shown here.

[b] Calculated by compiler for a gas partial pressure of 101.325 kPa assuming that Henry's law and ideal gas law apply.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
All glass apparatus used at very low gas partial pressures, containing a replaceable degassed solvent ampule equipped with a breakable point which could be broken by means of a magnetically activated plunger. Quantity of gas fed into system determined by measuring the pressure change in a known volume. Quantity of liquid measured by weight. Pressure change observed after solvent released. Experimental details described by Rzad and Claes, ref. (1).	1. Source not given; minimum purity specified as 99.0 mole per cent. 2. Fluka pure grade; minimum purity specified as 99.0 mole per cent.
	ESTIMATED ERROR: $\delta T/K = 0.05$; $\delta x_1/x_1 = 0.01$ (estimated by compiler).

	REFERENCES:
	1. Rzad, S.; Claes, P.
	   Bull. Soc. Chim. Belges
	   1964, *73*, 689.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Heptane; C_7H_{16}; [142-82-5]	McDaniel, A. S. *J. Phys. Chem.* 1911, *15*, 587-610.

VARIABLES:	PREPARED BY:
T/K = 295.35 - 313.15 p_1/kPa = 101.3 (1 atm)	H. L. Clever

EXPERIMENTAL VALUES:

Temperature		Mol Fraction	Bunsen Coefficient[a]	Ostwald Coefficient[b]
$t/°C$	T/K	$10^3 x_1$	α	$L/cm^3\ cm^{-3}$
22.2	295.35	4.37	0.6720	0.7242
25.0	298.15	4.27	0.6519	0.7116[c]
30.1	303.25	4.10	0.6221	0.6906
40.0	313.15	3.89	0.5820	0.6675

[a] Bunsen coefficient, α/cm^3(STP) cm^{-3} atm^{-1}.

[b] Listed as absorption coefficient in the original paper. Interpreted to be equivalent to Ostwald coefficient by compiler.

[c] Ostwald coefficient (absorption coefficient) estimated as 298.15 K value by author.

[d] Mole fraction and Bunsen coefficient values calculated by compiler assuming ideal gas behavior.

EVALUATOR'S COMMENT: McDaniel's data should be used with caution. His values are often 20 percent or more too small when compared with more reliable data.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The apparatus is all glass. It consists of a gas buret connected to a contacting vessel. The solvent is degassed by boiling under reduced pressure. Gas pressure or volume is adjusted using mercury displacement. Equilibration is achieved at atm pressure by hand shaking, and incrementally adding gas to the contacting chamber. Solubility measured by obtaining total uptake of gas by known volume of the solvent.	(1) Methane. Prepared by reaction of methyl iodide with zinc-copper. Passed through water and sulfuric acid. (2) Heptane.
	ESTIMATED ERROR: $\delta L/L \geq -0.20$
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Heptane; C_7H_{16}; [142-82-5] Octane; C_8H_{18}; [111-65-9]	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* <u>1976</u>, *4,* 269 - 280.

VARIABLES:	PREPARED BY:
T/K: 298.15 p/kPa: 101.325 (1 atm)	S. A. Johnson H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient $\alpha/cm^3 (STP) cm^{-3} atm^{-1}$	Ostwald Coefficient $L/cm^3 cm^{-3}$
Heptane			
298.15	5.73	0.876	0.956
Octane			
298.15	5.64	0.778	0.849

The Bunsen coefficient and mole fraction values were calculated by the compiler assuming that the gas is ideal and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric method. The apparatus described by Bodor, Bor, Mohai and Sipos was used (1).	Both the gas and the liquid were analytical grade reagents of Hungarian or foreign origin. No further information.
	ESTIMATED ERROR: $\delta L/L = \pm\ 0.03$

	REFERENCES:
	1. Bodor, E.; Bor, Gy.;
	   Mohai, B.; Sipos, G.
	   Veszpremi Vegyip. Egy. Kozl.
	   <u>1957</u>, *1*, 55.
	   Chem. Abstr. <u>1961</u>, *55*, 3175h.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Heptane; C_7H_{16}; [142-82-5]	Hayduk, W.; Buckley, W.D. *Can. J. Chem. Eng.* 1971, *49*, 667-671.

VARIABLES:	PREPARED BY:
T/K: 273.15-348.15 P/kPa: 101.325	W. Hayduk

EXPERIMENTAL VALUES:

T/K	Ostwald Coefficient[1] L/cm^3 cm^{-3}	Bunsen Coefficient[2] α/cm^3 (STP)cm^{-3}atm^{-1}	Mole Fraction[1] 10^4 x_1
273.15	0.894	0.894	57.1 (58.1)[3]
298.15	0.840	0.770	50.6 (49.4)
323.15	0.752	0.636	43.1 (43.1)
348.15	0.688	0.540	38.0 (38.3)

[1]Original data.

[2]Calculated by compiler

[3]The mole fraction solubility of the original data was used to determine the following equations for $\Delta G°$ and $\ln x_1$ and table of smoothed values:

$$\Delta G°/J\ mol^{-1} = -RT \ln x_1 = 58.916\ T - 4401.9$$

$$\ln x_1 = 529.5/T - 7.086$$

   Std. deviation for $\Delta G° = 43.2$ J mol^{-1}; Correlation coefficient = 0.9997

T/K	$10^{-4}\Delta G°$/J mol^{-1}	10^4 x_1	T/K	$10^{-4}\Delta G°$/J mol^{-1}	10^4 x_1
273.15	1.169	58.1	313.15	1.404	45.4
283.15	1.228	54.2	323.15	1.464	43.1
293.15	1.287	50.9	333.15	1.523	41.0
298.15	1.316	49.4	343.15	1.582	39.1
303.15	1.346	48.0	348.15	1.611	38.3

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A volumetric method using a glass apparatus was employed. Degassed solvent contacted the gas while flowing as a thin film, at a constant rate, through an absorption spiral into a solution buret. A constant solvent flow was obtained by means of a calibrated syringe pump. The solution at the end of the spiral was considered saturated. Dry gas was maintained at atmospheric pressure in a gas buret by mechanically raising the mercury level in the buret at an adjustable rate. The solubility was calculated from the constant slope of volume of gas dissolved and volume of solvent injected. Degassing was accomplished using a two stage vacuum process described by Clever et al. (1).	1. Matheson Co. Specified as ultra high purity grade of 99.97 per cent. 2. Canlab. Chromatoquality grade of specified minimum purity of 99.0 per cent.

	ESTIMATED ERROR:
	δT/K = 0.1 $\delta x_1/x_1$ = 0.01

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

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Octane; C_8H_{18}; [111-65-9]	Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. *J. Chem. Thermodyn.* <u>1978</u>, *10*, 817 - 822.
VARIABLES: T/K: 298.25, 313.35 p/kPa: 101.325 (1 atm)	PREPARED BY: H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient α/cm^3 (STP) cm^{-3} atm^{-1}	Ostwald Coefficient L/cm^3 cm^{-3}
298.25	5.026	0.6913	0.7548
313.35	4.744	0.6410	0.7353

The Bunsen coefficients were calculated by the compiler.

It is assumed that the gas is ideal and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The solubility apparatus is based on the design of Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus is that described by Battino, Banzhof, Bogan, and Wilhelm (3).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is intermittently applied through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent is passed in a thin film down a glass helical tube containing solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

(1) Methane. Matheson Co., Inc. Minimum mole percent purity stated to be 99.97.

(2) Octane. Phillips Petroleum Co. 99 mole per cent, distilled, density at 298.15 K, ρ/g cm^{-3} 0.6988.

ESTIMATED ERROR:
$$\delta T/K = 0.02$$
$$\delta P/mmHg = 0.5$$
$$\delta x_1/x_1 = 0.01$$

REFERENCES:

1. Morrison, T. J.; Billett, F. *J. Chem. Soc.* <u>1948</u>, 2033.

2. Battino, R.; Evans, F. D.; Danforth, W. F. *J. Am. Oil Chem. Soc.* <u>1968</u>, *45*, 830.

3. Battino, R.; Banzhof, M.; Bogan, M.; Wilhelm, E. *Anal. Chem.* <u>1971</u>, *43*, 806.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Octane; C_8H_{18}; [111-65-9]	Hayduk, W.; Buckley, W.D. *Can. J. Chem. Eng.* 1971, *49*, 667-671.

VARIABLES:	PREPARED BY:
T/K: 273.15-348.15 P/kPa: 101.325	W. Hayduk

EXPERIMENTAL VALUES:

T/K	Ostwald Coefficient[1] L/cm^3 cm^{-3}	Bunsen Coefficient[2] α/cm^3 (STP)$cm^{-3}atm^{-1}$	Mole Fraction[1] 10^4 x_1
273.15	0.826	0.826	58.6 (58.9)[3]
298.15	0.767	0.703	51.1 (50.5)
323.15	0.696	0.588	44.1 (44.4)
348.15	0.653	0.512	39.7 (39.7)

[1]Original data.

[2]Calculated by compiler

[3]The mole fraction solubility of the original data was used to determine the following equations for $\Delta G°$ and $\ln x_1$ and table of smoothed values:

$$\Delta G°/J\ mol^{-1} = -RT \ln x_1 = 57.958\ T - 4172.4$$

$$\ln x_1 = 501.9/T - 6.971$$

Std. deviation for $\Delta G° = 20.0\ J\ mol^{-1}$; Correlation coefficient = 1.000

T/K	$10^{-4}\Delta G°/J\ mol^{-1}$	10^4 x_1	T/K	$10^{-4}\Delta G°/J\ mol^{-1}$	10^4 x_1
273.15	1.166	58.9	303.15	1.340	49.1
283.15	1.224	55.2	313.15	1.398	46.6
293.15	1.282	52.0	323.15	1.456	44.4
298.15	1.311	50.5	348.15	1.601	39.7

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A volumetric method using a glass apparatus was employed. Degassed solvent contacted the gas while flowing as a thin film, at a constant rate, through an absorption spiral into a solution buret. A constant solvent flow was obtained by means of a cabibrated syringe pump. The solution at the end of the spiral was considered saturated. Dry gas was maintained at atmospheric pressure in a gas buret by mechanically raising the mercury level in the buret at an adjustable rate. The solubility was calculated from the constant slope of volume of gas dissolved and volume of solvent injected. Degassing was accomplished using a two stage vacuum process described by Clever et al. (1).	1. Matheson Co. Specified as ultra high purity grade of 99.97 per cent. 2. Canlab. Chromatoquality grade of specified minimum purity of 99.0 per cent.
	ESTIMATED ERROR: $\delta T/K$ = 0.1 $\delta x_1/x_1$ = 0.01
	REFERENCES: 1. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M. *J. Phys. Chem.* 1957, *61*, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8]	Hiraoka, H.; Hildebrand, J. H.
(2) 2,2,4-Trimethylpentane or isooctane; C_8H_{18}; [540-84-1]	J. Phys. Chem. 1964, 68, 213-214.

VARIABLES:	PREPARED BY:
T/K = 277.51 - 308.22 p_1/kPa = 101.325 (1 atm)	M. E. Derrick H. L. Clever

EXPERIMENTAL VALUES:

Temperature		Mol Fraction	Bunsen Coefficient	Ostwald Coefficient
$t/°C$	T/K	$10^3 x_1$	$\alpha/cm^3 (STP) cm^{-3} atm^{-1}$	$L/cm^3 cm^{-3}$
4.36	277.51	6.236	0.868	0.882
14.97	288.12	5.688	0.781	0.824
24.77	297.92	5.351	0.726	0.792
35.07	308.22	4.989	0.669	0.755

The Bunsen and Ostwald coefficients were calculated by the compiler assuming ideal gas behavior.

Smoothed Data: For use between 277.51 and 308.22 K.

$$\ln x_1 = -7.2940 + 6.1413/(T/100 \text{ K})$$

The standard error about the regression line is 3.32 x 10^{-4}.

T/K	Mol Fraction $10^2 x_1$
278.15	6.182
288.15	5.726
298.15	5.331
308.15	4.986

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
The apparatus consists of a gas measuring buret, an absorption pipet, and a reservoir for the solvent. The buret is thermostated at 25°C, the pipet at any temperature from 5 to 30°C. The pipet contains an iron bar in glass for magnetic stirring. The pure solvent is degassed by freezing with liquid nitrogen, evacuating, then boiling with a heat lamp. The degassing process is repeated three times. The solvent is flowed into the pipet where it is again boiled for final degassing. Manipulation of the apparatus is such that the solvent never comes in contact with stopcock grease. The liquid in the pipet is sealed off by mercury. Its volume is the difference between the capacity of the pipet and the volume of mercury that confines it. Gas is admitted into the pipet. Its exact amount is determined by P-V measurements in the buret before and after	(1) Methane. Phillips Petroleum Co. Gas passed through a cold trap. (2) Isooctane. Source not given. Distilled, purity checked by ultraviolet absorbance.
	ESTIMATED ERROR: $\delta T/K$ = 0.02 $\delta x_1/x_1$ = 0.003
	REFERENCES: 1. Kobatake, Y.; Hildebrand, J. H. J. Phys. Chem. 1961, 65, 331.

introduction of the gas into the pipet. The stirrer is set in motion. Equilibrium is attained within 24 hours.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Nonane; C_9H_{20}; [111-84-2] Decane; $C_{10}H_{22}$; [124-18-5]	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* 1976, 4, 269 - 280.

VARIABLES:	PREPARED BY:
T/K: 298.15 p/kPa: 101.325 (1 atm)	S. A. Johnson H. L. Clever

EXPERIMENTAL VALUES:

	T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient α/cm^3(STP)cm^{-3}atm^{-1}	Ostwald Coefficient L/cm^{3}cm^{-3}
Nonane				
	298.15	5.57	0.698	0.762
Decane				
	298.15	5.52	0.635	0.693

The Bunsen coefficient and mole fraction values were calculated by the compiler assuming that the gas is ideal and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric method. The apparatus described by Bodor, Bor, Mohai and Sipos was used (1).	Both the gas and the liquid were analytical grade reagents of Hungarian or foreign origin. No further information.
	ESTIMATED ERROR: $\delta L/L = \pm 0.03$
	REFERENCES: 1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G. *Veszpremi Vegyip. Egy. Kozl.* 1957, 1, 55. *Chem. Abstr.* 1961, 55, 3175h.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Decane; $C_{10}H_{22}$; [124-18-5]	Wilcock, R. J.; Battino, R.; Danforth, W. F.; Wilhelm, E. *J. Chem. Thermodyn.* 1978, *10*, 817 - 822.

VARIABLES:
    T/K: 282.80, 313.35
    p/kPa: 101.325 (1 atm)
	PREPARED BY:
	
	    H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient α/cm^3 (STP) cm^{-3} atm^{-1}	Ostwald Coefficient L/cm^3 cm^{-3}
282.80	5.737	0.6693	0.6929
313.35	4.798	0.5420	0.6218

The Bunsen coefficients were calculated by the compiler.

It is assumed that the gas is ideal and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The solubility apparatus is based on the design of Morrison and Billett (1) and the version used is described by Battino, Evans, and Danforth (2). The degassing apparatus is that described by Battino, Banzhof, Bogan, and Wilhelm (3).

Degassing. Up to 500 cm^3 of solvent is placed in a flask of such size that the liquid is about 4 cm deep. The liquid is rapidly stirred, and vacuum is intermittently applied through a liquid N_2 trap until the permanent gas residual pressure drops to 5 microns.

Solubility Determination. The degassed solvent is passed in a thin film down a glass helical tube containing solute gas plus the solvent vapor at a total pressure of one atm. The volume of gas absorbed is found by difference between the initial and final volumes in the buret system. The solvent is collected in a tared flask and weighed.

SOURCE AND PURITY OF MATERIALS:

(1) Methane. Matheson Co., Inc. Minimum mole percent purity stated to be 99.97.

(2) Decane. Phillips Petroleum Co. 99 mol %, distilled, density at 298.15 K, ρ/g cm^{-3} 0.7264.

ESTIMATED ERROR:
    δT/K = 0.02
    δP/mmHg = 0.5
    $\delta x_1/x_1$ = 0.01

REFERENCES:

1. Morrison, T. J.; Billett, F.
   J. Chem. Soc. 1948, 2033.

2. Battino, R.; Evans, F. D.;
   Danforth, W. F.
   J. Am. Oil Chem. Soc. 1968,
   45, 830.

3. Battino, R.; Banzhof, M.;
   Bogan, M.; Wilhelm, E.
   Anal. Chem. 1971, *43*, 806.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Dodecane; $C_{12}H_{26}$; [112-40-3]	Hayduk, W.; Buckley, W.D. *Can. J. Chem. Eng.* <u>1971</u>, *49*, 667-671.

VARIABLES:	PREPARED BY:
T/K: 273.15-348.15 *P*/kPa: 101.325	W. Hayduk

EXPERIMENTAL VALUES:

T/K	Ostwald Coefficient[1] *L*/cm^3 cm^{-3}	Bunsen Coefficient[2] α/cm^3 (STP) cm^{-3} atm^{-1}	Mole Fraction[1] 10^4 x_1
273.15	0.627	0.627	62.4 (62.8)[3]
298.15	0.590	0.540	54.9 (54.4)
323.15	0.547	0.462	48.2 (48.2)
348.15	0.517	0.406	43.4 (43.5)

[1]Original data.

[2]Calculated by compiler

[3]The mole fraction solubility of the original data was used to determine the following equations for $\Delta G°$ and $\ln x_1$ and table of smoothed values:

$$\Delta G°/\text{J mol}^{-1} = -RT \ln x_1 = 56.325\, T - 3869.4$$

$$\ln x_1 = 465.4/T - 6.775$$

Std. deviation for $\Delta G° = 15.3$ J mol^{-1}; Correlation coefficient = 0.9999

T/K	$10^{-4}\Delta G°$/J mol^{-1}	10^4 x_1	*T*/K	$10^{-4}\Delta G°$/mol^{-1}	10^4 x_1
273.15	1.152	62.8	303.15	1.321	53.0
283.15	1.208	59.1	313.15	1.377	50.5
293.15	1.264	55.9	323.15	1.433	48.2
298.15	1.292	54.4	348.15	1.574	43.5

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A volumetric method using a glass apparatus was employed. Degassed solvent contacted the gas while flowing as a thin film, at a constant rate, through an absorption spiral into a solution buret. A constant solvent flow was obtained by means of a calibrated syringe pump. The solution at the end of the spiral was considered saturated. Dry gas was maintained at atmospheric pressure in a gas buret by mechanically raising the mercury level in the buret at an adjustable rate. The solubility was calculated from the constant slope of volume of gas dissolved and volume of solvent injected. Degassing was accomplished using a two stage vacuum process described by Clever et al. (1).	1. Matheson Co. Specified as ultra high purity grade of 99.98 per cent. 2. Canlab. Chromatoquality grade of specified minimum purity of 99.0 per cent.

ESTIMATED ERROR:
δT/K = 0.1 $\delta x_1/x_1$ = 0.01

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

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Undecane; $C_{11}H_{24}$; [1120-21-4] Dodecane; $C_{12}H_{26}$; [112-40-3]	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* <u>1976</u>, *4*, 269 - 280.

VARIABLES:
      T/K: 298.15
      p/kPa: 101.325 (1 atm)
	PREPARED BY:
	         S. A. Johnson
	         H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient α/cm^3(STP)cm^{-3}atm^{-1}	Ostwald Coefficient L/cm^{3}cm^{-3}
Undecane			
298.15	5.46	0.580	0.633
Dodecane			
298.15	5.45	0.537	0.586

The Bunsen coefficient and mole fraction values were calculated by the compiler assuming that the gas is ideal and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric method. The apparatus described by Bodor, Bor, Mohai and Sipos was used (1).	Both the gas and the liquid were analytical grade reagents of Hungarian or foreign origin. No further information.
	ESTIMATED ERROR: $\delta L/L$ = ± 0.03

	REFERENCES:
	 1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G.
	     Veszpremi Vegyip. Egy. Kozl.
	     <u>1957</u>, *1*, 55.
	     Chem. Abstr. <u>1961</u>, *55*, 3175h.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Tridecane; $C_{13}H_{28}$; [629-50-5] Tetradecane; $C_{14}H_{30}$; [629-59-4]	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* <u>1976</u>, *4*, 269 - 280.

VARIABLES:	PREPARED BY:
T/K: 298.15 p/kPa: 101.325 (1 atm)	S. A. Johnson H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient α/cm^3(STP)cm^{-3}atm^{-1}	Ostwald Coefficient L/cm^{3}cm^{-3}
Tridecane			
298.15	5.39	0.496	0.541
Tetradecane			
298.15	5.40	0.465	0.508

The Bunsen coefficient and mole fraction values were calculated by the compiler assuming that the gas is ideal and that Henry's law is obeyed.

<div align="center">AUXILIARY INFORMATION</div>

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric method. The apparatus described by Bodor, Bor, Mohai and Sipos was used (1).	Both the gas and the liquid were analytical grade reagents of Hungarian or foreign origin. No further information.
	ESTIMATED ERROR: $\delta L/L = \pm 0.03$
	REFERENCES: 1. Bodor, E.; Bor, Gy.; Mohai, B.; Sipos, G. *Veszpremi Vegyip. Egy. Kozl.* <u>1957</u>, *1*, 55. *Chem. Abstr.* <u>1961</u>, *55*, 3175h.

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Pentadecane; $C_{15}H_{32}$; [629-62-9] Hexadecane; $C_{16}H_{34}$; [544-76-3]	Makranczy, J.; Megyery-Balog, K.; Rusz, L.; Patyi, L. *Hung. J. Ind. Chem.* <u>1976</u>, *4,* 269 - 280.

VARIABLES:	PREPARED BY:
T/K: 298.15 p/kPa: 101.325 (1 atm)	S. A. Johnson H. L. Clever

EXPERIMENTAL VALUES:

T/K	Mol Fraction $10^3 x_1$	Bunsen Coefficient α/cm^3(STP)cm^{-3}atm^{-1}	Ostwald Coefficient L/cm^{3}cm^{-3}
Pentadecane			
298.15	5.35	0.434	0.474
Hexadecane			
298.15	5.36	0.410	0.448

The Bunsen coefficient and mole fraction values were calculated by the compiler assuming that the gas is ideal and that Henry's law is obeyed.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric method. The apparatus described by Bodor, Bor, Mohai and Sipos was used (1).	Both the gas and the liquid were analytical grade reagents of Hungarian or foreign origin. No further information.
	ESTIMATED ERROR: $\delta L/L = \pm\ 0.03$

	REFERENCES:
	1. Bodor, E.; Bor, Gy.;
	   Mohai, B.; Sipos, G.
	   Veszpremi Vegyip. Egy. Kozl.
	   <u>1957</u>, *1*, 55.
	   Chem. Abstr. <u>1961</u>, *55*, 3175h.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. Hexadecane; $C_{16}H_{34}$; [544-76-3]	Lenoir, J-Y.; Renault, P.; Renon, H. *J. Chem. Eng. Data*, <u>1971</u>, *16*, 340-2.

VARIABLES:	PREPARED BY:
	C. L. Young

EXPERIMENTAL VALUES:

T/K	Henry's constant H_{CH_4}/atm	Mole fraction at 1 atm* x_{CH_4}
298.2	209	0.00478

* Calculated by compiler assuming a linear function of P_{CH_4} vs x_{CH_4}, i.e., x_{CH_4} (1 atm) = $1/H_{CH_4}$.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A conventional gas-liquid chromato-graphic unit fitted with a thermal conductivity detector was used. The carrier gas was helium. The value of Henry's law constant was calculated from the retention time. The value applies to very low partial pressures of gas and there may be a substantial difference from that measured at 1 atm. pressure. There is also considerable uncertainty in the value of Henry's constant since surface adsorption was not allowed for although its possible existence was noted.	(1) L'Air Liquide sample, minimum purity 99.9 mole per cent. (2) Touzart and Matignon or Serlabo sample, purity 99 mole per cent.
	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; δH/atm = $\pm 6\%$ (estimated by compiler).
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
(1) Methane; CH_4; [74-82-8] (2) Hexadecane; $C_{16}H_{34}$; [544-76-3]	Hayduk, W.; Buckley, W.D. *Can. J. Chem. Eng.* <u>1971</u>, *49*, 667-671.

VARIABLES:	PREPARED BY:
T/K: 298.15-348.15 P/kPa: 101.325	W. Hayduk

EXPERIMENTAL VALUES:

T/K	Ostwald Coefficient[1] L/cm^3 cm^{-3}	Bunsen Coefficient[2] α/cm^3 (STP)cm^{-3}atm^{-1}	Mole Fraction[1] 10^4 x_1
298.15	0.500	0.458	60.2 (59.9)[3]
323.15	0.475	0.401	53.7 (55.2)
348.15	0.464	0.364	49.9 (49.7)

[1]Original data.

[2]Calculated by compiler.

[3]The mole fraction solubility of the original data was used to determine the following equations for $\Delta G°$ and $\ln x_1$ and table of smoothed values:

$$\Delta G°/\text{J mol}^{-1} = -RT \ln x_1 = 53.380\ T - 3229.7$$

$$\ln x_1 = 388.5/T - 6.420$$

Std. deviation for $\Delta G°$ = 20.4 J mol^{-1}; Correlation coefficient = 0.9999

T/K	$10^{-4}\Delta G°/\text{mol}^{-1}$	10^4 x_1
298.15	1.269	59.9
303.15	1.295	58.6
313.15	1.349	56.3
323.15	1.375	55.2
333.15	1.455	52.3
348.15	1.535	49.7

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
A volumetric method using a glass apparatus was employed. Degassed solvent contacted the gas while flowing as a thin film, at a constant rate, through an absorption spiral into a solution buret. A constant solvent flow was obtained by means of a calibrated syringe pump. The solution at the end of the spiral was considered saturated. Dry gas was maintained at atmospheric pressure in a gas buret by mechanically raising the mercury level in the buret at an adjustable rate. The solubility was calculated from the constant slope of volume of gas dissolved and volume of solvent injected. Degassing was accomplished using a two stage vacuum process described by Clever et al. (1).	1. Matheson Co. Specified as ultra high purity grade of 99.97 per cent. 2. Canlab. Olefin-free grade of specified minimum purity of 99.0 per cent.

ESTIMATED ERROR:
δT/K   = 0.1 $\delta x_1/x_1$ = 0.01

REFERENCES:

1. Clever, H.L.; Battino, R.; Saylor, J.H.; Gross, P.M.

    J. Phys. Chem. <u>1957</u>, *61*, 1078.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH₄; [74-82-8] 2. Hexadecane; C₁₆H₃₄; [544-76-3]	Cukor, P.M.; Prausnitz, J.M. *J. Phys. Chem.* 1972, *76*, 598-601

VARIABLES:	PREPARED BY:
Temperature	C.L. Young

EXPERIMENTAL VALUES:

T/K	Henry's Constant[a] /atm	Mole fraction of methane[b] in liquid, x_{CH_4}
300	174	0.00575
325	191	0.00524
350	206	0.00485
375	218	0.00459
400	228	0.00439
425	233	0.00429
450	235	0.00426
475	233	0.00429

a. Quoted in supplementary material for original paper

b. Calculated by compiler for a partial pressure of 1 atmosphere

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric apparatus similar to that described by Dymond and Hildebrand (1). Pressure measured with a null detector and precision gauge. Details in ref. (2).	No details given

ESTIMATED ERROR:

$\delta T/K = \pm 0.05$; $\delta x_{CH_4} = \pm 2\%$

REFERENCES:

1. Dymond, J.; Hildebrand, J.H. *Ind. Eng. Chem. Fundam.* 1967, *6*, 130.

2. Cukor, P.M.; Prausnitz, J.M. *Ind. Eng. Chem. Fundam.* 1971, *10* 638.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH₄; [74-82-8] 2. Hexadecane; C₁₆H₃₄; [544-76-3]	Rivas, O.R.; Prausnitz, J.M. *Ind. Eng. Chem. Fundam.* <u>1979</u>,*18*, 289-292.

VARIABLES:	PREPARED BY:
Temperature	C.L. Young

EXPERIMENTAL VALUES:

T/K	Henry's constant / atm	Mole fraction at 1 atm partial pressure*, x_{CH_4}
298.15	171.7	0.005824
373.15	216.1	0.004627
473.15	231.7	0.004316

* Calculated by compiler assuming mole fraction solubility linear with pressure.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric apparatus with a fused quartz precision bourdon pressure gauge. Solubility apparatus carefully thermostatted. Solvent degassed *in situ*. Apparatus described in source and similar to that described in ref (1).	No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.05$; $\delta x_{CH_4} = \pm 1\%$.

REFERENCES:
1. Cukor, P.M.; Prausnitz, J.M.

   Ind. Eng. Chem. Fundam. <u>1971</u>, *10*, 638.

COMPONENTS:	ORIGINAL MEASUREMENTS:

1. Methane; CH_4; [74-82-8]
2. Hexadecane; $C_{16}H_{34}$; [544-76-3]
  or
  Octadecane; $C_{18}H_{38}$; [593-45-3]
	Richon, D.; Renon, H.
	J. Chem. Eng. Data 1980, *25*, 59-60.

VARIABLES:	PREPARED BY:
	C. L. Young

EXPERIMENTAL VALUES:

T/K	Limiting value of Henry's constant, H^∞ /atm	Mole fraction of methane, * x_{CH_4}
	Hexadecane	
298.15	171.2	0.005841
	Octadecane	
323.15	196.9	0.005079

* Calculated by compiler assuming mole fraction is a linear
function of pressure up to 1 atm.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Inert gas stripping plus gas chromatographic method. Details given in ref. (1). Method based on passing constant stream of inert gas through dissolved gas-solvent mixture and periodically injecting mixture into gas chromatograph. Henry's law constant determined from variation of gas peak area with time.	1. L'Air Liquide sample, purity 99.95 mole per cent. 2. Hexadecane was a Merck sample, Octadecane was a Fluka sample, both had purities of not less than 99 mole per cent.

	ESTIMATED ERROR:
	$\delta T/K = \pm0.05$; $\delta H^\infty = \pm4\%$ (estimated by compiler).

	REFERENCES:

	1. Leroi, J. C.; Masson, J. C.;
	  Renon, H.; Fabries, J. F.;
	  Sannier, H. *Ind. Eng. Chem.*
	  Process. Des. Develop. 1977, *16*,
	  139.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. Alkanes	Lin, P. J.; Parcher, J. F. *J. Chromatog. Sci.* 1982, *20*, 33-38.

VARIABLES:	PREPARED BY: C. L. Young

EXPERIMENTAL VALUES:

T/K	Henry's law constant, H /atm	Mole fraction at a partial pressure of 1 atmosphere x_{CH_4}
	Hexadecane; $C_{16}H_{34}$; [544-76-3]	
298.2	179	0.00559
313.2	189	0.00529
328.2	192	0.00521
	Octacosane; $C_{28}H_{58}$; [630-02-4]	
353.2	157	0.00637
373.2	165	0.00606
393.2	174	0.00575
	Hexatriacontane; $C_{36}H_{74}$; [630-06-8]	
353.2	131	0.00763
373.2	137	0.00730
393.2	145	0.00690
413.2	153	0.00654

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Henry's law constant determined from retention volume of gas on a chromatographic column. Helium was used as a carrier gas and a mass spectrometer was used as a detector. The measured Henry's law constants were independent of sample size, flow rate and composition of injected sample. The dead volume was determined by two independent methods and the values agreed within experimental error.	No details given.

ESTIMATED ERROR:

$\delta T/K = \pm 0.1$; $\delta x_{CH_4} = \pm 5\%$

(estimated by compiler).

REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. 2,2,4,4,6,8,8-Heptamethyl nonane; $C_{16}H_{34}$; [4390-04-9]	Richon, D.; Renon, H. *J. Chem. Eng. Data* <u>1980</u>, *25*, 59-60.
VARIABLES:	PREPARED BY: C. L. Young

EXPERIMENTAL VALUES:

T/K	Limiting value of Henry's constant, H^∞/atm	Mole fraction of methane, * x_{CH_4}
298.15	32.8	0.0305

* Calculated by compiler assuming mole fraction is a linear
function of pressure up to 1 atm.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Inert gas stripping plus gas chromatographic method. Details given in ref. (1). Method based on passing constant stream of inert gas through dissolved gas-solvent mixture and periodically injecting mixture into gas chromatograph. Henry's law constant determined from variation of gas peak area with time.	1. L'Air Liquide sample, purity 99.95 mole per cent. 2. Sigma sample, purity not less than 99 mole per cent.
	ESTIMATED ERROR: $\delta T/K = \pm0.05$; $\delta x_{CH_4} = \pm4\%$ (estimated by compiler).
	REFERENCES: 1. Leroi, J. C.; Masson, J. C.; Renon, H.; Fabries, J. F.; Sannier, H. *Ind. Eng. Chem. Process. Des. Develop.* <u>1977</u>, *16*, 139.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH₄; [74-82-8] 2. Octadecane; C₁₈H₃₈; [593-45-3]	Ng, S.; Harris, H.G.; Prausnitz, J.M.; *J. Chem. Engng. Data*, 1969, *14*, 482-3.
VARIABLES: Temperature	PREPARED BY: C.L. Young

EXPERIMENTAL VALUES:

T/K	Henry's Constant, H /atm.	Mole fraction[+] of methane in liquid, x_{CH_4}
308.2	209	0.00478
323.2	239	0.00418
343.2	272	0.00368
363.2	255	0.00392
373.2	306	0.00327
423.2	395	0.00253

+ at 1 atmosphere partial pressure, calculated by
   compiler assuming mole fraction equals $1/H$.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Gas chromatographic method. Solvent supported on Chromosorb P in 6 m column. Gas injected as sample, helium used as carrier gas. Henry's law constant calculated from knowledge of retention time and flow rate.	1. Matheson sample purity greater than 99 mole per cent. 2. Matheson, Coleman and Bell sample, m.pt. 27-28.5°C.
	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; δH/atm = $\pm 5\%$.
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. Eicosane; $C_{20}H_{42}$; [112-95-8]	Ng. S.; Harris, H.G.; Prausnitz, J.M. *J. Chem. Engng. Data,* <u>1969</u>, *14*, 482-3

VARIABLES:	PREPARED BY:
Temperature	C. L. Young

EXPERIMENTAL VALUES:

T/K	Henry's Constant, H /atm	Mole fraction of methane in liquid, x_{CH_4} *
323.2	226	0.00442
373.2	286	0.00350
393.2	301	0.00332
413.2	356	0.00281

* At 1 atmosphere partial pressure, calculated by compiler assuming mole fraction equals $1/H$

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Gas chromatographic method. Solvent supported on Chromosorb P in 6 m column. Gas injected as sample, helium used as carrier gas. Henry's law constant claculated from knowledge of retention time and flow rate.	1. Matheson sample, purity greater than 99 mole per cent. 2. Matheson, Coleman and Bell sample, m.pt. 35-36.5°C.
	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta H/atm = \pm 5\%$
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. Eicosane; $C_{20}H_{42}$; [112-95-8]	Chappelow, C.C.; Prausnitz, J.M. *Am. Inst. Chem. Engnrs. J.* <u>1974</u>, *20*, 1097-1104.

VARIABLES:
   Temperature
	PREPARED BY:
	   C.L. Young

EXPERIMENTAL VALUES:

T/K	Henry's Constant[a] /atm	Mole fraction[b] of methane at 1 atm. partial pressure, x_{CH_4}
325	170	0.00588
350	184	0.00543
375	196	0.00510
400	205	0.00488
425	210	0.00476
450	214	0.00467
475	216	0.00463

a. Authors stated measurements were made at several pressures
    and values of solubility used were all within the Henry's
    Law region.

b. Calculated by compiler assuming linear relationship between
    mole fraction and pressure.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric apparatus similar to that described by Dymond and Hildebrand (1). Pressure measured with a null detector and precision gauge. Details in ref. (2).	Solvent degassed, no other details given.
	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta x_{CH_4} = \pm 1\%$
	REFERENCES: 1. Dymond, J.; Hildebrand, J.H. *Ind. Eng. Chem. Fundam.* <u>1967</u>,*6*,130. 2. Cukor, P.M.; Prausnitz, J.M. *Ind. Eng. Chem. Fundam.* <u>1971</u>,*10*,638.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. Docosane; $C_{22}H_{46}$ [629-97-0]	Ng, S.; Harris, H.G.; Prausnitz, J.M. *J. Chem. Engng. Data,* <u>1969</u>, *14,* 482-3

VARIABLES:
 	
    Temperature
	PREPARED BY:
	
	      C. L. Young

EXPERIMENTAL VALUES:

T/K	Henry's Constant, H /atm	Mole fraction of methane * in liquid, x_{CH_4}
333.2	229	0.00437
383.2	269	0.00372
408.2	314	0.00318
433.2	338	0.00296
453.2	355	0.00282
473.2	411	0.00243

* At 1 atmosphere partial pressure, calculated by compiler assuming
   mole fraction equals $1/H$

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Gas chromatographic method. Solvent supported on Chromosorb P in 6 m column. Gas injected as sample, helium used as carrier gas. Henry's law constant calculated from knowledge of retention time and flow rate.	1. Matheson sample, purity greater than 99 mole per cent. 2. Matheson, Coleman and Bell sample, m.pt . 43-45°C.
	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta H/atm = \pm 5\%$
	REFERENCES:

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. 2,6,10,15,19,23,-Hexamethyl-tetracosane,(Squalane); $C_{30}H_{62}$; [111-01-3]	Chappelow, C.C.; Prausnitz, J.M. *Am. Inst. Chem. Engnrs. J.* 1974, *20*, 1097-1104.

VARIABLES:	PREPARED BY:
Temperature	C.L. Young

EXPERIMENTAL VALUES:

T/K	Henry's Constant[a] /atm	Mole fraction[b] of methane at 1 atm. partial pressure, x_{CH_4}
300	111	0.00901
325	124	0.00806
350	135	0.00741
375	144	0.00694
400	151	0.00662
425	156	0.00641
450	160	0.00625
475	163	0.00613

a. Authors stated measurements were made at several pressures and values of solubility used were all within the Henry's Law region.

b. Calculated by compiler assuming linear relationship between mole fraction and pressure.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:	SOURCE AND PURITY OF MATERIALS:
Volumetric apparatus similar to that described by Dymond and Hildebrand (1). Pressure measured with a null detector and precision gauge. Details in ref. (2).	

ESTIMATED ERROR:
$$\delta T/K = \pm 0.1; \quad \delta x_{CH_4} = \pm 1\%$$

REFERENCES:
1. Dymond, J.; Hildebrand, J.H. *Ind.Chem.Eng.Fundam.* 1967,*6*,130.
2. Cukor, P.M.; Prausnitz, J.M. *Ind.Chem.Eng.Fundam.* 1971,*10*,638.