

COMPONENTS: 1. Methane; CH ₄ ; [74-82-8] 2. Benzenamine; (Aniline); C ₆ H ₇ N; [62-53-3]	ORIGINAL MEASUREMENTS: Lenoir, J-Y.; Renault, P.; Renon, H. <i>J. Chem. Eng. Data</i> , <u>1971</u> , 16, 340-2.						
VARIABLES:	PREPARED BY: C. L. Young						
EXPERIMENTAL VALUES: <table border="1" style="width: 100%; margin-top: 20px;"> <thead> <tr> <th style="text-align: center;">T/K</th> <th style="text-align: center;">Henry's constant $H_{\text{CH}_4}/\text{atm}$</th> <th style="text-align: center;">Mole fraction at 1 atm* x_{CH_4}</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">298.2</td> <td style="text-align: center;">1580</td> <td style="text-align: center;">0.000633</td> </tr> </tbody> </table> <p style="margin-top: 20px;">* Calculated by compiler assuming a linear function of P_{CH_4} vs x_{CH_4}, i.e., $x_{\text{CH}_4}(1 \text{ atm}) = 1/H_{\text{CH}_4}$.</p>		T/K	Henry's constant $H_{\text{CH}_4}/\text{atm}$	Mole fraction at 1 atm* x_{CH_4}	298.2	1580	0.000633
T/K	Henry's constant $H_{\text{CH}_4}/\text{atm}$	Mole fraction at 1 atm* x_{CH_4}					
298.2	1580	0.000633					
AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE: A conventional gas-liquid chromatographic 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.	SOURCE AND PURITY OF MATERIALS: (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: $\delta T/K = \pm 0.1$; $\delta H/\text{atm} = \pm 6\%$ (estimated by compiler). REFERENCES:						

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8] 2. Quinoline; C ₉ H ₇ N; [91-22-5]			Simnick, J.J.; Sebastian, H.M.; Lin, H-M.; Chao, K-C. <i>J. Chem. Engng. Data.</i> <u>1979</u> , <i>24</i> , 239-240	
VARIABLES:			PREPARED BY:	
Temperature, pressure			C.L. Young	
EXPERIMENTAL VALUES:				
T/K	p/atm	p ⁺ /MPa	Mole fraction of methane in liquid, x _{CH₂}	Mole fraction of methane in gas, y _{CH₂}
462.75	19.91	2.017	0.0197	0.9815
	29.98	3.038	0.0297	0.9865
	49.9	5.06	0.0488	0.9901
	100.2	10.15	0.0945	0.9919
	149.4	15.14	0.1352	0.9919
	200.0	20.27	0.1750	0.9904
	249.7	25.30	0.2112	0.9888
542.85	19.90	2.016	0.0206	0.8876
	29.91	3.031	0.0311	0.9187
	50.0	5.07	0.0529	0.9449
	99.3	10.06	0.1036	0.9612
	152.4	15.44	0.1571	0.9643
	199.4	20.20	0.2025	0.9633
	249.1	25.24	0.2455	0.9622
622.65	19.83	2.009	0.0170	0.5838
	30.11	3.051	0.0304	0.7052
	49.8	5.05	0.0557	0.7999
	99.9	10.12	0.1191	0.8692
	151.3	15.33	0.1831	0.8866
	199.5	20.21	0.2410	0.8886
	249.0	25.23	0.3010	0.8837
+ calculated by compiler.				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: Flow apparatus with both liquid and gas components continually passing into a mixing tube and then into a cell in which the phases separated under gravity. Liquid sample removed from bottom of cell and vapor sample from top of cell. Composition of samples estimated using gas chromatography. Temperature measured with thermocouple and pressure with Bourdon gauge. Details in ref. (1).			SOURCE AND PURITY OF MATERIALS:	
			1. Matheson sample, purity better than 99 mole per cent.	
			2. Fisher Scientific Co. sample, distilled over zinc under helium, purity better than 99 mole per cent.	
			ESTIMATED ERROR:	
			$\delta T/K = \pm 0.1-02$; $\delta p/MPa = \pm 0.5\%$. δx_{CH_2} , $\delta y_{CH_2} = \pm 2\%$.	
			REFERENCES:	
			1. Simnick, J.J.; Lawson, C.C.; Lin, H-M.; Chao, K-C. <i>Am. Inst. Chem. Engrs. J.</i> <u>1977</u> , <i>23</i> , 469.	

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]			Simnick, J.J.; Sebastian, H.M.;	
2. Quinoline; C ₉ H ₇ N; [91-22-5]			Lin, H-M.; Chao, K-C.	
			<i>J. Chem. Engng. Data.</i> <u>1979</u> , 24, 239-240.	
<u>EXPERIMENTAL VALUES:</u>				
T/K	p/atm	p ⁺ /MPa	Mole fraction of methane in liquid, x _{CH₂}	Mole fraction of methane in gas, y _{CH₂}
702.85	30.03	3.043	0.0170	0.2716
	50.4	5.11	0.0514	0.4770
	99.9	10.12	0.1379	0.6381
	152.0	15.40	0.2283	0.6802
	175.2	17.75	0.2767	0.6752
	200.2	20.29	0.3311	0.6639
	220.2	22.31	0.4027	0.6391
+ calculated by compiler.				

COMPONENTS:

1. Methane; CH₄; [74-82-8]
2. 1-Methyl-2-pyrrolidinone;
C₅H₉NO; [872-50-4]

EVALUATOR:

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Department of Physical Chemistry,
University of Melbourne.
Parkville, Victoria, 3052
Australia.
February 1986.

EVALUATION:

There appears to be large discrepancies between the mole fraction solubilities for this mixture as reported by the various workers (1-4). The datum of Wu et al.(4) at 298.15 K is in reasonable agreement with the datum of Lenoir et al.(2) at the same temperature. The high pressure data of Shakhova and Zubchenko (1) appears to be consistent with that of Wu et al.(4) and Lenoir et al.(2) but the necessary assumption that Henry's law is valid between 0.1 and 2.1 MPa does not allow closer comparison. All three sets of data are classified as tentative. The data of Murrieta-Guevara and Rodriguez (3) disagrees with the previous three workers data being of the order of 80-100 per cent larger. Their data are classified as doubtful.

References

1. Shakhova, S. F.; Zubchenko, Yu. P.
Khim. Prom., 1973, *49*, 595
2. Lenoir, J-Y.; Renault, P.; Renon, H.
J. Chem. Eng. Data 1971, *16*, 340.
3. Murrieta-Guevara, F.; Rodriguez, A. T.
J. Chem. Eng. Data 1984, *29*, 456.
4. Wu, Z.; Zeck, S.; Knapp, H.
Ber. Bunsenges. Phys. Chem., 1985, *89*, 1009.

EXPERIMENTAL VALUES:		Mole fraction of methane in liquid, x_{CH_4}	α^+ vol/vol
T/K	P/MPa		
298.15	2.087	0.0190	4.5
	2.969	0.0269	6.4
	3.334	0.0293	7.0
	4.316	0.0374	9.0
	5.249	0.0465	11.3
	6.080	0.0515	12.6
	7.255	0.0596	14.7
	7.964	0.0661	16.4
	8.045	0.0664	16.5
	8.339	0.0672	16.7
	8.481	0.0672	16.7
	10.254	0.0783	19.7
343.15	2.158	0.0186	4.4
	3.587	0.0305	7.3
	3.809	0.0317	7.6
	6.870	0.0535	13.1
	6.870	0.0550	13.5
	8.734	0.0668	16.6
	9.372	0.0713	17.8
	9.859	0.0735	18.4
	11.136	0.0820	20.7
	11.571	0.0856	21.7
373.15	2.158	0.0182	4.3
	4.904	0.0386	9.3

AUXILIARY INFORMATION	
METHOD/APPARATUS/PROCEDURE: Rocking autoclave. Mixture stirred by ball in rocking autoclave. Samples of liquid analysed by volumetric method. Details in ref. (1).	SOURCE AND PURITY OF MATERIALS: 1. Purity 97.8 mole per cent. 2. No details given.
	ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/MPa = \pm 0.01$; $\delta x_{\text{CH}_4} = \pm 5\%$. (estimated by compiler)
	REFERENCES: 1. Shakhova, S.F.; Zubchenko, Yu.P.; Kaplan, L.K. <i>Khim. Prom.</i> <u>1973</u> , 5, 108.

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1.	Methane; CH ₄ ; [74-82-8]	Shakhova, S.F.; Zubchenko, Yu.P.	
2.	1-methyl-2-pyrrolidone; C ₅ H ₉ NO; [872-50-4]	<i>Khím. Prom.</i> , <u>1973</u> , 49,595-6.	
EXPERIMENTAL VALUES:			
T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	α^+ vol/vol
373.15	5.350	0.0421	10.2
	7.407	0.0569	14.0
	9.221	0.0668	16.6
	9.393	0.0687	17.1
	10.305	0.0750	18.8
	10.375	0.0750	18.8
<p>+ quoted in original paper, appears to be volume of gas at T/K = 273.15 and P = 1 atmosphere absorbed by unit volume of liquid at room temperature.</p>			

COMPONENTS: 1. Methane; CH ₄ ; [74-82-8] 2. 1-Methyl-2-pyrrolidinone; C ₅ H ₉ NO; [872-50-4]	ORIGINAL MEASUREMENTS: Lenoir, J-Y.; Renault, P.; Renon, H. <i>J. Chem. Eng. Data</i> <u>1971</u> , <i>16</i> , 340-2						
VARIABLES:	PREPARED BY: C.L. Young						
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AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE: A conventional gas-liquid chromatographic 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.	SOURCE AND PURITY OF MATERIALS: (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: $\delta T/K = \pm 0.1$; $\delta H/\text{atm} = \pm 6\%$ (estimated by compiler). REFERENCES:						

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) 2-Amino-ethanol or monoethanol-amine; C ₂ H ₇ NO; [141-43-5] (3) 1-Methyl-2-pyrrolidinone or N-methylpyrrolidone; C ₅ H ₉ NO; [872-50-4]	ORIGINAL MEASUREMENTS: Murrieta-Guevara, F.; Rodriguez, A.T. <i>J. Chem. Eng. Data</i> <u>1984</u> , <i>29</i> , 456 - 60.																																																																																														
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<table border="1"> <thead> <tr> <th colspan="2">Temperature</th> <th colspan="2">Pressure</th> <th>Monoethanol-amine</th> <th>Methane</th> </tr> <tr> <th>$t/^\circ\text{C}$</th> <th>T/K</th> <th>p_1/atm</th> <th>p_1/MPa</th> <th>wt %</th> <th>$10^3 x_1$</th> </tr> </thead> <tbody> <tr> <td rowspan="6">25.0</td> <td rowspan="6">298.2</td> <td>0.269</td> <td>0.0273</td> <td rowspan="6">0</td> <td>0.6</td> </tr> <tr> <td>0.469</td> <td>0.0475</td> <td>1.0</td> </tr> <tr> <td>0.687</td> <td>0.0696</td> <td>1.3</td> </tr> <tr> <td>0.937</td> <td>0.0949</td> <td>1.7</td> </tr> <tr> <td>1.213</td> <td>0.1229</td> <td>2.0</td> </tr> <tr> <td>1.578</td> <td>0.1599</td> <td>2.4</td> </tr> <tr> <td rowspan="6">25.0</td> <td rowspan="6">298.2</td> <td>1.942</td> <td>0.1968</td> <td rowspan="6">5.1</td> <td>2.7</td> </tr> <tr> <td>0.258</td> <td>0.0261</td> <td>0.7</td> </tr> <tr> <td>0.466</td> <td>0.0472</td> <td>1.4</td> </tr> <tr> <td>0.686</td> <td>0.0695</td> <td>2.1</td> </tr> <tr> <td>0.937</td> <td>0.0949</td> <td>2.6</td> </tr> <tr> <td>1.247</td> <td>0.1264</td> <td>3.3</td> </tr> <tr> <td rowspan="6">25.0</td> <td rowspan="6">298.2</td> <td>1.594</td> <td>0.1611</td> <td rowspan="6">14.3</td> <td>4.0</td> </tr> <tr> <td>1.938</td> <td>0.1964</td> <td>4.6</td> </tr> <tr> <td>0.274</td> <td>0.0278</td> <td>0.6</td> </tr> <tr> <td>0.486</td> <td>0.0492</td> <td>1.3</td> </tr> <tr> <td>0.702</td> <td>0.0711</td> <td>1.7</td> </tr> <tr> <td>0.948</td> <td>0.0961</td> <td>2.2</td> </tr> <tr> <td rowspan="4"></td> <td rowspan="4"></td> <td>1.158</td> <td>0.1173</td> <td rowspan="4"></td> <td>2.4</td> </tr> <tr> <td>1.468</td> <td>0.1487</td> <td>3.0</td> </tr> <tr> <td>1.694</td> <td>0.1716</td> <td>3.3</td> </tr> <tr> <td>1.946</td> <td>0.1972</td> <td>3.4</td> </tr> </tbody> </table>						Temperature		Pressure		Monoethanol-amine	Methane	$t/^\circ\text{C}$	T/K	p_1/atm	p_1/MPa	wt %	$10^3 x_1$	25.0	298.2	0.269	0.0273	0	0.6	0.469	0.0475	1.0	0.687	0.0696	1.3	0.937	0.0949	1.7	1.213	0.1229	2.0	1.578	0.1599	2.4	25.0	298.2	1.942	0.1968	5.1	2.7	0.258	0.0261	0.7	0.466	0.0472	1.4	0.686	0.0695	2.1	0.937	0.0949	2.6	1.247	0.1264	3.3	25.0	298.2	1.594	0.1611	14.3	4.0	1.938	0.1964	4.6	0.274	0.0278	0.6	0.486	0.0492	1.3	0.702	0.0711	1.7	0.948	0.0961	2.2			1.158	0.1173		2.4	1.468	0.1487	3.0	1.694	0.1716	3.3	1.946	0.1972	3.4
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METHOD/APPARATUS/PROCEDURE: <p>The apparatus was a liquid-vapor equilibrium system with circulation of the gas phase. The 170 cm³ equilibrium cell was made of glass with a gas inlet tube ending in a fritted glass disk at the bottom of the cell.</p> <p>The solvent was placed in the cell and weighed. The degassing was carried out <i>in situ</i> by freezing-evacuating-thawing cycles.</p> <p>A known amount of solute gas was added to the system at thermal equilibrium and a pump started to circulate the vapor phase. Equilibrium was attained in 30 minutes. The equilibrium pressure in the cell was measured with a calibrated stainless steel pressure transducer used in absolute fashion.</p> <p>Purification of the solvents is described in (ref 1).</p>	SOURCE AND PURITY OF MATERIALS: (1) Methane. Matheson Co., Inc. Stated to be 99.99 mol %. (2) Monoethanolamine. J.T.Baker Co. 99.56 mol %. Fractionated and dried. (3) N-Methylpyrrolidone. Matheson, Coleman and Bell. 98 mol %. Fractionated and dried, GLC purity better than 99.5 mol %. ESTIMATED ERROR: $\delta T/K = \pm 0.1$ $\delta p_1/p_1 = \pm 0.001$ $\delta x_1/x_1 = \pm 0.10$ (compiler) REFERENCES: 1. Murrieta-Guevara, F.; Rodriguez, A. <i>J. Chem. Eng. Data</i> <u>1984</u> , <i>29</i> , 204.																																																																																														

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(1) Methane; CH ₄ ; [74-82-8] (2) 2,2'-Iminobis-ethanol or diethanolamine; C ₄ H ₁₁ NO ₂ ; [111-42-2] (3) 1-Methyl-2-pyrrolidinone or N-methylpyrrolidone; C ₅ H ₉ NO; [872-50-4]		Murrieta-Guevara, F.; Rodriguez, T. A. <i>J. Chem. Eng. Data</i> <u>1984</u> , <i>29</i> , 456 - 60.			
VARIABLES:		PREPARED BY:			
$T/K = 298.2$ $p_1/\text{MPa} = 0.0273 - 0.1981$		H. L. Clever			
EXPERIMENTAL VALUES:					
Temperature		Pressure		Diethanol-amine	Methane
$t/^\circ\text{C}$	T/K	p_1/atm	p_1/MPa	wt %	$10^3 x_1$
25.0	298.2	0.269	0.0273	0	0.6
		0.469	0.0475		1.0
		0.687	0.0696		1.3
		0.937	0.0949		1.7
		1.213	0.1229		2.0
		1.578	0.1599		2.4
		1.942	0.1968		2.7
25.0	298.2	0.270	0.0274	14.3	0.6
		0.468	0.0474		1.0
		0.721	0.0732		1.4
		0.937	0.0949		1.7
		1.238	0.1254		2.2
		1.582	0.1603		2.8
		1.955	0.1981		3.2
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:		
<p>The apparatus was a liquid-vapor equilibrium system with circulation of the gas phase. The 170 cm³ equilibrium cell was made of Pyrex glass with a gas inlet tube ending in a fritted glass disk at the bottom of the cell.</p> <p>The solvent was placed in the cell and weighed. The degassing was carried out <i>in situ</i> by freezing-evacuating-thawing cycles.</p> <p>A known amount of solute gas was added to the system already at thermal equilibrium and the vapor phase circulated by a magnetic pump. Equilibrium pressure was attained within 30 minutes. The equilibrium pressure was measured with a calibrated stainless steel pressure transducer used in the absolute fashion.</p> <p>Purification of the solvents is described in (ref 1).</p>			(1) Methane. Matheson Co., Inc. Stated to be 99.99 mol %. (2) Diethanolamine. J. T. Baker Co. 98.5 mol %. (3) N-Methylpyrrolidone. Matheson, Coleman and Bell. 98 mol %. Both solvents fractionated and dried. GLC purity then better than 99.5 mol %. See (ref 1).		
			ESTIMATED ERROR:		
			$\delta T/K = \pm 0.1$ $\delta p_1/p_1 = \pm 0.001$ $\delta x_1/x_1 = \pm 0.10$ (compiler)		
			REFERENCES:		
			1. Murrieta-Guevara, F.; Rodriguez, A.T. <i>J. Chem. Eng. Data</i> <u>1984</u> , <i>29</i> , 204.		

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<p>VARIABLES:</p> <p>Composition of solvent</p>	<p>PREPARED BY:</p> <p>C. L. Young.</p>								
<p>EXPERIMENTAL VALUES:</p> <table border="1" data-bbox="216 541 1307 752"> <thead> <tr> <th>T/K</th> <th>Henry's constant /MPa</th> <th>Ostwald coefficient, L</th> <th>Mole fraction of methane x 10⁴</th> </tr> </thead> <tbody> <tr> <td>298.15</td> <td>39.060</td> <td>0.0349</td> <td>0.2594</td> </tr> </tbody> </table> <p>^a Calculated by compiler for a partial pressure of 1 atmosphere</p>		T/K	Henry's constant /MPa	Ostwald coefficient, L	Mole fraction of methane x 10 ⁴	298.15	39.060	0.0349	0.2594
T/K	Henry's constant /MPa	Ostwald coefficient, L	Mole fraction of methane x 10 ⁴						
298.15	39.060	0.0349	0.2594						
<p>AUXILIARY INFORMATION</p>									
<p>METHOD APPARATUS/PROCEDURE:</p> <p>Precision volumetric apparatus described in detail in ref. (1). Pressure measured with mercury manometer.</p>	<p>SOURCE AND PURITY OF MATERIALS:</p> <p>1. Purity better than 99 volume per cent. 2. Merck sample, dried with molecular sieve 4 X. Final water content less than 0.01 mass per cent, purity 99.9 mole per cent by GC.</p> <p>ESTIMATED ERROR:</p> <p>$\partial T/K = \pm 0.01$; $\partial P/Pa = \pm 50$; $\partial x = \pm 0.005$</p> <p>REFERENCES:</p> <p>1. Zeck, S.; Dissertation, TU Berlin, 1985.</p>								

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) N-Methylformamide; C ₂ H ₅ NO; [123-39-7]		ORIGINAL MEASUREMENTS: de Ligny, C. L.; Denessen, H.J.M. Alfenaar, M. <i>Recl. Trav. Chim. Pays-Bas</i> <u>1971</u> , 90, 1265-1284.		
VARIABLES: T/K : 298.15 p_1/kPa : 101.325 (1 atm)		PREPARED BY: H. L. Clever		
EXPERIMENTAL VALUES:				
T/K	Molality $10^3 m_1/mol\ kg^{-1}$	Mol Fraction $10^4 x_1$	Bunsen Coefficient $\alpha/cm^3\ (STP)\ cm^{-3}\ atm^{-1}$	Ostwald Coefficient $L/cm^3\ cm^{-3}$
298.15	8.32 ± 0.06	4.92	0.186	0.204
<p>The mole fraction, Bunsen and Ostwald coefficients values were calculated by the compiler assuming ideal gas behavior.</p>				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: Details of the method are given in an earlier paper (1). The solvent is saturated with gas in a special two cell vessel in which the gas is pre-saturated with solvent vapor. A one cm ³ sample of the gas-saturated liquid is taken and injected into a Becker gas chromatograph equipped with a stripping vessel mounted in front of a 15% carbowax-on-celite 1 m column. The carrier gas is oxygen free helium. A katharometer detector is used.		SOURCE AND PURITY OF MATERIALS: (1) Methane. Baker Chemical Co. Ultra pure. (2) N-Methylformamide. Source not given. Purified by the method of Verhoek (2). Water content < 0.02% (Fisher titration), no other impurities detected by GLC.		
		ESTIMATED ERROR: $\delta m_1/m_1 = 0.01$		
		REFERENCES: 1. de Ligny, C.L.; van der Veen, N.G. <i>Recl. Trav. Chim. Pays-Bas</i> <u>1971</u> , 90, 984. 2. Verhoek, F. H. <i>J. Am. Chem. Soc.</i> <u>1936</u> , 58, 2577.		

Temperature		Pressure	Absorption Coefficient	Bunsen Coefficient
$t/^{\circ}\text{C}$	T/K	p_1/mmHg	$/\text{cm}^3 (\text{STP}) \text{cm}^{-3}$	$\alpha/\text{cm}^3 (\text{STP}) \text{cm}^{-3} \text{atm}^{-1}$
1	274.15	200	0.10	0.38
		400	0.21	0.40
		600	0.32	0.405
		760	0.42	0.42
		900	0.49	0.41
5	278.15	200	0.08	0.30
		400	0.19	0.36
		600	0.31	0.39
		760	0.39	0.39
		900	0.46	0.39
20	293.15	200	0.07	0.27
		400	0.16	0.30
		600	0.25	0.32
		760	0.31	0.31
		900	0.38	0.32
40	313.15	200	0.04	0.15
		400	0.09	0.17
		600	0.16	0.20
		760	0.21	0.21
		900	0.25	0.21

The compiler calculated the Bunsen coefficients.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

The apparatus consists of an absorption flask in a thermostated bath and an water-jacketted buret.

SOURCE AND PURITY OF MATERIALS:

- (1) Methane. No information.
- (2) *N,N*-Dimethylformamide. Distilled, dried. Refractive index $n_D^{25} = 1.4265$, density $\rho_4^{25} = 0.9451 \text{ g cm}^{-3}$. The water content was 0.2 wt percent.

ESTIMATED ERROR:

$\delta\alpha/\alpha = \pm 0.05$ (compiler)
At pressures 600 mmHg and above.

REFERENCES:

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) 1,1,2,2,3,3,4,4,4-Nonfluoro-N, N-bis(nonafluorobutyl)-1-butanamine or perfluorotributylamine; (C ₄ F ₉) ₃ N; [311-89-7]		ORIGINAL MEASUREMENTS: Powell, R. J. <i>J. Chem. Eng. Data</i> <u>1972</u> , <i>17</i> , 302 - 304.		
VARIABLES: T/K: 288.15 - 318.15 p ₁ /kPa: 101.325 (1 atm)		PREPARED BY: P. L. Long H. L. Clever		
EXPERIMENTAL VALUES:				
T/K	Mol Fraction 10 ⁴ x ₁	Bunsen Coefficient α/cm ³ (STP) cm ⁻³ atm ⁻¹	Ostwald Coefficient L/cm ³ cm ⁻³	N = R $\frac{\Delta \log x_1}{\Delta \log T}$
298.15	68.83	0.435	0.475	-1.88
The Bunsen and Ostwald coefficients were calculated by the compiler. The author states that the solubility measurements were made over the temperature interval of about 288.15 to 318.15 K, but only the solubility value at 298.15 K was given in the paper. The slope, N=R(Δlog x ₁ /Δlog T), was given. Smoothed Data: For use between 288.15 and 303.15 K The smoothed data were calculated by the compiler from the slope, N, in the form $\log x_1 = \log (68.83 \times 10^{-4}) - (1.88/R) \log (T/298.15)$ with R = 1.9872 cal K ⁻¹ mol ⁻¹ .				
T/K	Mol Fraction 10 ³ x ₁			
288.15	7.109			
293.15	6.994			
298.15	6.883			
303.15	6.776			
308.15	6.671			
313.15	6.571			
318.15	6.473			
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: The apparatus is the Dymond and Hildebrand (1) apparatus which uses an all glass pumping system to spray slugs of degassed solvent into the gas. The amount of gas dissolved is calculated from the initial and final pressures. The solvent is degassed by freezing, pumping, and followed by boiling under reduced pressure.		SOURCE AND PURITY OF MATERIALS: (1) Methane. Source not given. Stated to be manufacturer's research grade, dried over CaCl ₂ before use. (2) 1,1,2,2,3,3,4,4,4-Nonfluoro-N, N-bis(nonafluorobutyl)-1-butanamine. Minnesota Mining & Manufacturing Co. Distilled, used portion boiling between 447.85-448.64 K which gave a single GLC peak. ρ _{298.15} = 1.880 g cm ⁻³ .		
		ESTIMATED ERROR: $\delta x_1/x_1 = \pm 0.002$ $\delta N/\text{cal K}^{-1} \text{ mol}^{-1} = \pm 0.1$		
		REFERENCES: 1. Dymond, J. H.; Hildebrand, J. H. <i>Ind. Eng. Chem. Fundam.</i> <u>1967</u> , <i>6</i> , 130.		

<p>COMPONENTS:</p> <p>1. Methane; CH₄; [74-82-8]</p> <p>2. Nitrobenzene; C₆H₅NO₂; [98-95-3]</p>	<p>ORIGINAL MEASUREMENTS:</p> <p>Lenoir, J-Y.; Renault, P.; Renon, H. <i>J. Chem. Eng. Data</i>, <u>1971</u>, 16, 340-2.</p>						
<p>VARIABLES:</p>	<p>PREPARED BY:</p> <p>C. L. Young</p>						
<p>EXPERIMENTAL VALUES:</p> <table border="1" data-bbox="308 602 1214 746"> <thead> <tr> <th>T/K</th> <th>Henry's constant $H_{\text{CH}_4}/\text{atm}$</th> <th>Mole fraction at 1 atm* x_{CH_4}</th> </tr> </thead> <tbody> <tr> <td>298.2</td> <td>940</td> <td>0.00106</td> </tr> </tbody> </table> <p>* Calculated by compiler assuming a linear function of P_{CH_4} vs x_{CH_4}, i.e., $x_{\text{CH}_4}(1 \text{ atm}) = 1/H_{\text{CH}_4}$.</p>		T/K	Henry's constant $H_{\text{CH}_4}/\text{atm}$	Mole fraction at 1 atm* x_{CH_4}	298.2	940	0.00106
T/K	Henry's constant $H_{\text{CH}_4}/\text{atm}$	Mole fraction at 1 atm* x_{CH_4}					
298.2	940	0.00106					
<p>AUXILIARY INFORMATION</p>							
<p>METHOD/APPARATUS/PROCEDURE:</p> <p>A conventional gas-liquid chromatographic 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.</p>	<p>SOURCE AND PURITY OF MATERIALS:</p> <p>(1) L'Air Liquide sample, minimum purity 99.9 mole per cent. (2) Touzart and Matignon or Serlabo sample, purity 99 mole per cent.</p> <p>ESTIMATED ERROR:</p> <p>$\delta T/K = \pm 0.1$; $\delta H/\text{atm} = \pm 6\%$ (estimated by compiler).</p> <p>REFERENCES:</p>						

COMPONENTS: (1) Methane; CH ₄ ; [74-82-8] (2) Ethylamine, nitrate or ethyl ammonium nitrate; C ₂ H ₇ N.HNO ₃ ; [22113-86-6]	ORIGINAL MEASUREMENTS: Evans, D. F.; Chen, S.-H.; Schriver, G. W.; Arnett, E. M. <i>J. Am. Chem. Soc.</i> <u>1981</u> , <i>103</i> , 481-2.								
VARIABLES: $T/K = 288.15 - 313.15$	PREPARED BY: H. L. Clever								
EXPERIMENTAL VALUES: <table border="1" data-bbox="288 533 915 666"> <thead> <tr> <th>T/K^a</th> <th>H/atm</th> <th>H/MPa^a</th> <th>$10^4 x_1^a$</th> </tr> </thead> <tbody> <tr> <td>298.15</td> <td>4750 ± 110</td> <td>480 ± 10</td> <td>2.11</td> </tr> </tbody> </table> <p>^a Calculated by compiler.</p> <p>The authors state that measurements were made at 15, 25, and 40 °C, but only the 25 °C value is given in the paper.</p> <p>Henry's constant is defined as $H/atm = (p_1/atm)/x_1$.</p> <p>The authors give the following values for the thermodynamic changes for transfer of one mole of methane from the gas at 0.101325 MPa to the infinitely dilute solution:</p> $\Delta G_1^0/kcal\ mol^{-1} = 5.024 \pm 0.073,$ $\Delta H_1^0/kcal\ mol^{-1} = -0.057 \pm 0.058, \text{ and}$ $\Delta S_1^0/cal\ K^{-1}mol^{-1} = -17.04 \pm 0.15.$ <p>The Henry's constant given in the paper is apparently the experimental value at 298.15 K. Values of Henry's constant calculated by the compiler from the thermodynamic information above at 288.15, 298.15, and 313.15 K are 4794, 4815, and 4833 atm, respectively. The Henry constant increases 0.8 percent and the mole fraction solubility at 0.101325 MPa decreases 0.8 percent as the temperature changes from 288.15 to 313.15 K.</p>		T/K^a	H/atm	H/MPa^a	$10^4 x_1^a$	298.15	4750 ± 110	480 ± 10	2.11
T/K^a	H/atm	H/MPa^a	$10^4 x_1^a$						
298.15	4750 ± 110	480 ± 10	2.11						
AUXILIARY INFORMATION									
METHOD/APPARATUS/PROCEDURE: <p>The solubility measurement was carried out in an apparatus described earlier for vapor pressure measurement (ref 1).</p> <p>The apparatus consists of an equilibration vessel, a fused quartz pressure gage, and a vacuum system.</p> <p>The solvent is degassed by a freeze thaw cycle in the equilibration vessel. Known amounts of gas were added to the system and the system was stirred for at least an hour after constant pressure was achieved.</p> <p>The vapor pressure of the solvent was unmeasurably low in the apparatus used.</p>	SOURCE AND PURITY OF MATERIALS: (1) Methane. Source not given. Stated to be > 99.9 percent. (2) Ethyl ammonium nitrate. No information. In (ref 2) it is stated the substance is prepared from ethylamine and nitric acid, concentrated and dried on a rotary evaporator, and had a melting point about 14 °C. ESTIMATED ERROR: $\delta T/K = \pm 0.001$ $\delta p_1/mmHg = \pm 0.1$ $\delta H/H = \pm 0.03$ REFERENCES: 1. Arnett, E. M.; Chawla, B. <i>J. Am. Chem. Soc.</i> <u>1979</u> , <i>101</i> , 7141. 2. Evans, D.F.; Yamauchi, A.; Roman, R.; Casassa, E.Z. <i>J. Coll. Interface Sci.</i> <u>1982</u> , <i>88</i> , 89.								