

COMPONENTS:			EVALUATOR:		
(1) Propane; C ₃ H ₈ ; [74-98-6]			Rubin Battino		
(2) Water; H ₂ O; [7732-18-5]			Department of Chemistry		
			Wright State University		
			Dayton, Ohio 45435 U.S.A.		
			November, 1983		
CRITICAL EVALUATION:					
<p>The solubility of <i>propane</i> in water has been reported in thirteen papers (1-13). The data from all of these papers were converted to mole fraction solubilities at 0.101325 MPa partial pressure of gas and fitted to both of the following equations:</p>					
$\ln x_1 = A_0 + A_1/T + A_2 \ln T + A_3 T + A_4 T^2 \quad \text{where } T = T/100 \text{ K.} \quad (1)$					
$\ln x_1 = B_0 + B_1/(T/K) + B_2/(T/K)^2 + B_3/(T/K)^3 + B_4/(T/K)^4 \quad (2)$					
<p>Three coefficients were found to be quite adequate to describe the temperature dependence for both equations. Equation (1) was selected for this evaluation. The fitting process was repeated several times deleting those points which differed from the smoothed function by two standard deviations or more. On the basis of this criterion and examination of the original papers, the results of references (7-13) were not used in determining the final smoothing equation. The two lowest temperature points from reference (1) were also discarded. The final smoothing equation for the temperature range 273-347 K is:</p>					
$\ln x_1 = -102.044 + 144.345/T + 39.4740 \ln T \quad (3)$					
<p>The standard deviation for Equation 3 is 0.012 in $\ln x_1$, or about 2% in x_1. For this equation 10 points from reference (1) were used, twelve from (2), two from (3), three from (4), one from (5), and two from reference (6). Smoothed mole fractions at 0.101325 MPa partial pressure of gas and Ostwald coefficients at 5 K intervals are given in Table 1.</p>					
<p>The evaluator has made solubility measurements for this system in the temperature range from 278 to 323 K to a precision (standard deviation) for x_1 of $\pm 0.21\%$. Comparison of his unpublished results with the smoothed values in Table 1 show an agreement within 0.8% in the range 293 K to 323 K and also to values extrapolated to as high as 373 K. His values are, however, 2 to 6% higher in the temperature range from 273 to 288 K. He suggests caution in using the values in Table 1 for temperatures below 288 K.</p>					
<p>Table 2 gives the thermodynamic functions for the transfer of the gas from the vapor phase at 0.101325 MPa partial pressure of gas to the (hypothetical) solution of unit mole fraction. With a three-term fitting equation $\Delta C_{p,1}^\circ$ is independent of temperature, with the value 328 J mol⁻¹ K⁻¹. Extrapolated values of ΔH_1° becomes positive at about 365 K.</p>					
Table 1. The solubility of propane in water at 0.101325 MPa partial pressure of gas.					
T/K	10 ⁵ x ₁	L	T/K	10 ⁵ x ₁	L
273.15	7.236	0.09001	313.15	1.865	0.02640
278.15	5.727	0.07255	318.15	1.689	0.02424
283.15	4.627	0.05967	323.15	1.549	0.02253
288.15	3.813	0.05000	328.15	1.438	0.02119
293.15	3.200	0.04265	333.15	1.350	0.02014
298.15	2.732	0.03699	338.15	1.281	0.01935
303.15	2.370	0.03258	343.15	1.227	0.01876
308.15	2.088	0.02913	348.15	1.188	0.01836

COMPONENTS:		EVALUATOR:	
(1) Propane; C ₃ H ₈ ; [74-98-6]		Rubin Battino	
(2) Water; H ₂ O; [7732-18-5]		Department of Chemistry	
		Wright State University	
		Dayton, Ohio 45435 U.S.A.	
		November, 1983	
CRITICAL EVALUATION: ...continued			
Table 2. Thermodynamic properties for the solubility of propane in water.			
T/K	$\Delta\bar{G}_1^\circ /$ kJ mol ⁻¹	$\Delta\bar{H}_1^\circ /$ kJ mol ⁻¹	$\Delta\bar{S}_1^\circ /$ J mol ⁻¹ K ⁻¹
273.15	21.65	-30.37	-190.4
278.15	22.59	-28.72	-184.5
283.15	23.50	-27.08	-178.6
288.15	24.38	-25.44	-172.9
293.15	25.23	-23.80	-167.2
298.15	26.05	-22.16	-161.7
303.15	26.84	-20.52	-156.2
308.15	27.61	-18.88	-150.9
313.15	28.35	-17.24	-145.6
318.15	29.07	-15.60	-140.4
323.15	29.76	-13.96	-135.3
328.15	30.42	-12.31	-130.2
333.15	31.06	-10.67	-125.3
338.15	31.67	- 9.03	-120.4
343.15	32.26	- 7.39	-115.6
348.15	32.83	- 5.75	-110.8
<u>References</u>			
1. Kresheck, G.C.; Schneider, H.; Scheraga, H.A., <i>J. Phys. Chem.</i> <u>1965</u> , <i>69</i> , 3132-44.			
2. Morrison, T.J.; Billett, F., <i>J. Chem. Soc.</i> <u>1952</u> , 3819-22.			
3. Claussen, W.F.; Polglase, M.F., <i>J. Am. Chem. Soc.</i> <u>1952</u> , <i>74</i> , 4817-9.			
4. Wetlaufer, D.B.; Malik, S.K.; Stoller, L.; Coffin, R.L., <i>J. Am. Chem. Soc.</i> <u>1964</u> , <i>86</i> , 508-14.			
5. Barone, G.; Crescenzi, V.; Pispisa, B.; Quadrifoglio, F., <i>J. Macromol. Chem.</i> <u>1966</u> , <i>1</i> , 761-71.			
6. Namiot, A., Yu. <i>Zh. Strukt. Khim.</i> <u>1961</u> , <i>2</i> , 408-17; <i>J. Struct. Chem. (Engl. Transl.)</i> <u>1961</u> , <i>2</i> , 381-9.			
7. Wen, W.-Y.; Hung, J.H., <i>J. Phys. Chem.</i> <u>1970</u> , <i>74</i> , 170-80			
8. McAuliffe, C., <i>J. Phys. Chem.</i> <u>1966</u> , <i>70</i> , 1267-75; <i>Nature</i> <u>1963</u> , <i>200</i> 1092-3.			
9. Wishnia, A., <i>J. Phys. Chem.</i> <u>1963</u> , <i>67</i> , 2079-82.			
10. Rudakov, E.S.; Lutsyk, A.I., <i>Zh. Fiz. Khim.</i> <u>1979</u> , <i>53</i> , 1298-1300; <i>Russ. J. Phys. Chem.</i> <u>1979</u> , <i>53</i> , 731-3.			
11. Lebeau, P., <i>Compt. Rend.</i> <u>1905</u> , <i>140</i> , 1454-6 and 1572. <i>Bull. Soc. Chim.</i> [3] <u>1905</u> , <i>33</i> , 1137-9.			
12. Umamo, S.; Nakano, Y., <i>Kogyo Kagaku Zasshi</i> <u>1958</u> , <i>61</i> , 536-44.			
13. Yano, T.; Suetaka, T.; Umehara, T.; Horiuchi, A. <i>Kagaku Kogaku</i> <u>1974</u> , <i>38</i> , 320-3.			

COMPONENTS:		ORIGINAL MEASUREMENTS:			
(1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		Wen, W.-Y.; Hung, J.H. <i>J. Phys. Chem.</i> <u>1970</u> , <i>74</i> , 170-180.			
VARIABLES:		PREPARED BY:			
<i>T</i> /K: 278.15-308.15 <i>P</i> /kPa: 101.325 (1 atm)		W. Hayduk			
EXPERIMENTAL VALUES:					
<i>t</i> /°C	<i>T</i> /K	Solubility ¹ <i>s</i> /cm ³ (STP) kg ⁻¹	Mole Fraction ² /10 ⁵ <i>x</i> ₁	Ostwald Coefficient ² L/cm ³ cm ⁻³	Bunsen Coefficient ² <i>α</i> /cm ³ (STP) cm ⁻³
5	278.15	69.57 ± 0.11	5.709	0.0709	0.0695
15	288.15	45.75 ± 0.06	3.645	0.0482	0.0455
25	298.15	32.31 ± 0.08	2.640	0.0352	0.0320
35	308.15	23.91 ± 0.07	1.950	0.0268	0.0208
¹ Original data. ² Calculated by compiler assuming that authors considered gas to be ideal, and using real gas molar volumes: $x_1 = s T (18.016) [273.15(1000)v_t]^{-1}; v_t/\text{cm}^3\text{mol}^{-1}\text{ at } T.$					
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:		
<p>The apparatus was similar to that described by Ben-Naim and Baer (1). Teflon needle valves were used in place of stopcocks.</p> <p>The apparatus consists of three main parts, a dissolution cell of 300 to 600 cm³ capacity, a gas volume measuring column, and a manometer.</p> <p>The solvent is degassed in the dissolution cell, the gas is introduced and dissolved while the liquid is kept stirred by a magnetic stirrer immersed in the water bath. Dissolution of the gas results in the change in the height of a column of mercury which is measured by a cathetometer.</p>			<ol style="list-style-type: none"> Matheson Co. Stated to be better than 99.9 per cent pure. Distilled from an all-Pyrex apparatus. Specific conductivity 1.5 x 10⁻⁶ (ohm cm)⁻¹. 		
			ESTIMATED ERROR:		
			$\delta T/K = \pm 0.005$ $\delta s_1/s_1 = \pm 0.003$		
			REFERENCES:		
			<ol style="list-style-type: none"> Ben-Naim, A.; Baer, S. <i>Trans. Faraday Soc.</i> <u>1963</u>, <i>59</i>, 2735. 		

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		Kresheck, G. C.; Schneider, H.; Scheraga, H. A. <i>J. Phys. Chem.</i> <u>1965</u> , <i>69</i> , 3132-44.		
VARIABLES: $T/K = 274.15 - 328.15$ $p_1/kPa = 101.325$		PREPARED BY: H. L. Clever		
EXPERIMENTAL VALUES:				
Temperature		Mol Fraction ^a	Molarity	Molality
$t/^\circ\text{C}$	T/K	$10^5 x_1$	$10^3 c_1/\text{mol dm}^{-3}$	$10^3 m_1/\text{mol kg}^{-1}$
1	274.15	7.215, 7.242		
4	277.15	6.254, 6.216		
	277.15 ^b	6.24 ± 0.02	3.46 ± 0.01	3.46 ± 0.01
10	283.15	4.729, 4.726		
15	288.15	3.861, 3.860		
20	293.15	3.234, 3.219		
25	298.15	2.748, 2.732		
	298.15 ^b	2.74 ± 0.01	1.52 ± 0.01	1.53 ± 0.01
30	303.15	2.362, 2.362		
35	308.15	2.086, 2.073		
40	313.15	1.886		
45	318.15	1.676, 1.668		
50	323.15	1.526, 1.533		
	323.15 ^b	1.53 ± 0.01	0.84 ± 0.01	0.85 ± 0.01
55	328.15	1.424, 1.409		
^a The experimental values of the mole fraction solubility were provided by H. Schneider. The last figure is not significant. ^b Smoothed values from the original paper.				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:		
<p>A known quantity of the gas was introduced from a gas buret into a calibrated volume which contained a weighed quantity of water. The water was stirred until equilibrium was attained (3 to 4 hours). The amount of gas in the vapor phase at equilibrium was determined from the propane partial pressure and volume of the vapor space. The volume was the difference in the empty vessel volume and the water volume. The amount of dissolved gas was obtained by difference.</p> <p>Handbook values of water density were used. The gas volume was corrected for nonideality by use of a compressibility factor (1). At each temperature the solubility was measured at two partial pressures which ranged from 0.5 to 0.7 atm at 4 °C to .2 to 1.6 atm at 50 °C. All solubility data were normalized to a partial pressure of 1 atm.</p>		<p>(1) Propane. Matheson Co., Inc. 99.92 mole per cent.</p> <p>(2) Water. Laboratory distilled water was deionized prior to use.</p>		
		ESTIMATED ERROR:		
		$\delta x_1/x_1 = \pm 0.005$		
		REFERENCES:		
		<p>1. Silberberg, I. H.; Kuo, P. K.; McKetta, J. J. <i>Petrol. Engr.</i> <u>1954</u>, <i>24</i>, C9.</p>		

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		Umano, S.; Nakano, Y. <i>Kogyo Kagaku Zasshi</i> 1958, 61, 536-44.		
VARIABLES:		PREPARED BY:		
$T/K = 273.2 - 293.2$ $p_1/kPa = 8.19 - 100.53$		H. L. Clever		
EXPERIMENTAL VALUES:				
Temperature		Total Pressure	Propane Partial	Mol Fraction
$t/^{\circ}C$	T/K	p/atm	Pressure, p_1/atm	$10^5 x_1$
0	273.2	0.1035	0.99747	0.4410
		0.3009	0.2948	1.5795
		0.4982	0.4922	3.1777
		0.6956	0.6896	4.6873
		0.9982	0.9922	6.7939
5	278.2	0.1048	0.09601	0.4755
		0.3022	0.2936	1.5059
		0.5008	0.4922	2.5663
		0.6969	0.6883	3.5123
		1.0008	0.9922	5.2597
10	283.2	0.1090	0.09690	0.3078
		0.3064	0.2943	1.1979
		0.5038	0.4916	2.0493
		0.7011	0.6880	3.0487
		1.0037	0.9916	4.2204
15	288.2	0.1060	0.08914	0.2686
		0.3033	0.2865	0.9077
		0.5007	0.4839	1.6691
		0.6974	0.6805	2.3853
		1.0000	0.9832	3.4902
20	293.2	0.1039	0.08087	0.1309
		0.3013	0.2782	0.8018
		0.4981	0.4751	1.3908
		0.6955	0.6724	1.9943
		0.9981	0.9750	3.0749
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:		
<p>The apparatus consists of a gas reservoir, a manometer-buret system, a thermostated mixing cell, and a solvent reservoir. The apparatus is constructed of glass and vinyl chloride tubing. A gasoline insoluble type stopcock grease is used.</p> <p>The apparatus is evacuated, then filled with the solute gas to condition the surface, vinyl chloride tubing, and stopcock grease. The solvent is degassed by boiling under reduced pressure in the solvent reservoir. The solvent is transferred to the evacuated mixing cell, the gas added to the pressure of the measurement. The mixing cell is shaken until equilibrium is attained.</p>		<p>(1) Propane. Oakford Gas and Appliance Co. Stated to be greater than 99 mol percent purity. The impurity is higher molecular weight hydrocarbons.</p> <p>(2) Water.</p>		
		ESTIMATED ERROR:		
		REFERENCES:		

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		Barone, G.; Crescenzi, V.; Pispisa, B.; Quadrifoglio, F. <i>J. Macromol. Chem.</i> <u>1966</u> , <i>1</i> , 761-771.		
VARIABLES:		PREPARED BY:		
<i>T</i> /K: 298.15 <i>P</i> /kPa: 101.325		W. Hayduk		
EXPERIMENTAL VALUES:				
<i>T</i> /K	Solubility ¹ s/m mol dm ⁻³	Mole Fraction ² /10 ⁵ <i>x</i> ₁	Ostwald Coefficient ² L/cm ³ cm ⁻³	Bunsen Coefficient ² α/cm ³ (STP)cm ⁻³ atm ⁻¹
298.15	1.50	2.71	0.0361	0.0329
<p>¹Original data reported as millimoles of gas per liter water at gas partial pressure of 101.325 kPa.</p> <p>²Calculated by compiler using a real gas molar volume.</p>				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:		
<p>A method utilizing a gas chromatographic analysis of saturated water was used. A volume of 4 cm³ of water was saturated at constant temperature in a 20-cm³ gas-washing bottle by means of a sintered glass bubbler. The top was sealed with a rubber stopper through which a hypodermic needle was inserted as a vent. Equilibration was continued for 1 hr. Samples of 0.20 cm³ were withdrawn by syringe and passed through a stripper where they were contacted with carrier gas, then through a CaCl₂ tube and finally to a gas chromatograph for analysis.</p>		<p>1. Riviera, Turin, Italy. Specified as chromatographically pure.</p> <p>2. Not specified.</p>		
		ESTIMATED ERROR:		
		<p><i>T</i>/K = 0.02 δ<i>s</i>/<i>s</i> = 0.04 (authors)</p>		
		REFERENCES:		

COMPONENTS:		ORIGINAL MEASUREMENTS:			
(1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		Morrison, T.J.; Billett, F. <i>J. Chem. Soc.</i> <u>1952</u> , 3819-3822.			
VARIABLES:		PREPARED BY:			
T/K: 285.45-347.25 P/kPa: 101.325		W. Hayduk			
EXPERIMENTAL VALUES:					
t/°C	T/K	Solubility ¹ s/cm ³ (STP) kg ⁻¹	Mole Fraction ² /10 ⁵ x ₁	Ostwald Coefficient ² L/cm ³ cm ⁻³	Bunsen Coefficient ² α/cm ³ (STP) cm ⁻³
12.3	285.45	50.70	4.15	0.0529	0.0505
15.5	288.65	45.39	3.72	0.0479	0.0452
21.5	294.65	37.07	3.03	0.0399	0.0368
22.8	295.95	35.65	2.91	0.0385	0.0354
25.5	298.65	32.58	2.66	0.0355	0.0323
26.0	299.15	32.21	2.63	0.0352	0.0319
31.5	304.65	28.25	2.31	0.0314	0.0279
40.3	313.45	22.86	1.863	0.0260	0.0225
49.0	322.15	19.50	1.587	0.0227	0.0191
59.0	332.15	16.94	1.377	0.0203	0.0165
64.5	337.65	16.03	1.301	0.0194	0.0155
74.1	347.25	14.55	1.181	0.0180	0.0140
<p>¹Original data expressed as cm³ (STP) per 1000 g water at total pressure of 101.325 kPa (1 atm). Smoothing equation given by authors (ref. 1 below): $\log_{10} s = -99.629 + 5445/(T/K) + 33.50 \log_{10} (T/K)$.</p> <p>²Calculated by compiler assuming that authors considered gas to be ideal, and using real gas molar volumes: $x_1 = sT(18.016)[273.15(1000)V_t]^{-1}$; $V_t/\text{cm}^3\text{mol}^{-1}$ at T.</p>					
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:		
<p>The equipment consisted of a solvent degassing system, an absorption spiral and a gas buret for measuring the gas volume. Degassed solvent was allowed to flow down the absorption spiral containing the gas, saturated with solvent vapor, at a total pressure of one atmosphere. The volume of gas absorbed was measured by means of the attached buret system. Details were previously described (2).</p>			<p>1. Prepared from Grignard reagent. Purity not specified.</p> <p>2. Degassed. No additional details given.</p>		
			ESTIMATED ERROR:		
			<p>δT/K = 0.02</p> <p>δs/s = 0.01 (compiler)</p>		
			REFERENCES:		
			<p>1. Morrison, T.J. <i>J. Chem. Soc.</i> <u>1952</u>, 3814.</p> <p>2. Morrison, T.J. <i>J. Chem. Soc.</i> <u>1948</u>, 2033.</p>		

COMPONENTS:		ORIGINAL MEASUREMENTS:		
(1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		Claussen, W.F.; Polglase, M.F. J. Am. Chem. Soc. <u>1952</u> , 74, 4817-4819.		
VARIABLES:		PREPARED BY:		
T/k: 292.95, 302.95 P/kPa: 101.325		W. Hayduk		
EXPERIMENTAL VALUES:				
$t^1/^\circ\text{C}$	T/K	Mole Fraction ² /10 ⁵ x ₁	Ostwald Coefficient ² L/cm ³ cm ⁻³	Bunsen Coefficient ¹ $\alpha/\text{cm}^3(\text{STP})\text{cm}^{-3}\text{atm}^{-1}$
19.8	292.95	3.25	0.0425	0.0395, 0.0395, 0.0397 0.0392, 0.0394, 0.0393 (0.03943) ³
29.8	302.95	2.38	0.0322	0.0288, 0.0289 (0.02885) ³
<p>¹Original data reported as the Bunsen coefficients.</p> <p>²Calculated by compiler using the average value of the Bunsen coefficients and real gas molar volumes.</p> <p>³Average value of Bunsen coefficients.</p>				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:		
<p>The gas solubility was determined by a micro combustion technique. It involved stripping the gas from a saturated water solution with oxygen, catalytically oxidizing the hydrocarbon and then adsorbing and weighing the carbon dioxide produced. Gas was bubbled through the water via a sintered glass disc until saturated. The train for analysis consisted of an oxygen tank, pressure regulators, mercury manometer, preheater, absorption tube containing ascarite and anhydrone, aerator, combustion tube containing copper oxide at 973 K, weighing tubes containing ascarite and anhydrone, and finally the Mariotte flask. Further details are given in the paper.</p>		<p>1. Ohio Chemical Co., specified as 99 per cent pure.</p> <p>2. Doubly distilled.</p>		
		ESTIMATED ERROR:		
		$\delta T/K = 0.1$ $\delta \alpha/\alpha = 0.01$ (estimated by compiler)		
		REFERENCES:		

COMPONENTS: (1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		ORIGINAL MEASUREMENTS: Yano, T.; Suetaka, T.; Umehara, T.; Horiuchi, A. <i>Kagaku Kogaku</i> <u>1974</u> , 38, 320-323.		
VARIABLES: T/K: 298.15 P/kPa: 101.325		PREPARED BY: W. Hayduk		
EXPERIMENTAL VALUES:				
T/K	Solubility ¹ s/mmol dm ⁻³	Mole Fraction ² /10 ⁵ x ₁	Ostwald Coefficient ² L/cm ³ cm ⁻³	Bunsen Coefficient ² α/cm ³ (STP)cm ⁻³ atm ⁻¹
298.15	1.44	2.60	0.0347	0.0316
¹ Original data reported as 10 ³ (mol) dm ⁻³ at a gas partial pressure of 101.325 kPa. ² Calculated by compiler using a real gas molar volume.				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: The method involved the measurement of the change in volume of a vapor-saturated gas in contact with stirred, initially deaerated water in an absorption flask. The pressure within the cell was adjusted to be essentially atmospheric pressure. Details are given in ref. 1.		SOURCE AND PURITY OF MATERIALS: 1. Specified minimum purity of 99.5 per cent. 2. Distilled.		
		ESTIMATED ERROR: δs/s = 0.01 (authors)		
		REFERENCES: 1. Yano, T.; Suetaka, T.; Umehara, T. <i>Nippon Kagaku Kaishi</i> <u>1972</u> , 11, 2194.		

COMPONENTS: (1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		ORIGINAL MEASUREMENTS: Wetlaufer, D.B.; Malik, S.D.; Stoller, L.; Coffin, R.L. <i>J. Am. Chem. Soc.</i> <u>1964</u> , <i>86</i> , 508-514.		
VARIABLES: T/K: 278.15-318-15 P/kPa: 101.325		PREPARED BY: W. Hayduk, C.L. Young		
EXPERIMENTAL VALUES:				
T/K	Solubility ¹ s/mmol dm ⁻³	Mole Fraction ² /10 ⁵ x ₁	Ostwald Coefficient ² L/cm ³ cm ⁻³	Bunsen Coefficient ² α/cm ³ (STP)cm ⁻³ atm ⁻¹
278.15	3.14	5.66	0.0702	0.0689
298.15	1.47	2.66	0.0354	0.0322
318.15	0.95	1.73	0.0208	0.0244
¹ Original data reported as millimoles per litre at a gas partial pressure of 101.325 kPa.				
² Calculated by compiler using real gas molar volumes.				
³ No correction was made for the amount of gas retained by the solvent during extraction, estimated by the authors to be 1-1.5 per cent; hence the results are expected to be too low by that amount.				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: A modified Van Slyke-Neill manometric blood gas apparatus, fitted with a magnetic stirrer was used. The solvent was saturated with gas; then a sample was transferred to the Van Slyke extraction chamber for gas desorption and volume measurement.		SOURCE AND PURITY OF MATERIALS: 1. Matheson Co. Instrument grade. Minimum specified purity 99.5 per cent. 2. Distilled.		
		ESTIMATED ERROR: δT/K = 0.05 δs/s = 0.02 (authors) ³		
		REFERENCES:		

COMPONENTS: (1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]	ORIGINAL MEASUREMENTS: McAuliffe, C. <i>J. Phys. Chem.</i> <u>1966</u> , <i>70</i> , 1267-1275. <i>Nature</i> , <u>1963</u> , <i>200</i> , 1092-1093.										
VARIABLES: T/K: 298.15 P/kPa: 101.325	PREPARED BY: W. Hayduk										
EXPERIMENTAL VALUES: <table border="1" data-bbox="137 490 1179 654"> <thead> <tr> <th>T/K</th> <th>Solubility¹ s/g(10⁶g water)⁻¹</th> <th>Mole Fraction² /10⁵x₁</th> <th>Ostwald Coefficient² L/cm³cm⁻³</th> <th>Bunsen Coefficient² α/cm³(STP)cm⁻³atm⁻¹</th> </tr> </thead> <tbody> <tr> <td>298.15</td> <td>62.4</td> <td>2.60</td> <td>0.0346</td> <td>0.0316</td> </tr> </tbody> </table> <p data-bbox="137 715 1179 858"> ¹Original data at 1 atm total pressure. ²Calculated by compiler correcting for vapor pressure of water. The same data appear in both sources. </p>		T/K	Solubility ¹ s/g(10 ⁶ g water) ⁻¹	Mole Fraction ² /10 ⁵ x ₁	Ostwald Coefficient ² L/cm ³ cm ⁻³	Bunsen Coefficient ² α/cm ³ (STP)cm ⁻³ atm ⁻¹	298.15	62.4	2.60	0.0346	0.0316
T/K	Solubility ¹ s/g(10 ⁶ g water) ⁻¹	Mole Fraction ² /10 ⁵ x ₁	Ostwald Coefficient ² L/cm ³ cm ⁻³	Bunsen Coefficient ² α/cm ³ (STP)cm ⁻³ atm ⁻¹							
298.15	62.4	2.60	0.0346	0.0316							
AUXILIARY INFORMATION											
METHOD/APPARATUS/PROCEDURE: The equipment consisted of a gas reservoir, contacting bottle, stripping column and a gas chromatographic analyzer. A rubber balloon maintained at essentially atmospheric pressure served as the gas reservoir which was connected to a bottle partially filled with the water solvent. Equilibrium was established by hand shaking for 5 to 10 min after which the mixture was allowed to stand for phase separation. The solubility was determined by injection of the gas-saturated water solution into a stripping column supplied with helium. The quantity of gas was determined by a gas chromatograph equipped with a hydrogen-flame ionization detector.	SOURCE AND PURITY OF MATERIALS: 1. Phillips Petroleum Co. of minimum specified purity 99.0%. 2. Distilled. ESTIMATED ERROR: $\delta T/K = 1.5$ $\delta s/s = 0.04$ (author) REFERENCES:										

COMPONENTS: (1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]	ORIGINAL MEASUREMENTS: Wishnia, A. <i>J. Phys. Chem.</i> <u>1963</u> , <i>67</i> , 2079-2082.																		
VARIABLES: T/K : 288.15-308.15 P/kPa : 101.325	PREPARED BY: W. Hayduk																		
EXPERIMENTAL VALUES:																			
<table border="1"> <thead> <tr> <th data-bbox="292 527 381 553">T/K</th> <th data-bbox="612 527 784 580">Solubility¹ $s/mMol(kg)^{-1}$</th> <th data-bbox="1005 527 1134 609">Mol Fraction¹ $/10^5 x_1$</th> </tr> </thead> <tbody> <tr> <td data-bbox="292 649 381 676">288.15</td> <td data-bbox="669 649 731 676">2.30</td> <td data-bbox="1032 649 1094 676">4.14</td> </tr> <tr> <td data-bbox="292 676 381 703">293.15</td> <td data-bbox="669 676 731 703">1.89</td> <td data-bbox="1032 676 1094 703">3.40</td> </tr> <tr> <td data-bbox="292 703 381 729">298.15</td> <td data-bbox="669 703 731 729">1.62</td> <td data-bbox="1032 703 1094 729">2.92</td> </tr> <tr> <td data-bbox="292 729 381 756">303.15</td> <td data-bbox="669 729 731 756">1.39</td> <td data-bbox="1032 729 1094 756">2.50</td> </tr> <tr> <td data-bbox="292 756 381 782">308.15</td> <td data-bbox="669 756 731 782">1.18</td> <td data-bbox="1032 756 1094 782">2.13</td> </tr> </tbody> </table>		T/K	Solubility ¹ $s/mMol(kg)^{-1}$	Mol Fraction ¹ $/10^5 x_1$	288.15	2.30	4.14	293.15	1.89	3.40	298.15	1.62	2.92	303.15	1.39	2.50	308.15	1.18	2.13
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<p>¹Values read from a graph of (log) s versus T^{-1} by compiler and calculated as mol fraction. No numerical data given. Values are s and not log s as indicated on axis.</p> <p>Solubilities of propane and butane in aqueous sodium dodecyl sulfate (SDS) solutions also given in graphical form but could not be read with sufficient accuracy to warrant listing here.</p>																			
AUXILIARY INFORMATION																			
METHOD/APPARATUS/PROCEDURE: The solubility was determined at pressures from 0.15 to 0.7 atm and extrapolated to the comparable solubility for a gas partial pressure of 1 atm. An all-glass apparatus was used which consisted of a calibrated liquid contactor, 10 cm ³ in volume and a 5-10 cm ³ gas storage tube. The water was deaerated in the contactor under vacuum. The pressure was measured with a manometer. The initial and final gas pressures and volumes, together with the compressibilities were used to compute the molal solubilities. At the sub-atmospheric pressures used, Henry's law was obeyed. The quantity of water charged was determined by weight. Details of experimental method are given in (1).	SOURCE AND PURITY OF MATERIALS: 1. Phillips Petroleum, research grade. Purity not specified. 2. Deaerated. ESTIMATED ERROR: $\delta T/K = 0.01$ (author) $\delta s/s = 0.08$ (compiler) REFERENCES: 1. Wishnia, A. <i>Proc. Natl. Acad. Sci., Biochem.</i> <u>1962</u> , <i>48</i> , 2200.																		

COMPONENTS: (1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]	ORIGINAL MEASUREMENTS: Namiot, A. Yu. <i>Zh. Strukt. Khim.</i> <u>1961</u> , 2, 408-17. * <i>J. Struct. Chem. (Engl. Transl.)</i> <u>1961</u> , 2, 381-9.														
VARIABLES: $T/K = 273, 283$ $p_1/kPa = 101.3$	PREPARED BY: H. L. Clever														
EXPERIMENTAL VALUES: <table border="1" data-bbox="323 519 1016 752"> <thead> <tr> <th colspan="2">Temperature</th> <th rowspan="2">Henry's Constant K/atm</th> <th rowspan="2">Mol Fraction at One Atm (Compiler) 10⁵x₁</th> </tr> <tr> <th>t/°C</th> <th>T/K</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>273.15</td> <td>13800</td> <td>7.25</td> </tr> <tr> <td>10</td> <td>283.15</td> <td>21400</td> <td>4.67</td> </tr> </tbody> </table> <p data-bbox="323 772 879 805">Henry's constant, K/atm = (p₁/atm) / x₁.</p>		Temperature		Henry's Constant K/atm	Mol Fraction at One Atm (Compiler) 10 ⁵ x ₁	t/°C	T/K	0	273.15	13800	7.25	10	283.15	21400	4.67
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AUXILIARY INFORMATION															
METHOD/APPARATUS/PROCEDURE: No experimental details are given. The paper does not make clear whether these are new experimental data or literature values. The paper does contain literature values of the partial molar volume of the gas in water and other thermodynamic information.	SOURCE AND PURITY OF MATERIALS: No experimental details are given. ESTIMATED ERROR: REFERENCES:														

COMPONENTS: (1) Propane; C ₃ H ₈ ; [74-98-6] (2) Water; H ₂ O; [7732-18-5]		ORIGINAL MEASUREMENTS: Rudakov, E.S.; Lutsyk, A.I. <i>Zh. Fiz. Khim.</i> , <u>1979</u> , <i>53</i> , 1298-1300. <i>Russ. J. Phys. Chem.</i> , <u>1979</u> , <i>53</i> , 731-733.		
VARIABLES: T/K = 298.15		PREPARED BY: E.S. Rudakov W. Hayduk		
EXPERIMENTAL VALUES:				
<i>T/K</i>	<i>Partition coefficient¹ k/cm³cm⁻³₁</i>	<i>Ostwald coefficient² L/cm³cm⁻³</i>	<i>Bunsen coefficient² α/cm³(STP)cm⁻³atm⁻¹</i>	<i>Mole fraction² 10⁵x₁</i>
298.15	29	0.0345	0.0314	2.58
¹ Original data ² Ostwald and Bunsen coefficients and mole fraction for 101.325 kPa calculated by compilers on basis that partition coefficient is equivalent to the inverse of the Ostwald coefficient and assuming that Henry's law applies.				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: Gas chromatographic method used to evaluate partition coefficients. Reactor containing gas and water mechanically shaken. After phase separation a measured volume of gas introduced into carrier gas for analysis. An equal volume of solution placed into a gas stripping cell for complete stripping of the propane by the carrier gas. The ratio of areas under the propane peaks used to determine the solubility. Actual equilibrium pressure not specified.		SOURCE AND PURITY OF MATERIALS: Sources and purities not specified.		
		ESTIMATED ERROR: $\delta k/k = 0.10$ (authors)		
		REFERENCES:		

COMPONENTS: (1) Propane; C_3H_8 ; [74-98-6] (2) Water, Benzene, Ethanol, Diethylether, Chloroform, Turpentine	ORIGINAL MEASUREMENTS: Lebeau, P. <i>Compt. Rend.</i> <u>1905</u> , 140, 1454-6 and 1572. <i>Bull. Soc. Chim.</i> [3] <u>1905</u> , 33, 1137-9.																																																								
VARIABLES: $T/K = 290.8 - 294.8$ $p/kPa = 100.4 - 100.9$	PREPARED BY: H. L. Clever																																																								
EXPERIMENTAL VALUES: <table border="1" data-bbox="281 521 1097 1113"> <thead> <tr> <th>Temperature</th> <th colspan="2">Pressure^a</th> <th>Solubility</th> </tr> <tr> <th><i>t</i>/°C</th> <th><i>T</i>/K</th> <th><i>p</i>/mmHg</th> <th>Volume propane/100 Volumes Solvent</th> </tr> </thead> <tbody> <tr> <td colspan="4">Water; H_2O; [7732-18-5]</td> </tr> <tr> <td>17.8</td> <td>291.0</td> <td>753</td> <td>6.5</td> </tr> <tr> <td colspan="4">Benzene; C_6H_6O; [71-43-2]</td> </tr> <tr> <td>21.5</td> <td>294.7</td> <td>757</td> <td>1452</td> </tr> <tr> <td colspan="4">Ethanol; C_2H_6O; [64-17-5]</td> </tr> <tr> <td>16.6</td> <td>290.8</td> <td>754</td> <td>790</td> </tr> <tr> <td colspan="4">1,1'-Oxybisethane or diethylether; $C_4H_{10}O$; [60-29-7]</td> </tr> <tr> <td>16.6</td> <td>290.8</td> <td>757</td> <td>926</td> </tr> <tr> <td colspan="4">Chloroform or trichloromethane; $CHCl_3$; [67-66-3]</td> </tr> <tr> <td>21.6</td> <td>294.8</td> <td>757</td> <td>1299</td> </tr> <tr> <td colspan="4">Oil of turpentine</td> </tr> <tr> <td>17.7</td> <td>290.9</td> <td>757</td> <td>1587</td> </tr> </tbody> </table> <p>^a Not clear whether this is total pressure or propane partial pressure. It is probably total pressure.</p>		Temperature	Pressure ^a		Solubility	<i>t</i> /°C	<i>T</i> /K	<i>p</i> /mmHg	Volume propane/100 Volumes Solvent	Water; H_2O ; [7732-18-5]				17.8	291.0	753	6.5	Benzene; C_6H_6O ; [71-43-2]				21.5	294.7	757	1452	Ethanol; C_2H_6O ; [64-17-5]				16.6	290.8	754	790	1,1'-Oxybisethane or diethylether; $C_4H_{10}O$; [60-29-7]				16.6	290.8	757	926	Chloroform or trichloromethane; $CHCl_3$; [67-66-3]				21.6	294.8	757	1299	Oil of turpentine				17.7	290.9	757	1587
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METHOD/APPARATUS/PROCEDURE: Details not given. The data are reported in both papers.	SOURCE AND PURITY OF MATERIALS: (1) Propane. Prepared by author from carefully purified propyl iodide by reaction with sodium in liquid ammonia. Melting point/°C = -195 Boiling point/°C = -44.5 Critical temperature/°C = 102. (2) Solvents. No information.																																																								
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