

COMPONENTS:

1. Methane; CH₄; [74-82-8]
2. Ethane; C₂H₆; [74-84-0]

EVALUATOR:

Colin L. Young,
School of Chemistry,
University of Melbourne,
Parkville, Victoria 3052,
Australia.

February 1984

EVALUATION:

Measurements on this system have recently been evaluated by Hiza, Miller and Kidnay (1). Some of the data on this system are perhaps more correctly considered as vapor-liquid equilibrium data rather than gas-liquid solubility since the gas-liquid critical temperatures of methane and ethane are 190.6 K and 305.3 K, respectively.

The data of Uehara (2) were determined using a static experimental technique. Six solubility measurements were made between 140 and 155 K at a total pressure of 10⁵ Pa. These data are rejected in the light of more recent data in which the partial pressures have been determined. The data of Ruhemann (3) and Guter, Newitt and Ruhemann (4) are not presented here. This early work appears to be in disagreement with more recent work and the experimental data show considerable scatter. These workers used a flow method and determined the solubility at 169 K, 185 K, 195 K and 273 K at a series of pressures between 10⁵ and 8.3 × 10⁶ Pa.

Michels and Nederbragt (5) made a very brief study of this system at 273 K and their data are rejected. Levitskaya (6) used a recirculating flow method to study this system at 178 K and 188 K; only three data points were given and the data are also rejected because of their limited nature.

The most extensive study of this system is that of Wichterle and Kobayashi (7) which covers the temperature range from 139 K to 200 K. Their data are believed to be accurate and are classified as recommended. Their measurements were carried out using a recirculating vapor flow apparatus. The data of Bloomer and coworkers (8) were determined using a dew-point/bubble-point apparatus over the temperature range 140 K to 300 K. This type of apparatus in general is not the most accurate for determining gas-liquid solubilities and the data are classified as tentative.

Wilson (9) and Miller and Staveley (10) investigated this system at 111 K and 116 K, respectively; their measurements are believed to be of high quality but are more correctly considered as vapor-liquid equilibrium. Therefore, these data are not considered further. The data of Kidnay and coworkers (11), (12), (13) are thought to be reliable. The apparatus used was of proven design and high purity materials were used in each study. The data of Kidnay and coworkers are in good agreement with those of Wichterle and Kobayashi (7) and are classified as recommended.

The limited data of Price and Kobayashi (14) are of moderate precision and their data at 227.95 K are classified as tentative. The limited data of Chang and Lu (15) are rejected, being superseded by the more accurate and more extensive data of Wichterle and Kobayashi (7).

The data of Hsi and Lu (16) deviate somewhat from values obtained by extrapolation of the data of Wichterle and Kobayashi (7) and the former data are classified as doubtful. The data of Skripka *et al.* (17) are in fair agreement with the data of Wichterle and Kobayashi (7) and are classified as tentative.

References

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(cont.)

COMPONENTS:

1. Methane; CH₄; [74-82-8]
2. Ethane; C₂H₆; [74-84-0]

EVALUATOR:

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February 1982

EVALUATION:

References (cont.)

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EXPERIMENTAL VALUES:				Mole fraction of methane	
T/K	T/°F	P/psia	P/MPa	in liquid, x_{CH_4}	in vapor, y_{CH_4}
149.82	-190.00	54.1	0.373	-	0.9750
159.82	-172.00	109.0	0.751	-	0.9750
168.71	-156.00	185.8	1.281	-	0.9750
177.04	-141.00	293.1	2.021	-	0.9750
183.15	-130.00	393.5	2.713	-	0.9750
192.59	-113.00	579.5	3.996	-	0.9746
		667.5	4.602	0.9746	-
209.26	-115.00	558.0	3.847	-	0.9746
		646.5	4.457	0.9746	-
188.15	-121.00	482.0	3.323	-	0.9746
		585.5	4.037	0.9746	-
183.15	-130.00	387.0	2.668	-	0.9746
		503.1	3.469	0.9746	-
169.82	-154.00	323.2	2.228	0.9746	-
161.48	-169.00	237.2	1.635	0.9746	-
150.93	-188.00	152.9	1.054	0.9746	-
138.71	-210.00	85.0	0.586	0.9746	-
194.26	-110.00	623.3	4.298	-	0.9746
		694.5	4.789	0.9746	-
195.37	-108.00	669.4	4.615	-	0.9746
		713.3	4.918	0.9746	-
213.68	-107.04	690.5	4.761	-	0.9746

(cont.)

AUXILIARY INFORMATION	
<p>METHOD/APPARATUS/PROCEDURE:</p> <p>Bubble point-dew point apparatus with glass equilibrium cell. Temperature measured with copper-constantan thermocouple. Pressure measured using a Bourdon pressure gauge. Dew point and bubble points observed visually.</p>	<p>SOURCE AND PURITY OF MATERIALS:</p> <ol style="list-style-type: none"> Phillips Petroleum Co. pure grade sample, distilled; final purity better than 99.9 mole per cent; major impurity nitrogen. Phillips Petroleum Co. sample; no impurities detected by mass spectrometry. <p>ESTIMATED ERROR:</p> <p>$\delta T/K = \pm 0.15$; $\delta P/MPa = \pm 0.03$ or less.</p> <p>REFERENCES:</p>

COMPONENTS:

- Methane; CH₄; [74-82-8]
- Ethane; C₂H₆; [74-84-0]

ORIGINAL MEASUREMENTS:

Bloomer, O. T.; Gami, D. C.;
Parent, J. D.
Inst. Gas Tech. Res. Bull. no. 22,
1953.

VARIABLES:

PREPARED BY:

C. L. Young

COMPONENTS:				ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]				Bloomer, O. T.; Gami, D. C.;	
2. Ethane; C ₂ H ₆ ; [74-84-0]				Parent, J. D.	
				<i>Inst. Gas Tech. Res. Bull. no. 22,</i>	
				<u>1953.</u>	
EXPERIMENTAL VALUES:				Mole fraction of methane	
T/K	T/°F	P/psia	P/MPa	in liquid, x_{CH_4}	in vapor, y_{CH_4}
213.68	-107.04	715.5	4.933	0.9746	-
205.37	-90.00	603.6	4.162	-	0.9250
		792.2 ^a	5.462	0.9250	-
204.82	-91.00	788.1 ^a	5.434	0.9250	-
204.26	-92.00	784.3 ^a	5.408	0.9250	-
202.59	-95.00	768.3	5.297	0.9250	-
199.82	-100.00	728.7	5.024	0.9250	-
196.48	-106.00	672.7	4.638	0.9250	-
192.04	-114.00	602.1	4.151	0.9250	-
185.93	-125.00	508.4	3.505	0.9250	-
178.71	-138.00	407.5	2.810	0.9250	-
171.48	-151.00	321.5	2.217	0.9250	-
162.04	-168.00	228.6	1.576	0.9250	-
151.48	-187.00	148.2	1.022	0.9250	-
140.43	-206.89	88.2	0.608	0.9250	-
160.93	-170.00	47.0	0.324	-	0.9250
175.37	-144.00	116.0	0.800	-	0.9250
185.37	-126.00	206.4	1.423	-	0.9250
193.15	-112.00	312.8	2.157	-	0.9250
198.71	-102.00	420.0	2.896	-	0.9250
202.59	-95.00	519.1	3.579	-	0.9250
207.04	-87.00	689.7	4.755	-	0.9250
207.37	-86.40	712.7	4.914	-	0.9250
207.34	-86.46	780.3 ^b	5.380	-	0.9250
207.07	-86.94	785.9 ^b	5.405	-	0.9250
206.26	-88.40	793.8 ^b	5.473	-	0.9250
218.71	-66.00	888.6 ^a	6.127	0.8516	-
217.59	-68.00	881.1 ^a	6.075	0.8516	-
216.48	-70.00	874.7	6.031	0.8516	-
215.37	-72.00	867.1	5.978	0.8516	-
213.71	-75.00	849.8	5.859	0.8516	-
210.93	-80.00	814.0	5.612	0.8516	-
205.37	-90.00	731.1	5.041	0.8516	-
198.71	-102.00	630.9	4.350	0.8516	-
190.93	-116.00	519.8	3.584	0.8516	-
183.15	-130.00	417.1	2.876	0.8516	-
172.04	-150.00	49.4	0.341	-	0.8516
185.93	-125.00	109.3	0.754	-	0.8516
198.71	-102.00	209.0	1.441	-	0.8516
174.26	-146.00	320.6	2.211	0.8516	-
164.26	-164.00	226.9	1.564	0.8516	-
153.15	-184.00	146.6	1.011	0.8516	-
142.04	-204.00	88.6	0.611	0.8516	-
207.04	-87.00	313.5	2.162	-	0.8516
213.15	-76.00	420.1	2.896	-	0.8516
217.04	-69.00	508.3	3.505	-	0.8516
220.37	-63.00	607.4	4.188	-	0.8516
222.59	-59.00	703.3	4.849	-	0.8516
223.43	-57.50	761.6 ^b	5.251	-	0.8516
222.87	-58.50	865.7 ^b	5.969	0.8516	-
222.04	-60.00	878.4 ^b	6.056	0.8516	-
220.93	-62.00	886.6 ^b	6.113	0.8516	-
219.82	-64.00	887.8 ^b	6.121	0.8516	-
238.71	-30.00	553.8	3.818	-	0.7000
240.93	-26.00	610.8	4.211	-	0.7000
244.26	-20.00	718.9	4.957	-	0.7000

(cont.)

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1. Methane; CH ₄ ; [74-82-8]		Bloomer, O. T.; Gami, D. C.;			
2. Ethane; C ₂ H ₆ ; [74-84-0]		Parent, J. D.			
		<i>Inst. Gas Tech. Res. Bull. no. 22,</i>			
		<u>1953.</u>			
EXPERIMENTAL VALUES:					
T/K	T/°F	P/psia	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	Mole fraction of methane in vapor, y_{CH_4}
245.93	-17.00	802.9	5.536	-	0.7000
246.32	-16.30	834.9	5.756	-	0.7000
246.32	-16.30	894.7 ^b	6.169	-	0.7000
245.37	-18.00	941.9 ^b	6.494	-	0.7000
244.26	-20.00	963.3 ^b	6.642	-	0.7000
242.04	-24.00	978.2 ^b	6.745	-	0.7000
237.04	-33.00	973.4 ^a	6.711	0.7000	-
234.82	-37.00	965.3	6.656	0.7000	-
232.04	-42.00	948.1	6.537	0.7000	-
227.59	-50.00	899.9	6.205	0.7000	-
219.26	-65.00	788.9	5.439	0.7000	-
210.93	-80.00	673.9	4.646	0.7000	-
202.59	-95.00	565.4	2.519	0.7000	-
183.15	-130.00	49.2	0.339	-	0.7000
199.82	-100.00	109.7	0.756	-	0.7000
214.82	-73.00	210.2	1.449	-	0.7000
225.93	-53.00	325.5	2.244	-	0.7000
233.15	-40.00	439.3	3.029	-	0.7000
194.26	-110.00	464.3	3.201	0.7000	-
184.26	-128.00	356.3	2.457	0.7000	-
173.71	-147.00	260.3	1.795	0.7000	-
170.21	-153.29	232.3	1.602	0.7000	-
160.19	-171.32	163.3	1.126	0.7000	-
145.47	-197.82	88.3	0.609	0.7000	-
244.26	-20.00	346.2	2.387	-	0.5002
244.26	-50.00	850.7	5.865	0.5002	-
227.59	-50.00	660.0	4.551	0.5002	-
216.48	-70.00	541.0	3.370	0.5002	-
205.37	-90.00	433.3	2.987	0.5002	-
194.26	-110.00	334.3	2.305	0.5002	-
252.59	-5.00	456.2	3.145	-	0.5002
258.15	+5.00	548.7	3.783	-	0.5002
266.43	+19.92	750.5	5.175	-	0.5002
264.71	+24.00	844.7 ^b	5.824	-	0.5002
268.62	+23.84	926.2 ^b	6.385	-	0.5002
265.98	+19.10	970.0 ^b	6.688	-	0.5002
197.04	-105.00	55.5	0.383	-	0.5002
210.93	-80.00	101.5	0.700	-	0.5002
222.04	-60.00	157.8	1.088	-	0.5002
233.15	-40.00	236.0	1.627	-	0.5002
180.37	-135.00	231.0	1.593	0.5002	-
169.26	-155.00	165.6	1.142	0.5002	-
153.73	-182.96	96.8	0.667	0.5002	-
263.15	+14.00	649.4	4.477	-	0.5002
266.48	+20.00	744.4	5.132	-	0.5002
258.15	+5.00	548.7 ^a	3.783	-	0.5002
263.15	+14.00	981.4 ^a	6.767	0.5002	-
264.26	+16.00	978.2 ^a	6.744	0.5002	-
261.48	+11.00	983.9	6.784	0.5002	-
259.26	+7.00	981.9	6.770	0.5002	-
254.84	-0.95	952.6	6.568	0.5002	-
205.37	-10.00	901.4	6.215	0.5002	-
244.26	-20.00	845.0	5.826	0.5002	-
235.93	-35.00	751.6	5.182	0.5002	-
230.37	-45.00	149.1	1.028	-	0.3002
		442.0	3.047	0.3002	-
216.48	-70.00	338.7	2.335	0.3002	-

(cont.)

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1. Methane; CH ₄ ; [74-82-8]			Bloomer, O. T.; Gami, D. C.;		
2. Ethane; C ₂ H ₆ ; [74-84-0]			Parent, J. D.		
			<i>Inst. Gas Tech. Res. Bull. no. 22,</i>		
			<u>1953.</u>		
EXPERIMENTAL VALUES:					
T/K	T/°F	P/psia	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	Mole fraction of methane in vapor, y_{CH_4}
202.59	-95.00	250.9	1.729	0.3002	-
188.71	-120.00	178.6	1.231	0.3002	-
172.40	-149.35	112.9	0.778	0.3002	-
202.59	-95.00	50.7	0.350	-	0.3002
216.48	-70.00	90.2	0.622	-	0.3002
230.37	-45.00	148.9	1.027	-	0.3002
244.26	-20.00	234.2	1.615	-	0.3002
255.37	0.00	326.9	2.254	-	0.3002
266.48	+20.00	449.1	3.096	-	0.3002
273.15	+32.00	543.4	3.747	-	0.3002
278.71	+42.00	638.3	4.401	-	0.3002
283.15	+50.00	738.4	5.091	-	0.3002
285.37	+54.00	815.4 _b	5.622	-	0.3002
285.11	+53.53	870.4 _b	6.001	0.3002	-
283.71	+51.00	888.8 _a	6.128	-	0.3002
280.93	+46.00	685.3	4.725	0.3002	-
280.23	+44.75	899.8	6.204	0.3002	-
279.09	+42.70	894.3	6.166	0.3002	-
274.55	+34.52	858.8	5.921	0.3002	-
266.48	+20.00	777.3	5.359	0.3002	-
252.59	-5.00	638.8	4.404	0.3002	-
242.04	-24.00	538.8 _b	3.715	0.3002	-
285.03	+53.39	872.3 _b	6.014	-	0.2998
284.26	+52.00	888.3 _a	6.125	0.2998	-
282.59	+49.00	898.3 _a	6.821	0.2998	-
204.26	-92.00	45.8	0.316	-	0.1507
216.48	-70.00	74.5	0.514	-	0.1507
232.04	-42.00	129.9	0.896	-	0.1507
245.93	-17.00	200.6	1.383	-	0.1507
255.37	0.00	263.5	1.817	-	0.1507
266.48	+20.00	356.2	2.456	-	0.1507
275.93	+37.00	454.9	3.136	-	0.1507
283.15	+50.00	546.6	3.769	-	0.1507
289.82	+62.00	647.5	4.464	-	0.1507
294.26	+70.00	734.0	5.061	-	0.1507
295.65	+72.50	774.0	5.337	-	0.1507
293.71	+69.00	720.1	4.965	-	0.1507
		809.3	5.580	0.1507	-
286.94	+56.83	749.6	5.168	0.1507	-
280.93	+46.00	684.9	4.722	0.1507	-
271.48	+29.00	587.6	4.051	0.1507	-
263.15	+14.00	508.1	3.503	0.1507	-
254.82	-1.00	437.9	3.019	0.1507	-
245.93	-17.00	370.6	2.555	0.1507	-
216.48	-70.00	201.6	1.390	0.1507	-
202.59	-95.00	145.2	1.001	0.1507	-
185.93	-125.00	93.9	0.647	0.1507	-
172.04	-150.00	61.9	0.427	0.1507	-
160.93	-170.00	40.6	0.280	0.1507	-
202.59	-95.00	42.4	0.292	-	0.1498
216.48	-70.00	74.5	0.514	-	0.1498
232.04	-42.00	129.7	0.894	-	0.1498
245.93	-17.00	200.4	1.382	-	0.1498
		370.6	2.555	0.1498	-
230.37	-45.00	270.9	1.868	0.1498	-
216.48	-70.00	201.2	1.387	0.1498	-

(cont.)

COMPONENTS:				ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]				Bloomer, O. T.; Gami, D. C.;	
2. Ethane; C ₂ H ₆ ; [74-84-0]				Parent, J. D.	
				<i>Inst. Gas Tech. Res. Bull. no. 22, 1953.</i>	
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T/K	T/°F	P/psia	P/MPa	in liquid, x_{CH_4}	in vapor, y_{CH_4}
202.59	-95.00	144.7	0.998	0.1498	-
289.82	+62.00	648.9	4.474	-	0.1498
294.26	+70.00	735.0	5.068	-	0.1498
295.65	+72.50	769.1	5.302	-	0.1498
295.54	+72.30	798.4 ^b	5.505	-	0.1498
295.37	+72.00	802.1 ^a	5.530	0.1498	-
294.82	+71.00	805.9 ^a	5.556	0.1498	-
293.71	+69.00	810.1	5.585	0.1498	-
292.04	+66.00	799.4	5.512	0.1498	-
287.99	+58.71	760.8	5.246	0.1498	-
208.15	-85.00	46.9	0.323	-	0.0500
222.04	-60.00	80.7	0.556	-	0.0500
235.93	-35.00	129.6	0.894	-	0.0500
249.82	-10.00	197.4	1.361	-	0.0500
263.71	+15.00	289.1	1.993	-	0.0500
273.93	+33.40	374.7	2.583	-	0.0500
284.26	+52.00	380.1	2.621	-	0.0500
293.15	+68.00	589.6	4.065	-	0.0500
299.82	+80.00	687.9	4.743	-	0.0500
296.59	+74.20	638.7	4.404	-	0.0500
296.79	+74.55	687.0	4.737	0.0500	-
289.82	+62.00	601.2	4.145	0.0500	-
282.04	+48.00	520.4	3.588	0.0500	-
272.04	+30.00	424.6	2.928	0.0500	-
260.93	+10.00	333.9	2.302	0.0500	-
247.04	-15.00	242.4	1.671	0.0500	-
230.37	-45.00	160.0	1.103	0.0500	-
210.93	-80.00	93.5	0.645	0.0500	-
188.71	-120.00	46.7	0.322	0.0500	-
302.12	+84.15	734.9	5.067	-	0.0500
		739.4 ^a	5.098	0.0500	-
301.48	+83.00	743.4	5.126	0.0500	-
300.37	+81.00	731.9	5.046	0.0500	-
298.71	+78.00	712.4	4.912	0.0500	-

^a Phase boundary disappeared.

^b Second (upper) dew point.

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8] 2. Ethane; C ₂ H ₆ ; [74-84-0]		Price, A. R.; Kobayashi, R. <i>J. Chem. Engng. Data</i> <u>1959</u> , 4, 40-52.	
VARIABLES: Temperature, pressure		PREPARED BY: C. L. Young	
EXPERIMENTAL VALUES:			
T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	Mole fraction of methane in vapor, y_{CH_4}
227.59	1.38	0.0968	0.505
	2.76	0.282	0.724
	4.14	0.438	0.800
	5.52	0.622	0.832
199.82	0.689	0.101	0.680
	1.38	0.250	0.814
	2.76	0.528	0.9165
	4.14	0.784	0.9498
172.04	0.689	0.251	0.9312
	1.38	0.561	0.970
144.26	0.689	0.833	0.9965
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
Recirculating vapor flow apparatus with modified Jerguson sight gauge for equilibrium cell. Vapor recycled with magnetic pump. Pressure measured with Bourdon pressure gauge and temperature measured with thermocouple. Details in source.		1. Phillips Petroleum Co. research grade, purity 99.5 mole per cent. 2. Phillips Petroleum Co. research grade, purity 99.9 mole per cent.	
		ESTIMATED ERROR: $\delta T/K = \pm 0.06$; $\delta P/\text{MPa} = \pm 1\%$; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 2\%$ (estimated by compiler).	
		REFERENCES:	

EXPERIMENTAL VALUES:			Dew pt. pressure			Mole fraction	
T/K (T/°C)	Bubble pt. pressure P/kg f cm ⁻²	P/MPa	P/kg f cm ⁻²	P/MPa	x _{CH₄}		
123.2 (-150)	0.005	0.0005	0.005	0.0005	0.0		
	0.11	0.0108	-	-	0.05		
	0.48	0.047	-	-	0.20		
	0.99	0.097	-	-	0.40		
	1.52	0.149	-	-	0.60		
	2.02	0.198	-	-	0.80		
	2.23	0.219	-	-	0.95		
	2.43	0.238	2.43	0.238	1.00		
	133.2 (-140)	0.02	0.002	0.02	0.002	0.0	
		0.30	0.029	-	-	0.05	
1.10		0.108	-	-	0.20		
2.06		0.202	-	-	0.40		
2.92		0.286	-	-	0.60		
3.74		0.367	-	-	0.80		
4.32		0.424	-	-	0.95		
4.51		0.442	4.51	0.442	1.00		
143.2 (-130)	0.05	0.005	0.05	0.005	0.00		
	0.50	0.049	-	-	0.05		
	1.79	0.176	-	-	0.20		
	3.43	0.336	-	-	0.40		
	4.89	0.480	-	-	0.60		
	6.24	0.612	-	-	0.80		
	7.36	0.722	-	-	0.95		
	7.67	0.752	7.67	0.752	1.00		
(cont.)							
AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE: Recirculating vapor flow apparatus fitted with magnetic stirrer. Temperature measured with platinum resistance thermometer. Liquid and gas analysed by gas chromatography. Details of apparatus in ref. (1)			SOURCE AND PURITY OF MATERIALS: 1 and 2. Purity not less than 99.9 per cent by volume.				
			ESTIMATED ERROR:				
			REFERENCES: 1. Skripka, V. G.; Barsuk, S. D.; Nikitina, I. E.; Ben'yaminovic, O. A. <i>Gazov. Prom.</i> 1964, 14, 11.				

COMPONENTS:
1. Methane; CH₄; [74-82-8]
2. Ethane; C₂H₆; [74-84-0]

ORIGINAL MEASUREMENTS:
Skripka, V. G.; Nikitina, I. E.; Zhdanovich, L. A.; Sirotin, A. G.; Benyaminovich, O. A.
Gazov. Prom.
1970, 15, 35-36.

VARIABLES:

PREPARED BY:
C. L. Young

EXPERIMENTAL VALUES:

T/K (T/°C)	Bubble pt. pressure P/kg f cm ⁻²	P/MPa	Dew pt. pressure P/kg f cm ⁻²	P/MPa	Mole fraction x _{CH₄}	
123.2 (-150)	0.005	0.0005	0.005	0.0005	0.0	
	0.11	0.0108	-	-	0.05	
	0.48	0.047	-	-	0.20	
	0.99	0.097	-	-	0.40	
	1.52	0.149	-	-	0.60	
	2.02	0.198	-	-	0.80	
	2.23	0.219	-	-	0.95	
	2.43	0.238	2.43	0.238	1.00	
	133.2 (-140)	0.02	0.002	0.02	0.002	0.0
		0.30	0.029	-	-	0.05
1.10		0.108	-	-	0.20	
2.06		0.202	-	-	0.40	
2.92		0.286	-	-	0.60	
3.74		0.367	-	-	0.80	
4.32		0.424	-	-	0.95	
4.51		0.442	4.51	0.442	1.00	
143.2 (-130)	0.05	0.005	0.05	0.005	0.00	
	0.50	0.049	-	-	0.05	
	1.79	0.176	-	-	0.20	
	3.43	0.336	-	-	0.40	
	4.89	0.480	-	-	0.60	
	6.24	0.612	-	-	0.80	
	7.36	0.722	-	-	0.95	
	7.67	0.752	7.67	0.752	1.00	

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus fitted with magnetic stirrer. Temperature measured with platinum resistance thermometer. Liquid and gas analysed by gas chromatography. Details of apparatus in ref. (1)

SOURCE AND PURITY OF MATERIALS:

1 and 2. Purity not less than 99.9 per cent by volume.

ESTIMATED ERROR:

REFERENCES:

1. Skripka, V. G.; Barsuk, S. D.; Nikitina, I. E.; Ben'yaminovic, O. A.
Gazov. Prom.
1964, 14, 11.

COMPONENTS:

1. Methane; CH₄; [74-82-8]
2. Ethane; C₂H₆; [74-84-0]

ORIGINAL MEASUREMENTS:

Skripka, V. G.; Nikitina, I. E.;
Zhdanovich, L. A.; Sirotin, A. G.;
Benyaminovich, O. A.

Gazov. Prom.

1970, 15, 35-36.

EXPERIMENTAL VALUES:

T/K (T/°C)	Bubble pt. pressure		Dew pt. pressure		Mole fraction x_{CH_4}
	P/kg f cm ⁻²	P/MPa	P/kg f cm ⁻²	P/MPa	
153.2	0.13	0.013	0.13	0.013	0.00
(-120)	0.73	0.072	-	-	0.05
	2.55	0.250	-	-	0.20
	4.95	0.485	-	-	0.40
	7.36	0.722	-	-	0.60
	9.77	0.958	-	-	0.80
	11.57	1.135	2.46	0.241	0.95
	12.18	1.194	12.18	-	1.00

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]			Hsi, C.; Lu, B. C.-Y.	
2. Ethane; C ₂ H ₆ ; [74-84-0]			Can. J. Chem. Eng.	
			1971, 49, 140-143.	
			(Supplementary data)	
VARIABLES:			PREPARED BY:	
			C. L. Young	
EXPERIMENTAL VALUES:				
T/K (T/°F)	P/psi	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in vapor, y_{CH_4}
159.2 (-173.1)	32.54	0.2244	0.1106	0.9130
	48.25	0.3327	0.1668	0.9400
	72.05	0.4968	0.2658	0.9611
	87.10	0.6005	0.3234	0.9676
	102.00	0.7033	0.3990	0.9747
	113.60	0.7832	0.4592	0.9791
	133.00	0.9170	0.5471	0.9831
	145.50	0.9997	0.6214	0.9863
	164.35	1.1332	0.7135	0.9893
	172.22	1.1874	0.7779	0.9916
	193.00	1.3307	0.8766	0.9943
	201.4	1.3886	0.9173	0.9963
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:	
Recirculating vapor flow apparatus constructed of 100 ml Jerguson gauge.			1. Matheson research grade sample, 99.99 mole per cent.	
Temperature measured using copper-constantan thermocouples.			2. Matheson research grade sample, purity 99.9 mole per cent.	
Pressure measured with Bourdon gauge.			ESTIMATED ERROR:	
Cell charged and vapor recirculated with magnetic pump for 2 or more hours. Samples of vapor and liquid removed at constant pressure and analysed using gas chromatography.			$\delta T/K = \pm 0.02$; $\delta P/MPa \sim \pm 0.005$;	
Helium was used as a carrier gas.			$\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 1\%$ (estimated by compiler).	
			REFERENCES:	

EXPERIMENTAL VALUES:			Mole fraction of methane	
T/K	P/psi	P/MPa	in liquid, x_{CH_4}	in vapor, y_{CH_4}
199.92	31.45a	0.2168a	0.0000	0.0000
	45.0	0.367	0.0214	0.3005
	65.0	0.448	0.0512	0.5098
	100.0	0.689	0.1039	0.6800
	160.0	1.104	0.1875	0.7957
	250.0	1.723	0.3100	0.8679
	350.0	2.413	0.4526	0.9052
	500.0	3.447	0.6601	0.9337
	600.0	4.137	0.7852	0.9461
	700.0	4.826	0.8942	0.9562
	719.0	4.957	0.9126	0.9584
	726.0	5.006	0.9175	0.9578
	732.0	5.047	0.9222	0.9575
	740.0	5.102	0.9319	0.9577
	748.0b	5.157b	0.9520	0.9520
195.44	522.0	3.599	0.7648	0.9546
	591.0	4.075	0.8539	0.9627
	634.0	4.371	0.9007	0.9680
	680.0	4.688	0.9437	0.9755
	693.0	4.778	0.9529	0.9764
	704.0	4.854	0.9613	0.9770
	708.0	4.881	0.9641	0.9756
	713.0b	4.916b	0.9706	0.9706
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE: Recirculating vapor flow apparatus with magnetic vapor pump. Pressure measured with Bourdon gauge and temperature with platinum resistance thermometer. Samples of both phases analysed using gas chromatography with flame ionisation detector. Details in source and ref. (1).			SOURCE AND PURITY OF MATERIALS:	
			1. Matheson Gas Products sample purity 99.97 mole per cent; purified by passing through molecular sieve. 2. Phillips Petroleum research grade. sample purity 99.99 mole per cent.	
			ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/MPa = \pm 0.015$ or less; $\delta x_{CH_4}, \delta y_{CH_4} = \pm 2\%$ or less.	
			REFERENCES:	
			1. Chang, H.L.; Hurt, L.J.; Kobayashi, R. <i>Am. Inst. Chem. Engrs. J.</i> <u>1966</u> , <i>11</i> , 1212.	

COMPONENTS:
 1. Methane; CH₄; [74-82-8]
 2. Ethane; C₂H₆; [74-84-0]

ORIGINAL MEASUREMENTS:
 Wichterle, I.; Kobayashi, R.
J. Chem. Engng. Data. 1972, *17*, 9-12.

VARIABLES:
 Temperature, pressure

PREPARED BY:
 C.L. Young

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]			Wichterle, I.; Kobayashi, R.	
2. Ethane; C ₂ H ₆ ; [74-84-0]			<i>J. Chem. Engng. Data.</i> <u>1972</u> , <i>17</i> , 9-12.	
EXPERIMENTAL VALUES:				
T/K	P/psi	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in vapor, y_{CH_4}
193.44	612.0	4.220	0.9007	0.9715
	660.0	4.551	0.9469	0.9787
	675.0	4.654	0.9590	0.98145
	685.0	4.723	0.9671	0.98316
	692.0	4.771	0.9724	0.98352
	696.0	4.799	0.9756	0.98371
	698.0b	4.813b	0.98214	0.98214
	192.39	22.05b	0.1520a	0.0000
39.0		0.269	0.0308	0.4339
61.5		0.424	0.0681	0.6358
100.0		0.689	0.1364	0.7755
160.0		1.104	0.2299	0.8605
250.0		1.723	0.3854	0.9087
350.0		2.413	0.5512	0.9372
500.0		3.447	0.7885	0.9607
600.0		4.137	0.9154	0.9755
640.0		4.413	0.9529	0.9822
662.0		4.564	0.9715	0.9862
675.0		4.654	0.9813	0.98973
682.0		4.702	0.9858	0.99100
685.0b		4.723b	0.99125	0.99125
190.94		20.41a	0.1407a	0.0000
	39.5	0.273	0.0340	0.4724
	60.5	0.417	0.0714	0.6513
	100.0	0.689	0.1386	0.7907
	160.0	1.104	0.2384	0.8709
	250.0	1.723	0.3955	0.9181
	350.0	2.413	0.5687	0.9425
	500.0	3.447	0.8150	0.9647
	563.0	3.882	0.9007	0.9750
	612.0	4.220	0.9474	0.9832
	630.0	4.344	0.9646	0.9869
	642.0	4.426	0.9749	0.9898
	651.0	4.488	0.9819	0.99187
	660.0	4.551	0.9882	0.99445
	664.0	4.578	0.99160	0.99579
	668.0	4.606	0.99383	0.99693
	670.0	4.619	0.99561	0.99765
671.0c	4.626c	1.0000	1.0000	
189.65	19.22a	0.1325a	0.0000	0.0000
	35.8	0.247	0.0320	0.4600
	60.0	0.413	0.0752	0.6741
	95.5	0.659	0.1380	0.7964
	140.0	0.966	0.2138	0.8626
	200.0	1.378	0.3202	0.9026
	300.0	2.068	0.4975	0.9369
	400.0	2.758	0.6816	0.9550
	500.0	3.447	0.8403	0.9706
	562.0	3.875	0.9214	0.9803
	600.0	4.137	0.9580	0.9876
	615.0	4.240	0.9729	0.99084
	625.0	4.309	0.9819	0.99388
	634.0	4.371	0.9893	0.99626
	648.0c	4.468c	1.0000	1.0000
188.04	477.0	3.288	0.8403	0.9719
	518.0	3.571	0.8970	0.9789
	556.0	3.833	0.9413	0.9849

COMPONENTS:		ORIGINAL MEASUREMENTS:			
1. Methane; CH ₄ ; [74-82-8]		Wichterle, I.; Kobayashi, R.			
2. Ethane; C ₂ H ₆ ; [74-84-0]		<i>J. Chem. Engng. Data.</i> 1972, 17, 9-12.			
EXPERIMENTAL VALUES:					
T/K	P/psi	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	Mole fraction of methane in vapor, y_{CH_4}	
188.04	580.0	3.999	0.9643	0.9898	
	598.0	4.123	0.9819	0.99448	
	606.0	4.178	0.9887	0.99661	
	616.0c	4.247c	1.0000	1.0000	
186.11	16.00a	0.1103a	0.0000	0.0000	
	36.7	0.253	0.0417	0.5585	
	61.5	0.424	0.0897	0.7358	
	104.0	0.717	0.1707	0.8471	
	180.0	1.241	0.3100	0.9116	
	275.0	1.896	0.5019	0.9435	
	400.0	2.758	0.7486	0.9674	
	482.0	3.323	0.8844	0.9792	
	524.0	3.613	0.9395	0.9866	
	550.0	3.792	0.9684	0.99187	
	562.0	3.875	0.9802	0.99495	
	568.0	3.916	0.9877	0.99730	
	579.0c	3.992c	1.0000	1.0000	
172.04	7.099a	0.04895a	0.0000	0.0000	
	30.8	0.213	0.0685	0.7681	
	45.5	0.314	0.1087	0.8469	
	81.0	0.558	0.2050	0.9161	
	120.0	0.828	0.3164	0.9434	
	180.0	1.241	0.5042	0.9656	
	247.5	1.706	0.7082	0.9788	
	299.0	2.062	0.8609	0.9878	
	324.0	2.234	0.9175	0.99209	
	339.5	2.341	0.9513	0.99531	
	361.5c	2.492c	1.0000	1.0000	
	158.15	2.715a	0.01872a	0.0000	0.0000
		25.8	0.178	0.1090	0.8990
28.8		0.199	0.1230	0.9089	
40.0		0.276	0.1640	0.9354	
50.0		0.345	0.2186	0.9485	
70.0		0.482	0.2953	0.9645	
100.0		0.689	0.4382	0.9767	
140.0		0.965	0.6528	0.9864	
170.0		1.172	0.8107	0.99221	
181.0		1.248	0.8650	0.99420	
199.0		1.372	0.9407	0.99740	
213.5c		1.472c	1.0000	1.0000	
144.26		0.841a	0.00580a	0.0000	0.0000
	27.3	0.188	0.1965	0.9716	
	37.0	0.255	0.2702	0.9796	
	43.0	0.297	0.3241	0.9834	
	56.0	0.386	0.4385	0.9880	
	66.0	0.455	0.5314	0.99100	
	81.0	0.558	0.6882	0.99433	
	98.0	0.676	0.8581	0.99728	
	114.0c	0.786c	1.0000	1.0000	
	130.37	0.186a	0.00128a	0.0000	0.0000
		28.0	0.193	0.4319	0.99479
35.0		0.241	0.5989	0.99654	
43.3		0.299	0.7788	0.99845	
48.6		0.334	0.8935	0.99919	
54.0c		0.372c	1.0000	1.0000	

a) saturated vapor pressure of ethane. b) gas-liquid critical pressure.
c) saturated vapor pressure of methane.

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8] 2. Ethane; C ₂ H ₆ ; [74-84-0]			Davalos, J.; Anderson, W. R.; Phelps, R. E.; Kidnay, A. J. <i>J. Chem. Eng. Data</i> <u>1976</u> , 21, 81-84.	
VARIABLES:			PREPARED BY:	
			C. L. Young	
EXPERIMENTAL VALUES:				
T/K	P/atm	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in vapor, y_{CH_4}
250.00	15.10		0.024	0.134
	22.00		0.089	0.365
	22.50		0.097	0.383
	32.50		0.196	0.540
	34.00		-	0.554
	45.00		0.320	0.643
	55.20		0.426	0.673
	65.70		0.546	0.673
	67.50		single phase	
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:	
Recirculating vapor flow apparatus. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Gas and liquid samples analysed by gas chromatography using a thermal conductivity detector. Details in source and ref. 1.			1. Matheson ultra high purity sample, maximum impurity 0.03 mole per cent. 2. Purity probably better than 99.9 mole per cent.	
			ESTIMATED ERROR: $\delta T/K = \pm 0.01$; $\delta P/\text{MPa} = \pm 0.003$ up to 3.5 MPa, ± 0.005 above 3.5 MPa; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 1.5\%$.	
			REFERENCES: 1. Miller, R. C.; Kidnay, A. J.; Hiza, M. J. <i>J. Chem. Thermodyn.</i> <u>1972</u> , 4, 807.	

COMPONENTS:		ORIGINAL MEASUREMENTS:		
1. Methane; CH ₄ ; [74-82-8] 2. Ethane; C ₂ H ₆ ; [74-84-0]		Miller, R. C.; Kidnay, A. J.; Hiza, M. J. <i>J. Chem. Thermodynamics</i> <u>1977</u> , <i>9</i> , 167-178.		
VARIABLES:		PREPARED BY:		
Temperature, pressure		C. L. Young		
EXPERIMENTAL VALUES:				
T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in vapor, y_{CH_4}	
160.00	0.1233	0.0602	0.8270	
	0.2026	0.1118	0.8970	
	0.2037	0.1127	0.8986	
	0.3050	0.1720	0.9344	
	0.3995	0.2225	0.9511	
	0.4116	0.2292	0.9534	
	0.5294	0.3035	0.9652	
	0.5984	0.3504	0.9704	
	0.793	0.4795	0.9794	
	0.993	0.6203	0.9854	
	1.195	0.7596	0.9909	
	1.338	0.8559	-	
	180.00	0.184	0.0327	0.5734
		0.313	0.0745	0.7493
0.471		0.1241	0.8335	
0.567		0.1567	0.8633	
0.953		0.2825	0.9213	
1.567		0.4928	0.9551	
2.128		0.6898	0.9712	
2.482		0.8025	0.9792	
2.828	0.9002	0.9874		
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:		
Vapor-recirculation system similar to that in refs. 1 and 2. Pressure measured with Bourdon gauge. Temperature measured with platinum resistance thermometer. Samples of liquid and vapor analysed by gas chromatography. Details in source.		1. Purity 99.99 mole per cent. 2. Purity 99.99 mole per cent.		
		ESTIMATED ERROR: $\delta T/K = \pm 0.02$; $\delta P/\text{MPa} = \pm 0.001$ up to 0.6 MPa; ± 0.005 above 0.6 MPa; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 0.001$.		
		REFERENCES: 1. Duncan, A. G.; Hiza, M. J. <i>Adv. Cryogen. Engng.</i> <u>1970</u> , <i>15</i> , 42. 2. Hiza, M. J.; Duncan, A. G. <i>Rev. Sci. Instr.</i> <u>1969</u> , <i>40</i> , 513.		

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]			Gupta, M.K.; Gardner, G.C.;	
2. Ethane; C ₂ H ₆ ; [74-84-0]			Hegarty, M.J.; Kidnay, A.J.	
			J. Chem. Engng. Data <u>1980</u> , <u>25</u> , 313-318.	
VARIABLES:			PREPARED BY:	
Temperature, pressure			C.L. Young	
EXPERIMENTAL VALUES:				
	Total pressure		Mole fraction of methane	
T/K	p/atm	p/MPa	in liquid, x _{CH₄}	in gas y _{CH₄}
260.00	16.80	1.702	0.0000	0.0000
	17.80	1.804	0.0088	0.0467
	18.88	1.913	-	0.0942
	19.42	1.968	0.0239	0.1150
	21.60	2.189	0.0445	0.1922
	23.22	2.353	0.0592	0.2387
	25.26	2.559	0.0788	0.2924
	29.98	3.038	0.1220	0.3810
	34.69	3.515	0.1652	0.4483
	40.59	4.113	0.2189	0.5052
	50.30	5.097	0.3087	0.5664
	55.18	5.591	0.3545	0.5823
	59.40	6.019	0.3952	0.5896
	62.65	6.348	0.4297	0.5897
270.00	65.18	6.604	0.4615	0.5823
	69.90	7.083	single phase	
	21.68	2.197	0.0000	0.0000
	22.53	2.283	0.0070	0.0298
	23.39	2.421	0.0188	0.0762
	26.10	2.645	0.0357	0.1332
	30.69	3.110	0.0739	0.2361
	35.07	3.553	0.1127	0.3140
	40.00	4.053	0.1550	0.3768
	AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:	
Recirculating vapor flow apparatus with diaphragm pump. Temperature measured with platinum resistance thermometer and pressure with Bourdon gauges. Cell stirred with double propeller stirrer. Vapor and liquid samples analysed by gas chromatography using a thermal conductivity detector. Details in ref. (1).			1 and 2. Purity at least 99 mole per cent. No extraneous peaks were found when samples analysed by gas chromatography.	
			ESTIMATED ERROR: $\delta T/K = \pm 0.02$; $\delta p/MPa = \pm 0.03$ up to 3.4 MPa, ± 0.1 above 3.4 MPa, $\delta x_{CH_4}, \delta y_{CH_4} = \pm 0.002$.	
			REFERENCES: 1. Somait, F.; Kidnay, A.J. J. Chem. Engng. Data <u>1978</u> , <u>23</u> , 301.	

COMPONENTS:			ORIGINAL MEASUREMENTS:		
1. Methane; CH ₄ ; [74-82-8]			Gupta, M. K.; Gardner, G. C.;		
2. Ethane; C ₂ H ₆ ; [74-84-0]			Hegarty, M. J.; Kidnay, A. J.		
			<i>J. Chem. Engng. Data</i>		
			1980, 25, 313-318.		
T/K	Total pressure		Mole fraction of methane		
	p/atm	p/MPa	in liquid, x _{CH₄}	in gas y _{CH₄}	
270.00	45.30	4.590	0.1984	0.4237	
	45.50	4.610	-	0.4251	
	49.06	4.971	0.2315	0.4484	
	50.26	5.093	0.2419	0.4558	
	55.02	5.575	0.2819	-	
	60.22	6.102	0.3321	0.4889	
	62.96	6.379	-	0.4896	
	64.53	6.539	0.3862	-	
	65.14	6.600	0.3980	-	
	65.44	6.631	-	0.4856	
	66.50	6.738	-	-	
	280.00	27.60	2.797	0.0000	0.0000
		28.50	2.888	0.0081	0.0279
		30.35	3.075	0.0231	0.0744
31.62		3.204	0.0335	0.1036	
36.08		3.656	0.0693	0.1864	
39.85		4.038	0.0996	0.2404	
43.58		4.416	0.1292	0.2818	
46.50		4.712	0.1528	0.3091	
49.75		5.041	0.1798	0.3336	
52.60		5.330	0.2044	0.3512	
55.72		5.646	0.2333	0.3654	
59.06		5.984	0.2668	0.3719	
60.07		6.087	0.2774	0.3711	
60.51		6.131	-	0.3699	
61.10		6.191	0.2913	0.3675	
61.84		6.266	0.3046	0.3609	
62.10	6.292	0.3109	0.3557		
62.40	6.323	-	-		