

COMPONENTS: 1. Methane; CH ₄ ; [74-82-8] 2. Ammonia; NH ₃ ; [7664-41-7]		ORIGINAL MEASUREMENTS: Kaminishi, G. <i>Kogyo Kagaku Zasshi</i> , <u>1965</u> , <i>68</i> , 419-23.
VARIABLES: Temperature, pressure		PREPARED BY: C.L. Young
EXPERIMENTAL VALUES:		
T/K	P/10 ⁵ Pa	Mole fraction of methane in liquid, α_{CH_4}
273.15	50.8	0.0128
	101.8	0.0238
	150.9	0.0315
	199.9	0.0366
298.15	50.8	0.0152
	101.8	0.0322
	150.9	0.0468
	199.9	0.0583
323.15	50.8	0.0145
	101.8	0.0386
	150.9	0.0644
	199.9	0.0901
AUXILIARY INFORMATION		
METHOD/APPARATUS/PROCEDURE: Static equilibrium cell with agitator. Pressure measured with Bourdon gauge. Liquid ammonia placed in cell and then methane pressurized into cell. After equilibrium established liquid sample removed and analysed by volumetric and gravimetric techniques. Details in source.		SOURCE AND PURITY OF MATERIALS: 1. Takachiho Co. sample, purity 99.9 mole per cent. 2. Distilled four times, no other details given.
		ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/10^5 \text{Pa} = \pm 0.1$; $\delta \alpha_{\text{CH}_4} = \pm 1\%$. (estimated by compiler).
		REFERENCES:

COMPONENTS:

EVALUATOR:

1. Methane; CH₄; [74-82-8]
2. Carbon dioxide; CO₂; [124-38-9]

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EVALUATION:

This system has been investigated by a number of workers but there is still a need for a definitive study. Kidnay and coworkers (1), (2) have investigated this system in the temperature range 230 K to 270 K and these data are classified as tentative. The data of Davalos *et al.* (1) at 270 K have a small error in the measurements above 50 atmospheres for the vapor phase composition and therefore the more recent measurements (2) are preferred in this range of pressure.

Kobayashi and coworkers (3) investigated the dew points in this system but since no liquid phase compositions were measured, this work is not considered further here. Neumann and Walch (4) and Sterner (5) presented their data in graphical form and they are not considered further here.

There appears to be fairly good agreement between the limited data of Kaminishi and coworkers (6), (7) and those of Kidnay and coworkers (1), (2) although the former workers' data scatter more. A very detailed comparison is not possible because the isotherm temperatures are different. The data of Donnelly and Katz (8) cover a wider temperature range than those of Kidnay and coworkers and their data show more scatter. However there is fair agreement between the two sets of data although as above a very detailed comparison is not possible because the temperature isotherms are different.

The data of Donnelly and Katz (8) and Kaminishi and coworkers (6), (7) are classified as tentative.

References

1. Davalos, J.; Anderson, W. R.; Phelps, R. E.; Kidnay, A. J. *J. Chem. Engng. Data*, 1976, *21*, 81.
2. Somait, F. A.; Kidnay, A. J. *J. Chem. Engng. Data*, 1978, *23*, 301.
3. Hwang, S.-C.; Lin, H.-M.; Chappellear, P. S.; Kobayashi, R. *J. Chem. Engng. Data*, 1976, *21*, 403.
4. Neumann, A.; Walch, W. *Chem. Ing.-Tech.*, 1968, *40*, 241.
5. Sterner, C. J. *Adv. Cryogen. Eng.*, 1961, *6*, 467.
6. Kaminishi, G.; Arai, Y.; Saito, S.; Maeda, A. *J. Chem. Eng. Japan*, 1968, *1*, 109.
7. Arai, Y.; Kaminishi, G.; Saito, S. *J. Chem. Eng. Japan*, 1971, *4*, 113.
8. Donnelly, H. G.; Katz, D. L. *Ind. Eng. Chem.*, 1954, *46*, 511.

COMPONENTS:				ORIGINAL MEASUREMENTS:					
1. Methane; CH ₄ ; [74-82-8]				Donnelly, H. G.; Katz, D. L.					
2. Carbon dioxide; CO ₂ ; [124-38-9]				<i>Ind. Eng. Chem.</i> <u>1954</u> , <i>46</i> , 511-7.					
VARIABLES:				PREPARED BY:					
Temperature, pressure				C. L. Young					
EXPERIMENTAL VALUES:									
T/K	P/MPa	Mole fraction of methane		T/K	P/MPa	Mole fraction of methane			
		in liquid, x_{CH_4}	in gas, y_{CH_4}			in liquid, x_{CH_4}	in gas, y_{CH_4}		
271.5	5.05	0.0685	0.253	241.5	6.27	0.286	0.676		
	5.59	0.0865	0.30		6.67	0.273	0.679		
	6.00	0.103	0.329		6.84	0.322	0.686		
	6.30	0.1225	-		7.57	0.426	0.680		
	6.81	0.16	0.367		7.78	-	0.676		
	6.84	0.157	0.369		7.90	0.501	0.672		
	7.25	0.165	0.387		223.7	1.48	0.0435	0.509	
	7.64	0.191	0.39			3.43	0.1465	0.751	
	259.8	3.19	0.0315			0.1885	4.01	0.172	0.777
		3.47	0.036			0.235	4.04	0.2043	0.772
3.69		0.051	0.266	5.39		0.312	0.796		
4.03		0.053	0.306	5.86		0.408	-		
5.05		0.1095	0.425	6.01		0.420	0.797		
6.03		0.1665	0.484	6.20		0.468	0.805		
6.16		-	0.52	6.37		0.483	0.783		
6.81		0.224	0.505	6.54		0.521	0.790		
6.85		0.223	0.509	219.3	1.11	-	0.477		
7.08		0.230	0.495		2.25	-	0.717		
241.5	2.39	0.0413	0.404		3.56	-	0.789		
	3.10	0.0895	0.521		4.54	0.261	0.813		
	4.07	0.134	0.605		5.33	0.347	0.818		
	4.70	0.166	0.629		5.60	-	0.822		
	5.26	0.191	0.652		6.43	0.663	0.833		
	5.59	-	0.658						
	(cont.)								
	AUXILIARY INFORMATION								
	METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:				
	Recirculating vapor flow apparatus. Composition of co-existing phases determined by analysis. Samples expanded to atmospheric pressure and carbon dioxide dissolved in sodium hydroxide solution. Details in source and ref. (1).				1. Phillips Petroleum sample.				
2. No details given.									
ESTIMATED ERROR:									
				$\delta T/K = \pm 0.1$; $\delta P/\text{MPa} = \pm 0.015$;					
				$\delta x_{\text{CH}_4} = \pm 0.01$ (estimated by compiler).					
REFERENCES:				1. Aroyan, H. J.; Katz, D. L.					
				<i>Ind. Eng. Chem.</i> <u>1951</u> , <i>48</i> , 185.					

COMPONENTS:

ORIGINAL MEASUREMENTS:

1. Methane; CH₄; [74-82-8] Donnelly, H. G.; Katz, D. L.
 2. Carbon dioxide; CO₂; [124-38-9] *Ind. Eng. Chem.* 1954, 46, 511-7.

EXPERIMENTAL VALUES:

T/K	P/MPa	Mole fraction of methane		T/K	P/MPa	Mole fraction of methane	
		in liquid, x_{CH_4}	in gas, y_{CH_4}			in liquid, x_{CH_4}	in gas, y_{CH_4}
209.3	4.78	-	0.877	209.3	5.35	0.648	0.882
	4.96	-	0.881		5.55	0.792	0.900
	5.12	0.535	0.879	199.8	4.49	0.771	0.926
	5.21	0.607	0.879		4.98	0.916	0.946

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]		Kaminishi, G.; Arai, Y.; Saito, S.; Maeda, A.	
2. Carbon dioxide; CO ₂ ; [124-38-9]		<i>J. Chem. Eng. Japan</i> <u>1968</u> , 1, 109-116.	
VARIABLES:		PREPARED BY:	
Temperature, pressure		C. L. Young	
EXPERIMENTAL VALUES:			
T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in gas, y_{CH_4}
233.15	3.70	-	0.657
	5.27	0.251	0.717
	6.20	0.360	0.727
	6.81	0.450	-
	7.19	0.519	0.703
253.15	3.70	-	0.396
	5.20	0.150	0.515
	6.20	0.213	0.556
	7.19	0.294	0.566
	7.80	0.357	0.563
273.15	8.11	0.400	0.540
	5.27	0.070	0.254
	6.20	-	0.322
	7.70	0.204	0.370
	8.19	0.246	0.367
283.15	6.20	0.069	0.188
	7.19	0.115	0.240
	8.19	0.177	0.250
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
Static cell fitted with magnetic stirrer. Temperature measured with liquid in glass thermometer and pressure measured with Bourdon gauge. After equilibrium established vapor and liquid samples analysed by a volumetric technique. Carbon dioxide was absorbed in potassium hydroxide soln.		1. Takachiho Chemical Industry Co. purity better than 99.9 mole per cent.	
		2. No details given.	
		ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/\text{MPa} = \pm 0.01$; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 1\%$.	
		REFERENCES:	

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]		Arai, Y.; Kaminishi, G.;	
2. Carbon dioxide; CO ₂ ; [124-38-9]		Saito, S. <i>J. Chem. Eng. Japan</i> <u>1971</u> , 4, 113-122.	
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}
253.15	2.63	-	0.204
	3.14	-	0.302
	4.38	-	0.444
	5.33	-	0.499
	6.23	0.204	-
	6.87	-	0.551
	7.42	0.302	-
	7.59	-	0.551*
	8.29	0.444	0.499*
	273.15	4.20	-
5.05		-	0.220
5.71		-	0.276
6.51		-	0.321
6.63		0.129	-
6.98		-	0.340
7.43		-	0.349
8.13		0.220	-
8.28		-	0.349*
8.38		-	0.340*
	8.52	0.276	0.321*
* retrograde condensation point.		(cont.)	
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
Bubble point-dew point apparatus consisting of glass capillary cell fitted with magnetic stirrer. Pressure measured with a dead weight gauge. Temperature measured with a mercury in glass thermometer. Mixtures of known composition charged into cell. Bubble point determined from plots of volume against pressure. Dew point determined visually. Details in source.		1. Tanachiko Chemical Industry Co. sample, purity 99.64 mole per cent. 2. Showa Tansan Industry Co. sample, purity 99.9 mole per cent.	
		ESTIMATED ERROR: $\delta T/K = \pm 0.01$; $\delta P/MPa = \pm 0.01$; $\delta x_{CH_4}, \delta y_{CH_4} = \pm 2\%$ (estimated by compiler).	
		REFERENCES:	

COMPONENTS:		ORIGINAL MEASUREMENTS:		
1. Methane; CH ₄ ; [74-82-8]		Arai, Y.; Kaminishi, G.; Saito, S.		
2. Carbon dioxide; CO ₂ ; [124-38-9]		<i>J. Chem. Eng. Japan</i> <u>1971</u> , 4, 113-122.		
EXPERIMENTAL VALUES:				
T/K	P/MPa	Mole fraction of methane		
		in liquid, x_{CH_4}	in vapor, y_{CH_4}	
288.15	5.45	-	0.043	
	5.95	-	0.091	
	6.25	0.043	-	
	6.26	-	0.116	
	6.71	-	0.146	
	7.06	-	0.167	
	7.30	0.091	-	
	7.40	-	0.182	
	7.75	0.116	-	
	8.11	0.146	-	
	8.12	-	0.182*	
	8.15	0.167**	-	
	<p>* retrograde condensation point.</p> <p>** critical opalescence was clearly observed.</p>			

COMPONENTS: 1. Methane; CH ₄ ; [74-82-8] 2. Carbon dioxide; CO ₂ ; [124-38-9]		ORIGINAL MEASUREMENTS: Davalos, J.; Anderson, W.R.; Phelps, R.E.; Kidnay, A.J. <i>J. Chem. Engng. Data.</i> <u>1976</u> , 21,81-4	
VARIABLES: Temperature, pressure		PREPARED BY: C.L. Young	
EXPERIMENTAL VALUES:			
T/K	P/10 ⁵ Pa	Mole fraction of methane in liquid, x_{CH_4} in vapor, y_{CH_4}	
230.00	15.20	0.027	0.399
	20.26	0.050	0.525
	32.42	0.115	0.683
	40.53	0.170	0.728
	48.64	0.235	0.751
	55.73	0.318	0.764
	61.91	0.397	0.752
	62.82	0.394	0.762
	65.86	0.472	0.757
	68.90	0.534	0.751
	69.35	0.526	0.732
	70.00	0.543	0.730
	70.73	0.561	0.725
	71.49	0.584	0.716
250.00	20.26	0.010	0.104
	23.63	0.023	0.223
	25.01	-	0.254
	30.40	0.053	0.361
	40.53	0.105	0.491
	50.66	0.166	0.575
	60.79	0.237	0.605
	70.93	0.326	0.615
	78.02	0.400	0.605
	79.54	0.405	0.564
	80.94	0.446	0.558
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE: 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).		SOURCE AND PURITY OF MATERIALS: 1. Matheson ultra high purity sample, maximum impurity 0.03 mole per cent. 2. Purity better than 99.9 mole per cent.	
		ESTIMATED ERROR: $\delta T/K = \pm 0.01$; $\delta P/10^5 \text{Pa} = \pm 0.03$ up to 3.5 MPa, ± 0.05 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]		Davalos, J.; Anderson, W.R.; Phelps, R.E.; Kidnay, A.J.	
2. Carbon dioxide; CO ₂ ; [124-38-9]		<i>J. Chem. Engng. Data.</i> <u>1976</u> , 21, 81-84.	
EXPERIMENTAL VALUES:			
T/K	P/10 ⁵ Pa	Mole fraction of methane in liquid, x_{CH_4}	Mole fraction of methane in vapor, y_{CH_4}
270.00	35.55	0.014	0.083
	37.01	0.018	0.108
	40.28	0.032	0.162 ¹
	42.14	0.040	0.190
	50.63	0.077	0.282
	58.58	0.113	0.353
	70.21	0.166	0.405
	80.63	0.260	0.411
	85.19	0.319	0.375

EXPERIMENTAL VALUES:			Mole fraction ^a	
T/K	P/psi	P/MPa	in liquid, x_{CH_4}	in vapor, y_{CH_4}
219.26	84.4	0.582	0.0000	-
	396.0	2.730	0.1035	-
	495.1	3.414	0.1507	-
	601.7	4.149	0.2189	-
	698.0	4.813	0.3028	-
	757.0	5.219	0.3735	-
	807.9	5.570	0.4488	-
	852.2	5.876	0.5265	-
	880.7	6.072	0.5825	-
	909.2	6.269	0.6394	-
	925.1	6.378	0.6758	-
	932.8	6.431	0.6939	-
	935.9	6.453	0.6031	-
	84.4	0.582	-	0.0000
	125.6	0.866	-	0.3111
	147.9	1.020	-	0.4049
	186.1	1.283	-	0.5141
	225.2	1.553	-	0.5869
	297.9	2.054	-	0.6720
	399.8	2.757	-	0.7380
	515.7	3.556	-	0.7778
	615.7	4.245	-	0.7979
	717.8	4.949	-	0.8089
(cont.)				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:	
<p>Recirculating vapor flow apparatus. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Gas added to cell at low temperature and vapor recirculated until equilibrium established. Samples analysed using gas chromatography. Details in source and ref. (1).</p>			<p>1. Matheson sample, purity at least 99.99 mole per cent.</p> <p>2. Coleman Instrument grade, purity at least 99.99 mole per cent.</p>	
			ESTIMATED ERROR:	
			<p>$\delta T/K = \pm 0.01$; $\delta P/MPa = \pm 0.02$; $\delta x_{CH_4}, \delta y_{CH_4} = \pm 2\%$.</p>	
REFERENCES:			<p>1. Chu, T. C.; Chen, R. J. J.; Chappellear, P. S.; Kobayashi, R. <i>J. Chem. Engng. Data</i> <u>1976</u>, <i>21</i>, 41.</p>	

COMPONENTS:

1. Methane; CH₄; [74-82-8]
 2. Carbon dioxide; CO₂; [124-38-9]

ORIGINAL MEASUREMENTS:

Mraw, S. C.; Hwang, S.-C.; Kobayashi, R.
J. Chem. Engng. Data
1978, *23*, 135-139.

VARIABLES:

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

Mole fraction ^a

T/K	P/psi	P/MPa	in liquid, x_{CH_4}	in vapor, y_{CH_4}
219.26	84.4	0.582	0.0000	-
	396.0	2.730	0.1035	-
	495.1	3.414	0.1507	-
	601.7	4.149	0.2189	-
	698.0	4.813	0.3028	-
	757.0	5.219	0.3735	-
	807.9	5.570	0.4488	-
	852.2	5.876	0.5265	-
	880.7	6.072	0.5825	-
	909.2	6.269	0.6394	-
	925.1	6.378	0.6758	-
	932.8	6.431	0.6939	-
	935.9	6.453	0.6031	-
	84.4	0.582	-	0.0000
	125.6	0.866	-	0.3111
	147.9	1.020	-	0.4049
	186.1	1.283	-	0.5141
	225.2	1.553	-	0.5869
	297.9	2.054	-	0.6720
	399.8	2.757	-	0.7380
	515.7	3.556	-	0.7778
	615.7	4.245	-	0.7979
	717.8	4.949	-	0.8089

(cont.)

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Gas added to cell at low temperature and vapor recirculated until equilibrium established. Samples analysed using gas chromatography. Details in source and ref. (1).

SOURCE AND PURITY OF MATERIALS:

- Matheson sample, purity at least 99.99 mole per cent.
- Coleman Instrument grade, purity at least 99.99 mole per cent.

ESTIMATED ERROR:

$$\delta T/K = \pm 0.01; \quad \delta P/MPa = \pm 0.02;$$

$$\delta x_{CH_4}, \delta y_{CH_4} = \pm 2\%.$$

REFERENCES:

- Chu, T. C.; Chen, R. J. J.; Chappellear, P. S.; Kobayashi, R. *J. Chem. Engng. Data* 1976, *21*, 41.

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]			Mraw, S. C.; Hwang, S.-C.;	
2. Carbon dioxide; CO ₂ ; [124-38-9]			Kobayashi, R.	
			<i>J. Chem. Engng. Data</i>	
			<u>1978</u> , 23, 135-139.	
EXPERIMENTAL VALUES:				
T/K	P/psi	P/MPa	Mole fraction ^a	
			in liquid, x_{CH_4}	in vapor, y_{CH_4}
219.26	805.8	5.556	-	0.8116
	870.9	6.005	-	0.8075
	919.9	6.342	-	0.7954
	940.8	6.487	-	0.7483
210.15	625.0	4.309	0.3175	-
	675.0	4.654	0.4056	-
	725.0	4.999	0.5205	-
	776.4	5.353	0.6522	-
	809.7	5.583	0.7239	-
	839.4	5.787	0.7848	-
	799.0	5.509	-	0.8588
203.15	710.1	4.896	0.7491	-
	720.0	4.964	0.7683	-
	730.0	5.033	0.7879	-
	740.0	5.102	0.8051	-
	750.0	5.171	0.8229	-
	760.3	5.242	0.8407	-
	770.3	5.311	0.8593	-
	750.0	5.171	-	0.8975
	770.2	5.310	-	0.8036
	775.2	5.345	-	0.8784
193.15	625.0	4.309	0.8917	-
	640.0	4.413	0.9136	-
	655.0	4.516	0.9328	-
	670.0	4.619	0.9509	-
	680.0	4.688	0.9622	-
	685.0	4.723	0.9674	-
	625.0	4.309	-	0.9490
	639.9	4.412	-	0.9543
	650.0	4.482	-	0.9582
	670.0	4.619	-	0.9669
	183.15	494.2	3.407	0.9453
500.0		3.447	0.9549	-
504.9		3.481	0.9630	-
513.0		3.537	0.9762	-
520.0		3.585	0.9870	-
524.9		3.619	0.9942	-
528		3.64	1.0000	-
173.15	362.3	2.498	0.9630	-
	366.4	2.526	0.9730	-
	370.4	2.554	0.9828	-
	374.0	2.579	0.9917	-
	377.8	2.605	1.0000	-
153.15	172.4	1.189	0.9941	-
	173.3	1.195	0.99895	-
	172.4	1.189	-	0.99901
	173.3	1.195	-	0.99984

^a Mole fraction of carbon dioxide given in source.

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]		Somait, F.A.; Kidnay, A.J.	
2. Carbon dioxide, CO ₂ ; [124-38-9]		<i>J. Chem. Engng. Data.</i> <u>1978</u> , 23,301-5.	
VARIABLES:		PREPARED BY:	
Temperature		C.L. Young	
EXPERIMENTAL VALUES:			
T/K	P/bar	Mole fraction of methane in liquid, x_{CH_4}	Mole fraction of methane in gas, y_{CH_4}
270.00	31.99	0.0000	0.0000
	38.35	0.0237	0.1269
	43.92	0.0455	0.2082
	48.79	0.0666	0.2629
	52.69	0.0838	0.2962
	60.80	0.1226	0.3519
	66.27	0.1533	0.3774
	74.96	-	0.3983
	77.01	0.2224	0.4006
	80.86	-	0.3969
	82.48	0.2740	0.3895
	82.83	-	0.3875
	84.32	0.3060	0.3726
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 two propeller stirrer. Vapor and liquid samples analysed by gas chromatography using a thermal conductivity detector. Details in source.		No details given	
		ESTIMATED ERROR:	
		$\delta T/K = \pm 0.02$; $\delta P/\text{bar} = \pm 0.015$ up to 100 bar; ± 0.1 above 100 bar; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 0.002$.	
		REFERENCES:	

COMPONENTS:				ORIGINAL MEASUREMENTS:			
1. Methane; CH ₄ ; [74-82-8]				Al-Sahhaf, T. A.; Kidnay, A. J.;			
2. Carbon dioxide; CO ₂ ; [124-38-9]				Sloan, E. D.			
				<i>Ind. Eng. Chem. Fundam.</i>			
				<u>1983</u> , 22, 372-380.			
VARIABLES:				C. L. Young			
Temperature, pressure							
EXPERIMENTAL VALUES:							
T/K	P/MPa	Mole fraction of methane in liquid, in vapor, x_{CH_4} y_{CH_4}		T/K	P/MPa	Mole fraction of methane in liquid, in vapor, x_{CH_4} y_{CH_4}	
219.26	0.581	0.0000	0.0000	240.00	7.397	0.4525	0.6624
	0.943		0.3529		7.594	0.4914	0.6473
	1.398	0.0339	0.5457		7.660	0.5048	0.6388
	1.900	0.0579	0.6493		7.772	0.5475	0.6199
	2.432	0.0859	0.7103				
	3.120	0.1308	0.7592	270.00	3.203	0.0000	0.0000
	3.861	0.1923	0.7890		3.673	0.0183	0.1048
					3.810	0.0235	0.1273
240.00	1.287	0.0000	0.0000		4.387	0.0457	0.2086
	2.104	0.0328	0.3480		5.183	0.0793	0.2885
	3.059	0.0761	0.5160		5.943	0.1167	0.3451
	4.089	0.1315	0.6050		6.156	0.1261	0.3543
	5.198	0.2074	0.6550		7.083	0.1785	0.3901
	6.120	0.2873	0.6742		7.969	0.2463	0.3980
	6.657	0.3475	0.6771		8.223	0.2737	0.3916
	7.073	0.4016	0.6728		8.415	0.3060	0.3742
	7.265	0.4315	0.6672		8.511		0.3532
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. Linde ultrahigh purity grade. Purity 99.97 mole per cent.			
				2. Linde "Coleman" grade. Purity 99.991 mole per cent.			
				ESTIMATED ERROR:			
				$\delta T/K = \pm 0.02$; $\delta P/\text{MPa} = \pm 0.003$ up to 3 MPa, ± 0.01 up to 10 MPa, ± 0.02 above 10 MPa; $\delta x, \delta y = \pm 0.002$.			
				REFERENCES:			
				1. Somait, F.; Kidnay, A. J. <i>J. Chem. Eng. Data</i> <u>1978</u> , 23, 301.			

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8] 2. Carbonyl sulfide; COS; [463-58-1]		Senturk, N. H.; Kalra, H.; Robinson, D. B. <i>J. Chem. Engng. Data</i> <u>1979</u> , 24, 311-313.	
VARIABLES:		PREPARED BY:	
Temperature, pressure		C. L. Young	
EXPERIMENTAL VALUES:			
		Mole fraction of methane	
T/K	P/MPa	in liquid, x_{CH_4}	in vapor, y_{CH_4}
298.15	2.47	0.0446	0.4318
	3.59	-	0.5637
	3.65	0.0884	-
	5.57	0.1850	0.6630
	7.27	0.2653	0.6867
323.15	9.16	0.3660	0.6823
	10.72	0.4866	0.6172
	3.37	0.0411	0.2644
	4.62	0.0915	0.4167
	6.21	0.1613	0.5063
348.15	7.57	0.2240	0.5370
	8.73	0.2878	0.5400
	9.62	0.3438	0.5278
	10.16	0.3889	0.4989
	4.53	0.0276	0.1242
373.15	5.38	0.0610	0.2123
	6.28	0.0962	0.2739
	7.40	0.1502	0.3245
	8.33	0.2026	0.3344
	8.62	0.2208	0.3289
373.15	6.06	0.0102	0.0205
	6.50	0.0313	0.0549
	6.71	0.0421	0.0574
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
Cell fitted with two movable pistons which enabled cell contents to be circulated in external line. Fitted with optical system which allowed measurement of refractive index. Temperature measured with iron-constantan thermocouple and pressure with Bourdon gauge. Components charged into cell, mixed by piston movement. Samples withdrawn and analysed by gas chromatography. Details in source and ref. (1).		1. Matheson, ultra high purity sample, purity 99.97 mole per cent. 2. Matheson special sample purity 99.7 mole per cent. Major impurities were hydrogen sulfide 0.03%, carbon disulfide 0.05%, carbon dioxide 0.21%, traces of nitrogen and carbon monoxide.	
		ESTIMATED ERROR:	
		$\delta T/K = \pm 0.05$; $\delta P/\text{MPa} = \pm 0.02$; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 0.003$ to 0.005.	
		REFERENCES:	
		1. Besserer, G. J.; Robinson, D. B. <i>Can. J. Chem. Eng.</i> <u>1971</u> , 49, 651.	

COMPONENTS:

1. Methane; CH₄; [74-82-8]
2. Hydrogen sulfide; H₂S; [7783-06-4]

EVALUATOR:

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

March 1982

EVALUATION:

This system has been investigated by three groups of workers. The data of Reamer *et al.* (1) covers the temperature range 277.6 K to 444.3 K and their data are classified as tentative. The data of Kohn and Kurata (2) are, in general, in good agreement with those of Reamer *et al.* (1) (except at 277.6 K and the highest pressure), and are therefore also classified as tentative. The data of Robinson and coworkers (3), (4) are in reasonable agreement with the data of Reamer *et al.* (1) at 277.6 K and 344.3 K but only fair agreement at 310.9 K. Because of the very limited nature of the data of Robinson and coworkers, detailed comparison is not possible.

References

1. Reamer, H. H.; Sage, B. H.; Lacey, W. N.
Ind. Eng. Chem., 1951, 43, 976.
2. Kohn, J. P.; Kurata, F.
Am. Inst. Chem. Engrs. J., 1958, 4, 211.
3. Robinson, D. B.; Lorenzo, A. P.; Macrygeorgos, C. A.
Can. J. Chem. Engng., 1959, 37, 212.
4. Robinson, D. B.; Bailey, J. A.
Can. J. Chem. Engng., 1957, 35, 151.

COMPONENTS:				ORIGINAL MEASUREMENTS:			
1. Methane; CH ₄ ; [74-82-8]				Reamer, H. H.; Sage, B. H.;			
2. Hydrogen sulfide; H ₂ S; [7783-06-4]				Lacey, W. N. <i>Ind. Eng. Chem.</i> <u>1951</u> , <i>43</i> , 976-981.			
VARIABLES:				PREPARED BY:			
Temperature, pressure				C. L. Young			
EXPERIMENTAL VALUES:							
T/K	P/MPa	Mole fraction of methane in liquid, in gas, x_{CH_4} y_{CH_4}		T/K	P/MPa	Mole fraction of methane in liquid, in gas, x_{CH_4} y_{CH_4}	
277.6	1.38	0.0057	0.1371	277.6	13.44	0.5500	0.5500
	1.72	0.0132	0.2783	310.9	2.76	0.0007	0.0117
	2.07	0.0212	0.3896		3.10	0.0067	0.0963
	2.41	0.0284	0.4604		3.45	0.0128	0.1642
	2.76	0.0354	0.5126		3.79	0.0190	0.2203
	3.10	0.0424	0.5551		4.14	0.0255	0.2688
	3.45	0.0493	0.5879		4.83	0.0385	0.3416
	4.14	0.0636	0.6394		5.52	0.0523	0.3976
	4.83	0.0783	0.6755		6.21	0.0670	0.4396
	5.52	0.0930	0.6989		6.89	0.0828	0.4707
	6.21	0.1083	0.7141		7.58	0.0996	0.4923
	6.89	0.1250	0.7242		8.27	0.1182	0.5079
	7.58	0.1433	0.7299		8.62	0.1282	0.5130
	8.27	0.1635	0.7321		8.96	0.1390	0.5182
	8.62	0.1750	0.7319		9.66	0.1620	0.5240
	8.96	0.1868	0.7306		10.34	0.1885	0.5255
	9.65	0.2137	0.7262		11.03	0.2192	0.5195
	10.34	0.2450	0.7185		11.72	0.2532	0.5058
	11.03	0.2798	0.7075		12.07	0.2725	0.4947
	11.72	0.3240	0.6931		12.41	0.2940	0.4797
	12.07	0.3492	0.6828		12.76	0.3185	0.4580
	12.41	0.3758	0.6686		13.10	0.3578	0.4190
	13.10	0.4401	0.6130				(cont.)
AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:			
PVT cell charged with mixture of known composition. Pressure measured with pressure balance. Temperature measured using resistance thermometer. Bubble and dew points determined for various compositions from discontinuity in slope of pv isotherm. Co-existing phase compositions determined by graphical means. Details in ref. (1).				1. Crude sample treated for removal of alkanes, CO ₂ and water; final purity 99.9 mole per cent. 2. Crude sample purified and twice sublimed.			
				ESTIMATED ERROR: $\delta T/K = \pm 0.01$; $\delta P/MPa = \pm 0.01$; $\delta x_{CH_4}, \delta y_{CH_4} = \pm 0.003$.			
				REFERENCES: 1. Sage, B. H.; Lacey, W. N. <i>Trans. Am. Inst. Mining and Met. Engrs.</i> <u>1940</u> , <i>136</i> , 136.			

COMPONENTS:				ORIGINAL MEASUREMENTS:			
1. Methane; CH ₄ ; [74-82-8]				Reamer, H. H.; Sage, B. H.;			
2. Hydrogen sulfide; H ₂ S;				Lacey, W. N.			
[7783-06-4]				<i>Ind. Eng. Chem.</i> <u>1951</u> , <i>43</i> , 976-981.			
EXPERIMENTAL VALUES:							
T/K	P/MPa	Mole fraction of methane		T/K	P/MPa	Mole fraction of methane	
		in liquid, x_{CH_4}	in gas, y_{CH_4}			in liquid, x_{CH_4}	in gas, y_{CH_4}
310.9	13.15	0.3880	0.3880	344.3	9.66	0.1021	0.2811
344.3	5.52	0.0031	0.0196		10.34	0.1245	0.2775
	5.86	0.0098	0.0592		11.03	0.1547	0.2580
	6.21	0.0167	0.0946		11.38	0.1830	0.2295
	6.89	0.0309	0.1553		11.45	0.2090	0.2090
	7.58	0.0459	0.2021	444.3	6.27	-	0.1000
	8.27	0.0622	0.2367		7.54	-	0.2000
	8.62	0.0720	0.2534		9.58	0.1000	-
	8.96	0.0814	0.2646		11.45	0.2000	-

COMPONENTS:			ORIGINAL MEASUREMENTS:		
1. Methane; CH ₄ ; [74-82-8]			Robinson, D. B.; Bailey, J. A.		
2. Hydrogen sulfide; H ₂ S; [7783-06-4]			<i>Can. J. Chem. Engng.</i> <u>1957</u> , 35, 151-158.		
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}	Mole fraction of methane in vapor, y_{CH_4}
310.9	100	600	4.14	0.033	0.290
		1200	8.27	0.109 [†]	0.510
		1600	11.03	0.260	0.478
† extrapolated from ternary data.					
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:		
Static equilibrium cell fitted with glass window. Temperature measured with copper-constantan thermocouples. Pressure measured with Bourdon gauge. Samples of gas and liquid analysed by absorbing hydrogen sulfide in potassium hydroxide solution and measuring the amount of methane volumetrically.			1. Phillips Petroleum Co. research grade sample, purity 99.7 mole per cent. 2. Matheson Co. sample, purity 98.8 mole per cent, 0.4 mole per cent methyl chloride, 0.3 mole per cent methyl mercaptan, 0.2 mole per cent nitrogen and 0.3 mole per cent carbon dioxide.		
			ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/MPa = \pm 1\%$; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 0.002$ (estimated by compiler).		
			REFERENCES:		

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8] 2. Hydrogen sulfide; H ₂ S; [7783-06-4]		Kohn, J.P.; Kurata, F. <i>Am. Inst. Chem. Engrs. J.</i> <u>1958</u> , 4, 211-217.	
VARIABLES:		PREPARED BY:	
Temperature, pressure		C.L. Young	
EXPERIMENTAL VALUES:			
T/K	P/10 ⁵ Pa	Mole fraction of methane in liquid, x_{CH_4}	Mole fraction of methane in vapor, y_{CH_4}
277.6	13.79	0.005	0.140
255.4	13.79	0.009	0.522
233.2	13.79	0.0125	0.754
210.9	13.79	0.018	0.906
188.7	13.79	0.025	0.968
299.8	27.56	0.016	0.251
277.6	27.56	0.035	0.513
255.4	27.56	0.045	0.720
233.2	27.56	0.054	0.862
210.9	27.56	0.062	0.935
188.7	27.56	0.066	0.969
322.0	41.37	0.015	0.143
299.8	41.37	0.038	0.406
277.6	41.37	0.058	0.628
255.4	41.37	0.072	0.792
233.2	41.37	0.083	0.900
210.9	41.37	0.093	0.947
199.8	41.37	0.101	0.955
338.7	55.16	0.010	0.104
322.0	55.16	0.035	0.290
310.9	55.16	0.051	0.405
299.8	55.16	0.068	0.501
288.7	55.16	0.086	0.596
277.6	55.16	0.090	0.690
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
Bubble point-dew point apparatus with borosilicate glass cell. Temperature measured with platinum resistance thermometer. Pressure measured with Bourdon gauge. Analysis of phases carried out using gas density measurement. Some details in source and ref. (1).		1. Pure grade Phillips Petroleum sample minimum purity 99 mole per cent. Purified by passing through alumina and then activated charcoal in dry-ice acetone bath. Final purity about 99.7 mole per cent. 2. Matheson Company sample purity 99 mole per cent. Purified as methane, final purity about 99.9 mole per cent.	
		ESTIMATED ERROR:	
		$\delta T/K = \pm 0.06$; $\delta P/\text{MPa} = \pm 0.015$; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} < 0.005$	
		REFERENCES:	
		1. Kohn, J.P.; Kurata, F. <i>Petroleum Process.</i> <u>1956</u> , 11, 57.	

COMPONENTS:

1. Methane; CH₄; [74-82-8]
2. Hydrogen sulfide; H₂S;
[7783-06-4]

ORIGINAL MEASUREMENTS:

Kohn, J.P.; Kurata, F.
Am. Inst. Chem. Engrs. J. 1958,
4, 211-217.

EXPERIMENTAL VALUES:

T/K	P/10 ⁵ Pa	Mole fraction of methane	
		in liquid ^x CH ₄	in vapor, ^y CH ₄
366.5	82.74	0.006	0.025
344.3	82.74	0.052	0.238
322.0	82.74	0.095	0.432
299.8	82.74	0.135	0.582
277.6	82.74	0.162	0.727
344.3	110.3	0.155	0.250
322.0	110.3	0.184	0.441
310.9	110.3	0.200	0.520
299.8	110.3	0.213	0.586
277.6	110.3	0.238	0.705

COMPONENTS:				ORIGINAL MEASUREMENTS:	
1. Methane; CH ₄ ; [74-82-8]				Robinson, D. B.; Lorenzo, A. P.;	
2. Hydrogen sulfide; H ₂ S; [7783-06-4]				Macrygeorgos, C. A.	
VARIABLES:				PREPARED BY:	
				C. L. Young	
EXPERIMENTAL VALUES:					
T/K	T/°F	P/MPa	P/psi	Mole fraction of methane in liquid, x_{CH_4}	Mole fraction of methane in vapor, y_{CH_4}
277.6	40	2.76	400	0.023	0.511
		6.89	1000	0.122	0.716
344.3	160	11.03	1600	0.256	0.708
		6.89	1000	0.032	0.156
		11.03	1600	0.159	0.265
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:	
Static equilibrium cell fitted with glass window. Temperature measured with copper-constantan thermocouples. Pressure measured with Bourdon gauge. Samples of gas and liquid analysed by absorbing hydrogen sulfide in potassium hydroxide solution and measuring the amount of methane volumetrically.				No details given.	
				ESTIMATED ERROR:	
				$\delta T/K = \pm 0.1$; $\delta P/\text{MPa} = \pm 1\%$;	
				$\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 0.002$ (estimated by compiler).	
				REFERENCES:	

COMPONENTS:		ORIGINAL MEASUREMENTS:					
1. Methane; CH ₄ ; [74-82-8]		Robinson, D. B.; Bailey, J. A.					
2. Hydrogen sulfide; H ₂ S; [7783-06-4]		Can. J. Chem. Engng.					
3. Carbon dioxide; CO ₂ ; [124-38-9]		1957, 35, 151-158.					
VARIABLES:		PREPARED BY:					
		C. L. Young					
EXPERIMENTAL VALUES:							
		T/K = 310.9		T/°F = 100			
		Mole fractions					
P/MPa	P/psi	in liquid			in vapor		
		x _{H₂S}	x _{CO₂}	x _{CH₄}	y _{H₂S}	y _{CO₂}	y _{CH₄}
4.14	600	0.840	0.160	0.0	0.608	0.392	0.0
		0.810	0.170	0.020	0.660	0.222	0.118
		0.905	0.069	0.026	0.667	0.206	0.127
		0.937	0.044	0.019	0.684	0.115	0.201
		0.891	0.101	0.008	0.644	0.259	0.097
		0.815	0.185	0.0	0.630	0.370	0.0
		0.870	0.122	0.008	0.630	0.317	0.053
		0.967	0.0	0.033	0.710	0.0	0.290
		0.955	0.029	0.061	0.690	0.066	0.244
		0.891	0.0	0.109	0.490	0.0	0.510
8.27	1200	0.843	0.042	0.115	0.470	0.095	0.435
		0.747	0.137	0.116	0.445	0.201	0.354
		0.683	0.213	0.104	0.418	0.278	0.304
		0.615	0.284	0.101	0.411	0.332	0.257
		0.598	0.305	0.097	0.407	0.347	0.246
		0.552	0.366	0.082	0.368	0.422	0.210
		0.416	0.458	0.066	0.348	0.498	0.155
		0.422	0.520	0.058	0.314	0.565	0.121
		0.372	0.563	0.065	0.316	0.579	0.105
		0.740	0.0	0.260	0.522	0.0	0.478
12.41	1800	0.706	0.036	0.258	0.530	0.047	0.423
		0.655	0.050	0.285	0.520	0.079	0.401
AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:			
Static equilibrium cell fitted with glass window. Temperature measured with copper-constantan thermocouples. Pressure measured with Bourdon gauge. Samples of gas and liquid analysed by absorbing hydrogen sulfide and carbon dioxide in potassium hydroxide solution and measuring the amount of methane volumetrically. Hydrogen sulfide in sample estimated by reacting with iodine solution, excess iodine being detected by the blue coloration produced with starch solution.				1. Phillips Petroleum Co. research grade sample, purity 99.7 mole per cent.			
				2. Matheson Co. sample, purity 98.8 mole per cent, 0.4 mole per cent methyl chloride, 0.3 mole per cent methyl mercaptan, 0.2 mole per cent nitrogen and 0.3 mole per cent carbon dioxide.			
				3. Purity 99.7 mole per cent.			
				ESTIMATED ERROR:			
				δT/K = ±0.1; δP/MPa = ±1%;			
				δx, δy = ±0.002 (estimated by compiler).			
				REFERENCES:			

COMPONENTS:				ORIGINAL MEASUREMENTS:			
1. Methane; CH ₄ ; [74-82-8]				Robinson, D. B.; Lorenzo, A. P.;			
2. Hydrogen sulfide; H ₂ S; [7783-06-4]				Macrygeorgos, C. A.			
3. Carbon dioxide; CO ₂ ; [124-38-9]				<i>Can. J. Chem. Engng.</i> 1959, 37, 212-217.			
VARIABLES:				PREPARED BY:			
				C. L. Young			
EXPERIMENTAL VALUES:							
T/K (T/°F)	P/MPa (P/psi)	in liquid		Mole fractions			
		x _{H₂S}	x _{CO₂}	x _{CH₄}	y _{H₂S}	y _{CO₂}	y _{CH₄}
277.6 (40)	2.76 (400)	0.977	0.0	0.023	0.489	0.0	0.511
		0.940	0.027	0.033	0.477	0.131	0.392
		0.889	0.070	0.041	0.454	0.192	0.354
		0.832	0.129	0.039	0.429	0.253	0.318
		0.819	0.148	0.033	0.423	0.352	0.225
		0.702	0.280	0.018	0.404	0.450	0.146
	6.89 (1000)	0.635	0.350	0.015	0.416	0.503	0.081
		0.597	0.403	0.0	0.365	0.635	0.0
		0.878	0.0	0.122	0.284	0.0	0.716
		0.756	0.090	0.154	0.291	0.139	0.570
		0.625	0.221	0.154	0.259	0.266	0.475
		0.412	0.414	0.174	0.229	0.353	0.418
		0.284	0.537	0.179	0.179	0.471	0.350
11.03 (1600)	0.144	0.680	0.176	0.104	0.567	0.329	
	0.0	0.867	0.133	0.0	0.655	0.345	
	0.744	0.0	0.256	0.292	0.0	0.708	
	0.643	0.063	0.294	0.311	0.087	0.602	
344.3 (160)	6.89 (1000)	0.488	0.135	0.377	0.340	0.142	0.518
		0.968	0.0	0.032	0.844	0.0	0.156
		0.936	0.031	0.033	0.836	0.061	0.103
(cont.)		0.911	0.063	0.026	0.822	0.118	0.060
		0.891	0.109	0.0	0.811	0.189	0.0
AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:			
Static equilibrium cell fitted with glass window. Temperature measured with copper-constantan thermocouples. Pressure measured with Bourdon gauge. Samples of gas and liquid analysed by absorbing hydrogen sulfide and carbon dioxide in potassium hydroxide solution and measuring the amount of methane volumetrically. Hydrogen sulfide in sample estimated by reacting with iodine solution, excess iodine being detected by the blue coloration produced with starch solution.				No details given.			
				ESTIMATED ERROR:			
				δT/K = ±0.1; δP/MPa = ±1%; δx, δy = ±0.002 (estimated by compiler).			
				REFERENCES:			

COMPONENTS:

1. Methane; CH₄; [74-82-8]
2. Hydrogen sulfide; H₂S;
[7783-06-4]
3. Carbon dioxide; CO₂; [124-38-9]

ORIGINAL MEASUREMENTS:

Robinson, D. B.; Lorenzo, A. P.;
Macrygeorgos, C. A.
Can. J. Chem. Engng.
1959, 37, 212-217.

EXPERIMENTAL VALUES:

T/K (T/°F)	P/MPa (P/psi)	Mole fractions					
		$x_{\text{H}_2\text{S}}$	in liquid		in vapor		
			x_{CO_2}	x_{CH_4}	$y_{\text{H}_2\text{S}}$	y_{CO_2}	y_{CH_4}
344.3 (160)	9.17 (1330)	0.903	0.023	0.074	0.724	0.066	0.210
		0.848	0.064	0.088	0.704	0.126	0.170
		0.770	0.123	0.107	0.699	0.162	0.139
		0.718	0.197	0.085	0.676	0.224	0.100
	11.03 (1600)	0.841	0.0	0.159	0.735	0.0	0.265
		0.818	0.018	0.164	0.737	0.027	0.236

COMPONENTS:			ORIGINAL MEASUREMENTS:					
1. Methane; CH ₄ ; [74-82-8] 2. Carbon dioxide; CO ₂ ; [124-38-9] 3. Hydrogen sulfide; H ₂ S; [7783-06-4]			Hensel, W. E. Jr.; Massoth, F. E. <i>J. Chem. Eng. Data</i> <u>1964</u> , 9, 352-356.					
VARIABLES:			PREPARED BY:					
			C. L. Young					
EXPERIMENTAL VALUES:								
			in liquid			Mole fractions in vapor		
T/K	P/psi	P/MPa	x _{CH₄}	x _{CO₂}	x _{H₂S}	y _{CH₄}	y _{CO₂}	y _{H₂S}
238.8	700	4.82	0.128	0.114	0.758	0.860	0.024	0.116
	500	3.45	0.095	0.134	0.771	0.750	0.095	0.155
	300	2.07	0.048	0.127	0.825	0.652	0.140	0.209
	700	4.82	0.172	0.471	0.357	0.677	0.226	0.097
	500	3.45	0.114	0.511	0.375	0.600	0.289	0.111
	700	4.82	0.194	0.662	0.144	0.651	0.305	0.043
	500	3.45	0.118	0.709	0.175	0.579	0.368	0.053
222.2	300	2.07	0.056	0.776	0.169	0.382	0.543	0.078
	700	4.82	0.126	0.122	0.751	0.893	0.026	0.085
	500	3.45	0.096	0.108	0.796	0.828	0.063	0.110
	300	2.07	0.058	0.130	0.812	0.798	0.085	0.117
	700	4.82	0.218	0.415	0.366	0.856	0.085	0.058
	500	3.45	0.128	0.466	0.406	0.764	0.177	0.059
	300	2.07	0.082	0.470	0.447	0.705	0.219	0.076
700	4.82	0.269	0.606	0.125	0.777	0.195	0.028	
500	3.45	0.163	0.684	0.153	0.744	0.230	0.026	
300	2.07	0.090	0.732	0.178	0.651	0.309	0.040	
AUXILIARY INFORMATION								
METHOD/APPARATUS/PROCEDURE:					SOURCE AND PURITY OF MATERIALS:			
Static equilibrium cell. Samples analysed using gas chromatography. Pressure measured using Bourdon gauges. Temperatures were measured using an alcohol thermometer which was checked against a copper-constantan thermocouple.					1 and 3. Matheson C.P. grade sample, purities 99.0 and 99.5 mole per cent, respectively.			
					2. Matheson "bone dry" grade, purity 99.95 per cent.			
					ESTIMATED ERROR: δT/K = ±1; δx, δy = ±2%.			
					REFERENCES:			

COMPONENTS:				ORIGINAL MEASUREMENTS:			
1. Methane; CH ₄ ; [74-82-8]				Zeininger, H.			
2. Nitrous oxide; N ₂ O; [10024-97-2]				<i>Chemie-Ing.-Techn.</i> <u>1972</u> , 44, 607-12.			
VARIABLES:				PREPARED BY:			
Temperature, pressure				C. L. Young			
EXPERIMENTAL VALUES:							
T/K	P/10 ⁵ Pa	Mole fraction of methane		T/K	P/10 ⁵ Pa	Mole fraction of methane	
		in liquid,	in gas,			in liquid,	in gas,
		x _{CH₄}	y _{CH₄}			x _{CH₄}	y _{CH₄}
213.15	4.2	0.0018	0.060	213.15	26.4	0.262	0.800
	4.3	0.0024	0.067		31.7	0.320	0.828
	4.6	0.003	0.097		37.7	0.413	0.830
	5.2	0.007	0.186		41.5	0.493	0.795
	5.7	0.009	0.240		42.4	0.577	0.777
	6.1	0.011	0.244	233.15	9.7	0.003	0.064
	6.4	0.014	0.283		10.0	0.006	0.095
	7.1	0.019	0.319		10.9	0.011	0.162
	7.3	0.016	0.368		11.0	0.010	0.147
	8.3	0.030	0.441		11.6	0.019	0.199
	9.1	0.030	0.494		12.4	0.017	0.205
	10.9	0.040	0.534		12.6	0.024	0.262
	11.1	0.049	0.548		13.2	0.028	0.317
	12.8	0.071	0.625		13.4	0.031	0.322
	15.0	0.087	0.653		14.2	0.032	0.285
	15.3	0.078	0.667		16.5	0.050	0.392
	17.4	0.099	0.696		21.6	0.084	0.510
	17.4	0.111	0.708		25.3	0.101	0.554
	21.0	0.154	0.753		32.1	0.151	0.633
	24.0	0.178	0.766		35.7	0.188	0.671
(cont.)							
AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:			
Static equilibrium cell stirred with a steel ball. Samples of gas and liquid phases removed and analysed by mass spectrometry. Care was taken to avoid large changes in pressure during sampling by taking small samples. Details in source.				Nitrous oxide was "pure" as determined by gas chromatography.			
				ESTIMATED ERROR: $\delta T/K = \pm 0.3$; $\delta P/10^5 Pa = \pm 0.2$; $\delta x_{CH_4} = \pm 0.011$; $\delta y_{CH_4} = \pm 0.016$.			
				REFERENCES:			

COMPONENTS:				ORIGINAL MEASUREMENTS:			
1. Methane; CH ₄ ; [74-82-8]				Zeininger, H.			
2. Nitrous oxide; N ₂ O; [10024-97-2]				<i>Chemie-Ing.-Techn.</i> 1972, 44, 607-12.			
EXPERIMENTAL VALUES:							
T/K	P/10 ⁵ Pa	Mole fraction of methane		T/K	P/10 ⁵ Pa	Mole fraction of methane	
		in liquid, ^x CH ₄	in gas, ^y CH ₄			in liquid, ^x CH ₄	in gas, ^y CH ₄
233.15	41.7	0.256	0.673	253.15	33.7	0.098	0.398
	43.8	0.265	0.709		36.6	0.098	0.398
	46.2	0.411	0.635		39.9	0.122	0.436
253.15	18.5	0.003	0.029	43.8	0.143	0.437	
	23.3	0.026	0.202	44.8	0.147	0.444	
	27.8	0.050	0.308	50.5	0.158	0.430	
	30.8	0.072	0.359	52.7	0.240	0.411	

<p>COMPONENTS:</p> <p>1. Methane; CH₄; [74-82-8]</p> <p>2. Sulfur Dioxide; SO₂; [7446-09-5]</p>	<p>ORIGINAL MEASUREMENTS:</p> <p>Dean, M. R.; Walls, W. S. <i>Ind. Eng. Chem.</i> <u>1947</u>, <i>39</i>, 1049-1051.</p>																								
<p>VARIABLES:</p> <p>Temperature, pressure</p>	<p>PREPARED BY:</p> <p>C. L. Young</p>																								
<p>EXPERIMENTAL VALUES:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">T/K</th> <th style="text-align: left;">P/MPa</th> <th style="text-align: left;">Mole fraction of methane in liquid, x_{CH_4}</th> <th style="text-align: left;">in gas, y_{CH_4}</th> </tr> </thead> <tbody> <tr> <td>301.48</td> <td>3.55</td> <td>0.0348</td> <td>0.839</td> </tr> <tr> <td>301.48</td> <td>1.74</td> <td>0.0152</td> <td>0.708</td> </tr> <tr> <td>241.10</td> <td>3.55</td> <td>0.0326</td> <td>0.987</td> </tr> <tr> <td>241.10</td> <td>1.90</td> <td>0.0176</td> <td>0.979</td> </tr> <tr> <td>241.10</td> <td>1.72</td> <td>0.0165</td> <td>0.972</td> </tr> </tbody> </table>		T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in gas, y_{CH_4}	301.48	3.55	0.0348	0.839	301.48	1.74	0.0152	0.708	241.10	3.55	0.0326	0.987	241.10	1.90	0.0176	0.979	241.10	1.72	0.0165	0.972
T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in gas, y_{CH_4}																						
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<p>AUXILIARY INFORMATION</p>																									
<p>METHOD/APPARATUS/PROCEDURE:</p> <p>Twin steel static cell. Pressure and volume of cell varied by introducing mercury. Pressure measured with Bourdon gauge. Analysis of samples of both gas and liquid phases carried out by Orsat gas analysis. Details in source.</p>	<p>SOURCE AND PURITY OF MATERIALS:</p> <ol style="list-style-type: none"> Phillips Petroleum sample, purity about 99.5 mole per cent. Refrigeration grade sample from Virginia Smelting Co. Purity about 99.6 mole per cent. <p>ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/MPa = \pm 0.01$; $\delta x_{\text{CH}_4} = \pm 0.0003$; $\delta y_{\text{CH}_4} = \pm 0.002$ (estimated by compiler).</p> <p>REFERENCES:</p>																								