

COMPONENTS:

1. Methane; CH₄; [74-82-8]
2. 2-Methylpropane (*isobutane*);
C₄H₁₀; [75-28-5]

EVALUATOR:

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CRITICAL EVALUATION:

The most extensive set of data on this system are those of Barsuk *et al.* (1). These data which cover the temperature range 198 to 377 K and are in reasonable agreement with those of Olds *et al.* (2) at 310.9 K and 344.25 K. There are significant discrepancies between the two sets of data at 377.6 K and near the critical region at the low temperatures.

References

1. Barsuk, S. D.; Skripka, V. G.; Benyaminovich, O. A.
Gazov. Prom. 1970, *15*, 38.
2. Olds, R. H.; Sage, B. H.; Lacey, W. N.
Ind. Eng. Chem. 1942, *34*, 1008.

T/K (T/°F)			Wt. fraction of methane in liquid, in vapor,		Mole fraction of methane in liquid, in vapor, x_{CH_4} y_{CH_4}	
310.9 (100)	0.55 0.69 1.03 1.38 2.07 2.76 3.45 4.14 4.83 5.52 6.21 6.89 7.58 8.27 8.96 9.65 10.34 11.03 11.58	80 100 150 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1679	0.00077 0.00311 0.00843 0.01400 0.02586 0.03793 0.05076 0.06434 0.07870 0.09390 0.1098 0.1266 0.1449 0.1648 0.1870 0.2123 0.2430 0.2858 0.3800	0.0248 0.0929 0.2049 0.2869 0.4031 0.4646 0.5076 0.5380 0.5594 0.5740 0.5826 0.5859 0.5845 0.5785 0.5673 0.5498 0.5233 0.4810 0.3800	0.00278 0.01117 0.02985 0.04888 0.08766 0.1249 0.1622 0.1993 0.2362 0.2728 0.4273 0.3441 0.3802 0.4166 0.4543 0.4938 0.5374 0.5916 0.6893	0.0843 0.2704 0.4826 0.5929 0.7097 0.7585 0.7886 0.8082 0.8213 0.8298 0.8348 0.8366 0.8358 0.8324 0.8259 0.8155 0.7989 0.7703 0.6893
344.3 (160)	1.38 2.07	200 300	0.00359 0.01345	0.0492 0.1468	0.01287 0.04702	0.1577 0.3838
(cont.)						
AUXILIARY INFORMATION						
METHOD/APPARATUS/PROCEDURE: PVT cell charged with mixture of known composition. Pressure measured with pressure balance. Temperature measured with resistance thermometer. Bubble point and dew point determined for various compositions from discontinuity in PV isotherm. Coexisting liquid and gas phase properties determined by graphical means. Details in ref. (1).				SOURCE AND PURITY OF MATERIALS: 1. Crude sample treated for removal of higher alkanes, carbon dioxide and water vapor. Final purity 99.9 mole per cent. 2. Phillips Petroleum sample, purity at least 99.97 mole per cent.		
				ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/MPa = \pm 0.007$; $\delta x_{CH_4} = \pm 0.001$; $\delta y_{CH_4} = \pm 0.005$ (estimated by compiler).		
				REFERENCES: 1. Sage, B. H.; Lacey, W. N. <i>Trans. Am. Inst. Mining Met. Engrs.</i> <u>1940</u> , 136, 136.		

COMPONENTS:			ORIGINAL MEASUREMENTS:			
1. Methane; CH ₄ ; [74-82-8]			Olds, R. H.; Sage, B. H.;			
2. 2-Methylpropane (<i>isobutane</i>) C ₄ H ₁₀ ; [75-28-5]			Lacey, W. N.			
			<i>Ind. Eng. Chem.</i>			
			1942, 34, 1008-1013.			
EXPERIMENTAL VALUES:						
T/K (T/°F)	P/MPa	p/psi	Wt. fraction of methane		Mole fraction of methane	
			in liquid,	in vapor,	in liquid, x_{CH_4}	in vapor, y_{CH_4}
344.3 (160)	2.76	400	0.02381	0.2139	0.08112	0.4962
	3.45	500	0.03481	0.2633	0.1155	0.5640
	4.14	600	0.04645	0.2998	0.1499	0.6078
	4.83	700	0.05875	0.3262	0.1843	0.6367
	5.52	800	0.07200	0.3454	0.2192	0.6563
	6.21	900	0.08624	0.3587	0.2546	0.6694
	6.89	1000	0.1020	0.3677	0.2913	0.6779
	7.58	1100	0.1189	0.3683	0.3281	0.6785
	8.27	1200	0.1381	0.3631	0.3671	0.6736
	8.96	1300	0.1623	0.3477	0.4122	0.6586
377.6 (220)	9.65	1400	0.1980	0.3156	0.4719	0.6253
	10.05	1457	0.2580	0.2580	0.5572	0.5572
	2.76	400	0.00871	0.0472	0.03082	0.1520
	3.45	500	0.01912	0.0876	0.06590	0.2579
	4.14	600	0.03030	0.1182	0.1016	0.3267
	4.83	700	0.04160	0.1387	0.1358	0.3682
	5.52	800	0.05460	0.1521	0.1729	0.3937
	6.21	900	0.07030	0.1580	0.2149	0.4045
	6.89	1000	0.09370	0.1488	0.2723	0.3875
	7.14	1035	0.1230	0.1230	0.3367	0.3367

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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}
198.15	4.9	0.092	0.993
	9.8	0.184	0.996
	19.6	0.354	0.998
	29.4	0.523	0.998
	39.2	0.698	0.997
	49.0	0.826	0.995
	53.4	0.981	0.981
213.15	4.9	0.074	0.981
	9.8	0.141	0.988
	19.6	0.269	0.993
	29.4	0.394	0.996
	39.2	0.516	0.995
	49.0	0.635	0.993
	58.8	0.755	0.991
	68.6	0.890	0.973
233.15	4.9	0.058	0.948
	9.8	0.111	0.966
	19.6	0.201	0.980
	29.4	0.293	0.985
	39.4	0.382	0.986
	49.0	0.472	0.985
	58.8	0.562	0.983
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE: Recirculating vapor flow apparatus fitted with magnetic stirrer. Temperature measured with platinum resistance thermometer. Liquid and gas phases analysed by gas chromatography. Details in source and ref. (1).		SOURCE AND PURITY OF MATERIALS: Both samples had purity of 99.5 mole per cent.	
		ESTIMATED ERROR: $\delta T/K = \pm 0.1$; $\delta P/10^5 \text{Pa} = \pm 0.4$; $\delta x_{\text{CH}_4}, \delta y_{\text{CH}_4} = \pm 3\%$	
		REFERENCES: 1. Skripka, V.G.; Barsuk, S.D.; Nikitina, I.E.; Benyaminovich, O.A. <i>Gazov. Prom.</i> <u>1964</u> , 14, 41.	

COMPONENTS:

ORIGINAL MEASUREMENTS:

1. Methane; CH₄; [74-82-8]
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Benyaminovich, O.A.
Gazov. Prom. 1970, *15*, 38-41.

EXPERIMENTAL VALUES:

T/K	P/10 ⁵ Pa	Mole fraction of methane	
		in liquid, x_{CH_4}	in vapor, y_{CH_4}
233.15	68.6	0.651	0.978
	78.5	0.745	0.971
	88.3	0.850	0.952
	91.2	0.908	0.908
253.15	4.9	0.038	0.670
	9.8	0.080	0.894
	19.6	0.155	0.946
	29.4	0.230	0.963
	39.2	0.306	0.967
	49.0	0.377	0.966
	58.8	0.449	0.964
	68.6	0.520	0.962
	78.5	0.593	0.957
	88.3	0.670	0.948
	98.1	0.754	0.924
106.5	0.856	0.856	
273.15	4.9	0.024	-
	9.8	0.060	0.829
	19.6	0.132	0.899
	29.4	0.200	0.921
	39.2	0.268	0.930
	49.0	0.331	0.935
	58.8	0.393	0.938
	68.6	0.457	0.939
	78.5	0.521	0.937
	88.3	0.586	0.931
	98.1	0.651	0.918
107.9	0.714	0.889	
114.9	0.810	0.810	
293.15	4.9	0.012	0.340
	9.8	0.043	0.741
	19.6	0.102	0.827
	29.4	0.163	0.860
	39.2	0.222	0.880
	49.0	0.281	0.890
	58.8	0.339	0.898
	68.6	0.396	0.899
	78.5	0.454	0.896
	88.3	0.512	0.889
	98.1	0.574	0.877
107.9	0.638	0.854	
117.7	0.725	0.778	
117.9	0.750	0.750	
310.95	4.9	0.002	0.030
	9.8	0.030	0.485
	19.6	0.084	0.707
	29.4	0.140	0.770
	39.2	0.194	0.805
	49.0	0.249	0.824
	58.8	0.303	0.834
	68.6	0.357	0.835
	78.5	0.412	0.833
	88.3	0.467	0.824
	98.1	0.524	0.807
107.9	0.603	0.760	
112.0	0.690	0.690	

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ORIGINAL MEASUREMENTS:

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Benyaminovich, O.A.

Gazov. Prom. 1970, 15, 38-41.

EXPERIMENTAL VALUES:

T/K	P/10 ⁵ Pa	Mole fraction of methane	
		in liquid, x_{CH_4}	in vapor, y_{CH_4}
344.25	14.7	0.018	0.231
	19.6	0.045	0.377
	29.4	0.096	0.531
	39.2	0.145	0.605
	49.0	0.196	0.645
	58.8	0.248	0.670
	68.6	0.301	0.680
	78.5	0.358	0.676
	88.3	0.425	0.654
377.55	97.0	0.558	0.558
	24.5	0.018	0.111
	29.4	0.044	0.200
	39.2	0.096	0.306
	49.0	0.150	0.377
	58.8	0.208	0.405
	68.6	0.316	0.358
	68.9	0.337	0.337