COMPONENTS:

1. Methane; CH_4; [74-82-8]
2. Methylbenzene; C_7H_8; [108-88-3]

ORIGINAL MEASUREMENTS:

Elbishlawi, M.; Spencer, J. R.;

Ind. Eng. Chem., 1951, *43*, 1811-5.

VARIABLES:

Pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	P/MPa	Mole fraction of methane in liquid, x	Mole fraction of methane in vapor, y
338.71	6.89	0.017	0.973
	20.69	0.052	0.987
	34.48	0.085	0.990
	48.28	0.120	0.990
	68.95	0.252	0.987
	103.43	0.325	0.985
	137.90	0.393	0.980
	172.38	0.452	0.976
	206.85	0.505	0.971
	241.3	0.554	0.962
	275.8	0.604	0.945
	310.3	0.664	0.919
	344.8	0.680	0.910
	351.7	0.700	0.895
	365.4	0.729	0.870

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Equilibrium cell fitted with vapor sampling port. Calibrated mercury injection pump. Details in source. Components charged into cell, pressure raised by injection of mercury. Cell rocked to establish equilibrium. Portions of mercury withdrawn and curve relating change in volume to pressure obtained. Bubble point established from change in slope. Vapor phase sample analysed. Details in source.

SOURCE AND PURITY OF MATERIALS:

1. Phillips Petroleum Co. pure sample, purity 99 mole per cent: impurities ethane (~0.5 mole per cent) and nitrogen (~0.3 mole per cent) and a trace of carbon dioxide.
2. Commercial sample purified by distillation.

ESTIMATED ERROR:

$\delta T/K = \pm 0.7$; $\delta P/MPa = \pm 0.01$; $\delta x/x, \delta y/y = \pm 0.001$ (estimated by compiler).

REFERENCES:

COMPONENTS:

1. Methane; CH_4; [74-82-8]
2. Methylbenzene, (Toluene); C_7H_8; [108-88-3]

ORIGINAL MEASUREMENTS:

Chang, H.O.; Kobayashi, R.

J. Chem. Engng. Data. 1967, *12*, 517-520.

VARIABLES:

Temperature, pressure

PREPARED BY:

C.L. Young

EXPERIMENTAL VALUES:

T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in vapor, y_{CH_4}
255.4	0.6895	0.0193	0.9979
	1.379	0.0390	0.9988
	2.758	0.0740	0.9991
	4.137	0.1120	0.9991
	5.516	0.1495	0.9991
	6.895	0.1861	0.9990
	8.618	0.2230	0.9990
	10.34	0.2660	0.9989
	12.07	0.3040	0.9986
	13.79	0.3500	0.9982
	17.24	0.4330	0.9973
	20.68	0.4950	0.9959
	24.13	0.5400	0.9937
244.3	0.6895	0.0209	0.9988
	1.379	0.0410	0.9993
	2.758	0.0815	0.9995
	4.137	0.1211	0.9996
	5.516	0.1609	0.9996
	6.895	0.1989	0.9995
	8.618	0.2465	0.9994
	10.34	0.2900	0.9993
	12.07	0.3300	0.9991
	13.79	0.3650	0.9989
	17.24	0.4450	0.9983

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Recirculating vapor flow apparatus with magnetic vapor pump. Pressure measured with Bourdon gauge and temperature with thermopile. Samples of both phases analysed using gas chromatography with flame ionization detector. Details in ref. (1) and (2).

SOURCE AND PURITY OF MATERIALS:

1. Matheson Co. sample, purity 99.99 mole per cent.
2. Phillips Petroleum sample, purity 99.96 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta P/MPa = \pm 0.015$; $\delta(1-x_{CH_4})$, $\delta(1-y_{CH_4}) = \pm 5\%$ or less.

REFERENCES:

1. Chang, H.L.; *Ph.D. Thesis.* Rice University, Houston, Texas, 1966,
2. Chang, H.L.; Hunt, L.J. and Kobayashi, R. *Am. Inst. Chem. Engnrs. J.* 1965, *12*, 1212.

COMPONENTS:

1. Methane; CH_4; [74-82-8]

2. Methylbenzene, (Toluene); C_7H_8; [108-88-3]

ORIGINAL MEASUREMENTS:

Chang, H.O.; Kobayashi, R.

J. Chem. Engng. Data. 1967, *12*, 517-520.

EXPERIMENTAL VALUES:

T/K	P/MPa	Mole fraction of methane in liquid, x_{CH_4}	in vapor, y_{CH_4}
244.3	20.68	0.5100	0.9974
	24.13	0.5650	0.9959
233.2	0.6895	0.0230	0.9994
	1.379	0.0452	0.9997
	2.758	0.0867	0.9998
	4.137	0.1296	0.9998
	5.516	0.1729	0.9998
	6.895	0.2150	0.9998
	8.618	0.2628	0.9997
	10.34	0.3099	0.9996
	12.07	0.3540	0.9995
	13.79	0.3951	0.9994
	17.24	0.4650	0.9990
	20.68	0.5315	0.9984
	24.13	0.5820	0.9974
222.0	0.6895	0.0251	0.99970
	1.379	0.0499	0.99983
	2.758	0.0972	0.99989
	4.137	0.1425	0.99990
	5.516	0.1920	0.99990
	6.895	0.2328	0.99988
	8.618	0.2840	0.99985
	10.34	0.3300	0.99981
	12.07	0.3760	0.99975
	13.79	0.4198	0.99968
	17.24	0.4979	0.99948
	20.68	0.5670	0.99911
	24.13	0.6251	0.99840
210.9	0.6895	0.0287	0.99988
	1.379	0.0551	0.99993
	2.758	0.1061	0.99995
	4.137	0.1605	0.99995
	5.516	0.2051	0.99995
	6.895	0.2510	0.99994
	8.618	0.3054	0.99993
	10.34	0.3535	0.99991
	12.07	0.4015	0.99989
	13.79	0.4500	0.99985
	17.24	0.5300	0.99975
	20.68	0.6012	0.99955
	24.13	0.6619	0.99913
199.8	0.6895	0.0322	0.99996
	1.379	0.0621	0.99997
	2.758	0.1184	0.99998
	4.137	0.1751	0.99998
	5.516	0.2279	0.99998
	6.895	0.2745	0.99998
	8.618	0.3301	0.99997
	10.34	0.3832	0.99996
	12.07	0.4350	0.99995
	13.79	0.4820	0.99994
	17.24	0.5710	0.99989
	20.68	0.6449	0.99979
	24.13	0.7076	0.99955

COMPONENTS:

1. Methane; CH_4; [74-82-8]
2. Methylbenzene; C_7H_8; [108-88-3]

ORIGINAL MEASUREMENTS:

Savvina, Ya. D.
Tr. Vses. Nauchno-Issled. Inst. Prirodn. Gazov., 1962, *17/25*, 185-196.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K (t/°C)	P/kgcm^{-3}	P/Mpa	K-value methane	K-value methylbenzene
313.2	20	1.96	18.75	0.006
(40)	50	4.90	8.36	0.005
	100	9.81	4.64	0.006
	150	14.7	3.29	0.011
	200	19.6	2.60	0.014
	250	24.5	2.17	0.027
	300	29.4	1.86	0.058
	350	34.3	1.62	0.108
	380	37.3	1.49	0.182
	410	40.2	1.35	0.289
	430	42.2	1.20	0.485
	435	42.7	1.10	0.685
333.2	20	1.96	19.43	0.009
(60)	50	4.90	8.86	0.008
	100	9.81	4.83	0.010
	150	14.7	4.43	0.014
	200	19.6	2.65	0.024
	250	24.5	2.20	0.041
	300	29.4	1.86	0.069
	350	34.3	1.58	0.136
	370	36.3	1.48	0.193
	390	38.2	1.39	0.268
	410	40.2	1.25	0.418
	419	41.1	1.09	0.706
353.2	20	1.96	20.54	0.014
(80)	50	4.90	9.43	0.011

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Values appear to be determined using apparatus described in ref.(1)

SOURCE AND PURITY OF MATERIALS:

No details given.

ESTIMATED ERROR:

REFERENCES:

1. Savvina, Ya. D.; Velikovskii, A. S. *Tr. Vses. Nauchno-Issled. Inst. Prirodn. Gazov.*, 1962, *17/25*, 163.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. Methylbenzene; C_7H_8; [108-88-3]	Savvina, Ya. D. *Tr. Vses. Nauchno-Issled. Inst. Prirodn. Gazov.*, 1962, *17/25*, 185-196.

EXPERIMENTAL VALUES:

T/K (t/°C)	P/kgcm^{-3}	P/Mpa	K-value methane	K-value methylbenzene
353.2	100	9.81	5.02	0.014
(80)	150	14.7	3.46	0.023
	200	19.6	2.59	0.035
	250	24.5	2.10	0.055
	300	29.4	1.80	0.089
	350	34.3	1.54	0.162
	380	37.3	1.37	0.289
	390	38.2	1.31	0.349
	400	39.2	1.20	0.500
	404	39.6	1.12	0.659
373.2	20	1.96	21.75	0.021
(100)	50	4.90	9.75	0.016
	100	9.81	4.96	0.021
	150	14.7	3.32	0.031
	200	19.6	2.50	0.045
	250	24.5	2.06	0.069
	300	29.4	1.75	0.109
	330	32.4	1.58	0.165
	360	35.3	1.41	0.258
	380	37.3	1.24	0.447
	386	37.9	1.12	0.642
393.2	20	1.96	24.25	0.031
(120)	50	4.90	9.98	0.024
	100	9.81	4.87	0.031
	150	14.7	3.16	0.041
	200	19.6	2.44	0.062
	250	24.5	2.02	0.081
	300	29.4	1.69	0.147
	310	30.4	1.63	0.172
	330	32.4	1.52	0.209
	355	34.8	1.35	0.325
	370	36.3	1.16	0.577
423.2	20	1.96	19.24	0.041
(150)	50	4.90	9.49	0.035
	100	9.81	4.56	0.041
	150	14.7	3.09	0.055
	200	19.6	2.40	0.073
	250	24.5	1.96	0.105
	300	29.4	1.64	0.178
	330	32.4	1.44	0.290
	345	33.8	1.25	0.472
	350	34.3	1.13	0.676

COMPONENTS:

1. Methane; CH_4; [74-82-8]

2. Methylbenzene; C_7H_8; [108-88-3]

ORIGINAL MEASUREMENTS:

Lin, Y.-N.; Hwang, S.-C.; Kobayashi, R.
J. Chem. Engng. Data 1978, *23*, 231-4.
(Same data in *Gas Proc. Assoc. Proc. 57, Ann. Conv.*, p.12-17.)

VARIABLES:

Temperature, pressure

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}
277.59	40.00	50.0	0.345	0.009669	0.99613
		100.0	0.689	0.01924	0.99785
		200.0	1.379	0.03647	0.99687
		400.0	2.758	0.06838	0.999105
		600.0	4.137	0.1004	0.999199
		800.0	5.516	0.1369	0.999045
		1000	6.895	0.1585	0.99875
		1250	8.618	0.1980	0.99830
		1500	10.34	0.2307	0.99773
		1750	12.07	0.2691	0.99692
		2000	13.79	0.2881	0.99581
		2500	17.24	0.3352	0.99266
		3000	20.68	0.3733	-
		3500	24.13	0.4015	-
		4000	27.58	0.4381	-
		4500	31.03	0.4736	-
		5000	34.47	0.5130	-
		5500	37.92	0.5530	-
		6000	41.37	0.5903	-
		7070†	48.75	0.8259	-
255.37	0.00	50.0	0.345	0.01158	0.999086
		100.0	0.689	0.02084	0.999565

† critical pressure

(cont.)

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Liquid phase compositions determined using a recirculating vapor flow apparatus fitted with magnetic pump as described in ref. (1). Equilibrium cell fitted with glass windows. Pressure measured with Bourdon pressure gauges and temperature measured with a platinum resistance thermometer. Liquid samples analysed by GC. Gas phase concentration determined using elution technique as given in ref. (2).

SOURCE AND PURITY OF MATERIALS:

1. Matheson ultra-high purity sample, at least 99.97 mole per cent methane.

2. Phillips Petroleum Company research grade sample, purity 99.94 mole per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.01$; $\delta p/psi = \pm 1\%$ of full scale for gauges of range 0-1000, 0-3000, 0-6000 and 1-10000; $\delta x = \pm 2\%$ or 0.005; $\delta y = \pm 2\%$ or 0.00005 whichever is the largest.

REFERENCES:

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

2. Hwang, S.-C.; Lin, H.-M.; Chappelear, P. S.; Kobayashi, R. *J. Chem. Engng. Data* 1976, *21*, 493.

COMPONENTS:

1. Methane; CH_4; [74-82-8]

2. Methylbenzene; C_7H_8; [108-88-3]

ORIGINAL MEASUREMENTS:

Lin, Y.-N.; Hwang, S.-C.; Kobayashi, R.
J. Chem. Engng. Data 1978, *23*, 231-4.
(Same data in *Gas Proc. Assoc. Proc. 57, Ann. Conv.*, p.12-17.)

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}
255.37	0.00	200.0	1.379	0.04147	0.999710
		400.0	2.758	0.08100	0.999819
		600.0	4.137	0.1225	0.999823
		800.0	5.516	0.1622	0.999767
		1000	6.895	0.1984	0.999589
		1250	8.618	0.2445	0.999250
		1500	10.34	0.2763	0.99877
		1750	12.07	0.3196	0.99792
		2000	13.79	0.3414	0.99667
		2500	17.24	0.3782	0.99351
		3000	20.68	0.4106	-
		3500	24.13	0.4352	-
		4000	27.58	0.4532	-
		4500	31.03	0.4673	-
		5000	34.47	0.4763	-
		5500	37.92	0.4960	-
		6000	41.37	0.5204	-
233.15	-40.00	100.0	0.689	0.02531	
		200.0	1.379	0.04471	
		400.0	2.758	0.08924	
		600.0	4.137	0.1326	
		800.0	5.516	0.1833	
		1000	6.895	0.1958	
		1250	8.618	0.2300	
		1500	10.34	0.2542	
		1750	12.07	0.2744	
		2000	13.79	0.3003	
		2500	17.24	0.3184	
		3000	20.68	0.3495	
		3500	24.13	0.3613	
		4000	27.58	0.3789	
		4500	31.03	0.4033	
		5000	34.47	0.4170	
		5500	37.92	0.4417	
		6000	41.37	0.4474	
188.71	-120.00	100.0	0.689	0.04179	
		200.0	1.379	0.08919	
		400.0	2.758	0.1861	
		600.0	4.137	0.2595	
		630.0	4.344	0.2652	
		630.0	4.344	0.9898*	
		1000	6.895	0.2541	
		1000	6.895	0.9880*	
		3000	20.68	0.2459	
		3000	20.68	0.9869*	

† critical pressure

* methane-rich liquid phase

COMPONENTS:

1. Methane; CH_4; [74-82-8]

2. Methylbenzene; C_7H_8; [108-88-3]

ORIGINAL MEASUREMENTS:

Lin, H-M.; Sebastian, H.M.; Simnick, J.J.; Chao, K-C.

J. Chem. Engng. Data, 1979, *24*, 146-9.

VARIABLES:

Temperature, pressure

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

T/K	p/atm	p/MPa	Mole fraction of methane in liquid, x_{CH_4}	in gas, y_{CH_4}
422.5	19.95	2.021	0.0353	0.8426
	29.88	3.028	0.0545	0.8808
	50.77	5.144	0.0954	0.9100
	99.08	10.039	0.1949	0.9231
	150.66	15.266	0.2879	0.9148
	200.00	20.265	0.3858	0.8981
	246.95	25.022	0.4897	0.8493
462.1	20.03	2.030	0.0280	0.6724
	30.10	3.050	0.0486	0.7499
	49.70	5.036	0.0884	0.8144
	98.83	10.014	0.1897	0.8606
	150.00	15.199	0.2850	0.8593
	199.61	20.225	0.4106	0.8257
	227.37	23.038	0.4925	0.7848
	249.40	25.270	0.6332	0.6780

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

Flow apparatus with both liquid and gas components continually passing into a mixing tube and then into a cell in which phases separated under gravity. Liquid sample removed from bottom of cell and vapor sample from top of cell. Composition determined by gas chromatography. Details in source and ref. (1).

SOURCE AND PURITY OF MATERIALS:

1. Matheson sample with purity better than 99 mole per cent.

2. Mallinckrodt Co. sample. Analytical reagent with 1.0°C boiling point range.

ESTIMATED ERROR:

$\delta T/K = \pm 0.2$; $\delta p/MPa \leqslant \pm 0.03$;

δx_{CH_4}, δy_{CH_4} = ±2%

REFERENCES:

1. Simnick, J.J.; Lawson, C.C.; Lin, H-M.; Chao, K-C.; *Am. Inst. Chem. Engnrs. J.*, 1977, *23*, 469.

COMPONENTS:	ORIGINAL MEASUREMENTS:
1. Methane; CH_4; [74-82-8] 2. Methylbenzene; C_7H_8; [108-88-3]	Lin, H.-M.; Sebastian, H. M.; Simnick, J. J.; Chao, K.-C. *J. Chem. Engng. Data* 1979, *24*, 146-9.

T/K	p/atm	p/MPa	Mole fraction of methane in liquid, x_{CH_4}	in gas, y_{CH_4}
500.8	19.90	2.016	0.0179	0.3668
	29.56	2.995	0.0379	0.5283
	49.91	5.057	0.0841	0.6712
	99.79	10.111	0.1964	0.7479
	147.28	14.923	0.3098	0.7439
	166.47	16.868	0.3807	0.7120
543.2	30.37	3.077	0.0219	0.2476
	49.90	5.056	0.0718	0.4222
	69.57	7.049	0.1246	0.5039
	99.44	10.076	0.2155	0.5493
	113.60	11.511	0.2736	0.5416

COMPONENTS:

1. Methane; CH_4; [74-82-8]

2. Methylbenzene (toluene); C_7H_8; [108-88-3]

ORIGINAL MEASUREMENTS:

Legret, D.; Richon, D.; Renon, H.

J. Chem. Engng. Data

1982, *27*, 165-169.

VARIABLES:

PREPARED BY:

C. L. Young

EXPERIMENTAL VALUES:

$T/K = 313.2$

$10^{-5}p/Pa$	Mole fraction of methane in liquid, x_{CH_4}	in vapor, y_{CH_4}
101.0	0.237	0.991
	0.234	-
152.1	0.316	0.991[a]
	0.321	-
196.4	0.383	0.990
250.3	0.447	0.983[a]
300.1	0.524	0.971
	0.520	-
349.2	0.592	0.954
380.0	-	0.919
387.5	0.653	0.911
	0.652	-
399.5	-	0.894
405.9	-	0.875
408.0	0.679	-
409.3	-	0.864
414.9	0.701	0.837
416.9	-	0.835
420.1	0.725	0.818
	-	0.822
424.2	0.733	0.789
424.5	0.744	0.784

[a] interpolated values.

AUXILIARY INFORMATION

METHOD/APPARATUS/PROCEDURE:

High pressure static cell fitted with magnetic stirrer. Pressure measured with transducer calibrated by comparison with Heise gauges which were checked periodically calibrated against a dead weight tester. Temperature measured with K type iron-constantan thermo-couples. Sampling microcell used and samples analysed using gas chromatography. Details in ref. (1).

SOURCE AND PURITY OF MATERIALS:

1. Air-Gas sample, purity at least 99.95 volume per cent.

2. Merck sample, stated purity by GC of 99.5 per cent.

ESTIMATED ERROR:

$\delta T/K = \pm 0.25$; $\delta p/MPa = \pm 0.1$; $\delta x_{CH_4} = \pm 0.01$; $\delta y_{CH_4} = \pm 0.005$.

REFERENCES:

1. Legret, D.; Richon, D.; Renon, H. *Am. Inst. Chem. Eng. J.* 1981, *27*, 203.