

## COMPONENTS:

1. Methane;  $\text{CH}_4$ ; [74-82-8]
2. Ethene;  $\text{C}_2\text{H}_4$ ; [74-85-1]

## EVALUATOR:

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March 1982

## EVALUATION:

This system has been investigated by several workers. The data of Miller, Kidnay and Hiza (1) are classified as recommended and cover the temperature range 150 to 190 K. These data are in good agreement with the less extensive data of Hsi and Lu (2), the latter data are classified as tentative. The data of Volova (3) are in fair agreement with those of Miller *et al.* (1) but the isotherms at 143 K and 127 K are of questionable accuracy. The limited data of Sagara *et al.* (4) in the temperature range 198 to 248 K are not directly comparable with those of Miller *et al.* (1) but are classified as tentative.

The data of Guter *et al.* (5) are not considered here as the experimental data were presented in small graphical form and are rejected.

References

1. Miller, R. C.; Kidnay, A. J.; Hiza, M. J.  
*J. Chem. Thermodyn.*, 1977, *9*, 167.
2. Hsi, C.; Lu, B. C.-Y.  
*Can. J. Chem. Eng.*, 1971, *49*, 140.
3. Volova, L. M.  
*Zh. Fiz. Khim.*, 1940, *14*, 268.
4. Sagara, H.; Arai, Y.; Saito, S.  
*J. Chem. Eng. Japan*, 1972, *5*, 339.
5. Guter, M.; Newitt, D. M.; Ruhemann, M.  
*Proc. Roy. Soc. London*, 1940, *A176*, 140.

EXPERIMENTAL VALUES:			Mole fraction of methane	
T/K (T/°F)	P/psi	P/MPa	in liquid, $x_{CH_4}$	in vapor, $y_{CH_4}$
148.1	30.50	0.2103	0.1523	0.8969
(-193.1)	36.00	0.2482	0.1798	0.9070
	42.10	0.2903	0.2262	0.9240
	45.80	0.3158	0.2419	0.9294
	45.55	0.3141	0.2442	0.9374
	59.90	0.4130	0.3423	0.9510
	60.20	0.4151	0.3448	0.9503
	60.00	0.4137	0.3483	0.9510
	65.35	0.4506	0.4004	0.9553
	72.00	0.4964	0.4329	0.9619
	71.85	0.4954	0.4359	0.9593
	78.00	0.5378	0.4938	0.9668
	79.25	0.5464	0.5034	0.9690
	85.00	0.5861	0.5522	0.9716
	87.00	0.5998	0.5759	0.9730
	89.00	0.6136	0.5812	0.9694
	89.30	0.6157	0.5911	0.9733
	92.50	0.6378	0.6197	0.9765
	99.05	0.6829	0.6814	0.9810
	105.00	0.7239	0.7483	0.9832
	114.80	0.7915	0.8194	0.9894
	123.13	0.8490	0.8921	0.9937
(cont.)				
AUXILIARY INFORMATION				
METHOD/APPARATUS/PROCEDURE:			SOURCE AND PURITY OF MATERIALS:	
<p>Recirculating vapor flow apparatus constructed of 100 ml Jerguson gauge.</p> <p>Temperature measured using copper-constantan thermocouples.</p> <p>Pressure measured with Bourdon gauge.</p> <p>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.</p> <p>Helium was used as a carrier gas.</p>			<p>1. Matheson research grade, purity 99.99 mole per cent.</p> <p>2. Matheson research grade, purity 99.98 mole per cent.</p>	
			ESTIMATED ERROR:	
			<p><math>\delta T/K = \pm 0.02</math>; <math>\delta P/MPa \sim \pm 0.005</math>;</p> <p><math>\delta x_{CH_4}, \delta y_{CH_4} = \pm 1\%</math> (estimated by compiler).</p>	
			REFERENCES:	

## COMPONENTS:

1. Methane; CH<sub>4</sub>; [74-82-8]
2. Ethene; C<sub>2</sub>H<sub>4</sub>; [74-85-1]

## ORIGINAL MEASUREMENTS:

Hsi, C.; Lu, B. C.-Y.  
*Can. J. Chem. Eng.*  
 1971, 49, 140-143.  
 (Supplementary data)

## VARIABLES:

## PREPARED BY:

C. L. Young

COMPONENTS:			ORIGINAL MEASUREMENTS:	
1. Methane; CH <sub>4</sub> ; [74-82-8]			Hsi, C.; Lu, B. C.-Y.	
2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1]			<i>Can. J. Chem. Eng.</i> 1971, 49, 140-143. (Supplementary data)	
EXPERIMENTAL VALUES:			Mole fraction of methane	
T/K (T/°F)	P/psi	P/MPa	in liquid, $x_{CH_4}$	in vapor, $y_{CH_4}$
148.1				
(-193.1)	136.30	0.9398	0.9851	0.9975
159.2	42.25	0.2913	0.1284	0.8263
(-173.1)	47.00	0.3241	0.1469	0.8402
	50.50	0.3482	0.1629	0.8572
	64.24	0.4429	0.2153	0.8930
	67.05	0.4623	0.2335	0.8934
	76.80	0.5295	0.2726	0.9150
	86.76	0.5982	0.3163	0.9202
	96.00	0.6619	0.3617	0.9341
	104.50	0.7205	0.4073	0.9377
	115.25	0.7946	0.4634	0.9490
	132.00	0.9102	0.5458	0.9564
	145.00	0.9997	0.6210	0.9666
	168.05	1.1587	0.7385	0.9758
	180.80	1.2466	0.8125	0.9830
	185.00	1.2755	0.8325	0.9850
	188.70	1.3010	0.8653	0.9891
168.7	28.41	0.1959	0.0408	0.5197
(-156.1)	35.00	0.2413	0.0557	0.6010
	44.25	0.3051	0.0840	0.6902
	48.00	0.3309	0.0919	0.7215
	47.55	0.3278	0.0938	0.7194
	60.05	0.4140	0.1265	0.7761
	61.30	0.4226	0.1352	0.7887
	75.42	0.5200	0.1719	0.8165
	77.02	0.5310	0.1772	0.8230
	93.01	0.6413	0.2302	0.8631
	97.00	0.6688	0.2398	0.8575
	110.00	0.7584	0.2811	0.8784
	122.50	0.8446	0.3251	0.8972
	132.00	0.9101	0.3553	0.9070
	140.00	0.9653	0.3875	0.9110
	145.69	1.0045	0.4080	0.9237
	156.00	1.0756	0.4403	0.9256
	160.27	1.1050	0.4570	0.9300
	162.00	1.1170	0.4617	0.9294
	170.80	1.1776	0.5040	0.9358
	176.50	1.2169	0.5132	0.9380
	185.00	1.2755	0.5450	0.9430
	191.00	1.3169	0.5711	0.9449
	195.00	1.3445	0.5843	0.9479
	196.50	1.3548	0.5848	0.9483
	206.0	1.4203	0.6192	0.9518
	210.0	1.4479	0.6380	0.9540
	209.5	1.4445	0.6430	0.9621
	228.3	1.5741	0.6890	0.9615
	227.8	1.5706	0.7042	0.9608
	230.9	1.5920	0.7225	0.9654
	235.0	1.6203	0.7320	0.9670
	235.0	1.6203	0.7327	0.9700
	247.5	1.7065	0.7794	0.9733
	250.0	1.7237	0.7860	0.9750
	249.2	1.7182	0.7893	0.9776
	256.5	1.7685	0.8037	0.9767
	260.1	1.7933	0.8330	0.9850
	264.5	1.8237	0.8424	0.9800
	271.5	1.8719	0.8648	0.9856
	275.0	1.8961	0.8780	0.9860
	280.3	1.9326	0.8816	0.9841
	284.0	1.9581	0.8962	0.9920
	293.0	2.0202	0.9250	0.9914
	306.6	2.1139	0.9690	0.9967

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1. Methane; CH <sub>4</sub> ; [74-82-8] 2. Ethene (Ethylene); C <sub>2</sub> H <sub>4</sub> ; [74-85-1]		Sagara, H.; Arai, Y.; Saito, S. <i>J. Chem. Engng. Japan</i> <u>1972, 5, 339-348.</u>	
VARIABLES:		PREPARED BY:	
Temperature, pressure		C. L. Young	
EXPERIMENTAL VALUES:			
T/K	P/MPa	Mole fraction of methane in liquid, $x_{\text{CH}_4}$	in gas, $y_{\text{CH}_4}$
198.15	1.02	0.107	0.623
	2.03	0.311	0.789
	2.03	0.312	0.799
223.15	4.03	0.738	0.912
	2.03	0.123	0.443
	4.05	0.398	0.708
248.15	5.57	0.616	0.764
	3.04	0.0809	0.242
	4.05	0.172	0.385
	4.56	0.242	0.453
	5.07	0.284	0.478
	6.08	0.395	0.513
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
Static stainless steel cell of capacity $5 \times 10^5$ mm <sup>3</sup> fitted with magnetic stirrer and sampling valves. Cell enclosed in cryostat. Temperature measured with thermocouple. Pressure measured using Bourdon gauge. Gases added to cell and equilibrated. Samples of liquid and gas withdrawn and analysed using a gas chromatograph with thermal conductivity detector. Details in source.		1. Takachiho Chemical Industry Co. sample, purity 99.9 mole per cent. 2. Takachiho Chemical Industry Co. Ltd., sample purity 99.5 mole per cent.	
		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 <sub>4</sub> ; [74-82-8] 2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1]		Miller, R.C.; Kidnay, A.J.; Hiza, M.J.  <i>J. Chem. Thermodynamics</i> , <u>1977</u> , <i>9</i> , 167-178.	
VARIABLES: Temperature, pressure		PREPARED BY: C.L. Young	
EXPERIMENTAL VALUES:			
T/K	P/10 <sup>5</sup> Pa	Mole fraction of methane in liquid, $x_{CH_4}$	in vapor, $y_{CH_4}$
150.00	1.547	0.0848	0.8338
	2.039	0.1237	0.8783
	3.035	0.2090	0.9244
	3.950	0.2896	0.9455
	5.022	0.4043	0.9627
	5.991	0.5118	0.9720
	7.02	0.6327	0.9790
	8.03	0.7580	0.9859
	9.03	0.8724	0.9927
160.00	1.798	0.0559	0.6952
	3.055	0.1260	0.8279
	5.024	0.2391	0.9032
	6.94	0.3653	0.9352
	8.51	0.4755	0.9537
	9.97	0.5913	0.9655
	11.45	0.7116	0.9754
	12.92	0.8156	0.9837
13.91	0.8866	0.9887	
170.00	2.028	0.0328	0.4815
	4.038	0.1105	0.7463
	6.034	0.1951	0.8372
	8.00	0.2811	0.8842
AUXILIARY INFORMATION			
METHOD/APPARATUS/PROCEDURE:		SOURCE AND PURITY OF MATERIALS:	
Vapor-recirculation system similar to that in ref. 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 99.98 mole per cent.	
		ESTIMATED ERROR: $\delta T/K = \pm 0.02$ ; $\delta P/10^5 Pa = \pm 0.01$ up to 0.6 MPa $\pm 0.05$ above 0.6 MPa; $\delta x_{CH_4}, \delta y_{CH_4} = \pm 0.001$ .	
		REFERENCES: 1. Duncan, A.G. and 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. Inst.</i> <u>1969</u> , <i>40</i> , 513.	

COMPONENTS:		ORIGINAL MEASUREMENTS:	
1.	Methane; CH <sub>4</sub> ; [74-82-8]	Miller, R.C.; Kidnay, A.J.;	
2.	Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1]	Hiza, M.J.	
		<i>J. Chem. Thermodynamics</i> , <u>1977</u> ,	
		9, 167-178.	
EXPERIMENTAL VALUES:			
T/K	P/10 <sup>5</sup> Pa	Mole fraction of methane in liquid, <i>x</i> <sub>CH<sub>4</sub></sub>	in vapor, <i>y</i> <sub>CH<sub>4</sub></sub>
170.00	10.01	0.3778	0.9128
	12.17	0.4872	0.9339
	14.07	0.5859	0.9489
	16.01	0.6897	0.9612
	18.00	0.7891	0.9728
	18.03	0.7918	0.9740
	19.96	0.8797	0.9840
180.00	3.227	0.0400	0.4340
	4.306	0.0706	0.5794
	6.101	0.1251	0.7065
	8.11	0.1879	0.7816
	11.99	0.3193	0.8589
	16.17	0.4703	0.9059
	20.30	0.6155	0.9319
	24.03	0.7586	0.9552
27.26	0.8628	0.9716	
190.00	4.323	0.0297	0.3123
	6.182	0.0723	0.5207
	7.98	0.1162	0.6290
	10.11	0.1695	0.7110
	15.12	0.3025	0.8146
	19.91	0.4411	0.8671
	25.16	0.5826	0.9028
	29.99	0.7050	0.9289
	37.20	0.8783	0.9623

COMPONENTS:		ORIGINAL MEASUREMENTS:					
1. Methane; CH <sub>4</sub> ; [74-82-8]		Hsi, C.; Lu, B. C.-Y.					
2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1]		Can. J. Chem. Eng.					
3. Ethane; C <sub>2</sub> H <sub>6</sub> ; [74-84-0]		1971, 49, 140-143.					
		(Supplementary data)					
VARIABLES:		PREPARED BY:					
		C. L. Young					
EXPERIMENTAL VALUES:		T/K = 159.2 (T/°F = -173.1)					
P/psi	P/MPa	Mole fraction					
		in liquid		in vapor			
		x <sub>CH<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>6</sub></sub>	y <sub>CH<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>6</sub></sub>
38.14	0.2630	0.1240	0.6812	0.1948	0.8203	0.1572	0.0225
60.43	0.4167	0.2150	0.6116	0.1734	0.8905	0.0957	0.0448
84.31	0.5813	0.3147	0.5185	0.1668	0.9251	0.0647	0.0102
102.00	0.7033	0.4058	0.4578	0.1364	0.9401	0.0528	0.0071
110.00	0.7584	0.4517	0.4161	0.1322	0.9504	0.0430	0.0066
127.97	0.8823	0.5367	0.3572	0.1061	0.9596	0.0356	0.0048
147.03	1.0137	0.6378	0.2840	0.0782	0.9722	0.0246	0.0032
162.89	1.1231	0.7230	0.2163	0.0607	0.9777	0.0201	0.0022
38.00	0.2620	0.1241	0.5775	0.2984	0.8268	0.1437	0.0295
59.90	0.4130	0.2200	0.5189	0.2611	0.8966	0.0830	0.0204
85.33	0.5883	0.3313	0.4422	0.2265	0.9306	0.0565	0.0129
104.95	0.7236	0.4241	0.3803	0.1956	0.9505	0.0406	0.0089
127.25	0.8774	0.5399	0.2986	0.1615	0.9623	0.0302	0.0075
136.29	0.9397	0.5878	0.2706	0.1416	0.9660	0.0280	0.0060
38.70	0.2668	0.1297	0.4356	0.4347	0.8516	0.1086	0.0398
64.42	0.4442	0.2419	0.3812	0.3769	0.9122	0.0611	0.0267
86.70	0.5978	0.3382	0.3280	0.3338	0.9389	0.0420	0.0191
103.00	0.7102	0.4136	0.2981	0.2883	0.9520	0.0341	0.0139
123.00	0.8481	0.5138	0.2499	0.2363	0.9638	0.0260	0.0102
143.43	0.9889	0.6255	0.1911	0.1834	0.9748	0.0180	0.0072
36.00	0.2482	0.1196	0.1844	0.6960	0.8787	0.0529	0.0684
60.19	0.4150	0.2179	0.1693	0.6128	0.9282	0.0314	0.0404
(cont.)							
AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:			
<p>Recirculating vapor flow apparatus constructed of 100 ml Jerguson gauge.</p> <p>Temperature measured using copper-constantan thermocouples.</p> <p>Pressure measured with Bourdon gauge.</p> <p>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.</p> <p>Helium was used as a carrier gas.</p>				<p>1, 2, 3. Matheson research grade samples, purities 99.99 mole per cent, 99.98 mole per cent and 99.9 mole per cent, respectively.</p>			
				<p>ESTIMATED ERROR:</p> <p><math>\delta T/K = \pm 0.02</math>; <math>\delta P/MPa \sim \pm 0.005</math>;</p> <p><math>\delta x, \delta y = \pm 1\%</math> (estimated by compiler).</p>			
				<p>REFERENCES:</p>			

COMPONENTS:		ORIGINAL MEASUREMENTS:					
1. Methane; CH <sub>4</sub> ;	[74-82-8]	Hsi, C.; Lu, B. C.-Y.					
2. Ethene; C <sub>2</sub> H <sub>4</sub> ;	[74-85-1]	<i>Can. J. Chem. Eng.</i>					
3. Ethane; C <sub>2</sub> H <sub>6</sub> ;	[74-84-0]	<u>1971</u> , 49, 140-143.					
		(Supplementary data)					
EXPERIMENTAL VALUES:							
T/K = 159.2 (T/°F = -173.1)							
P/psi	P/MPa	Mole fraction					
		in liquid			in vapor		
		x <sub>CH<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>6</sub></sub>	y <sub>CH<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>6</sub></sub>
80.00	0.5516	0.3040	0.1453	0.5507	0.9506	0.0215	0.0279
100.86	0.6954	0.3990	0.1262	0.4748	0.9637	0.0161	0.0202
121.08	0.8348	0.5027	0.1066	0.3907	0.9725	0.0117	0.0158
141.22	0.9737	0.6051	0.0814	0.3135	0.9810	0.0077	0.9887
154.16	1.0629	0.6761	0.0661	0.2578	0.9839	0.0061	0.0100
58.56	0.4038	0.2127	0.2388	0.5485	0.9151	0.0445	0.0404
73.50	0.5068	0.2782	0.2101	0.5117	0.9398	0.0319	0.0341
90.62	0.6248	0.3574	0.1910	0.4516	0.9540	0.0243	0.0217
105.00	0.7239	0.4228	0.1732	0.4040	0.9629	0.0204	0.0167
117.21	0.8081	0.4867	0.1575	0.3558	0.9687	0.0174	0.0139
130.00	0.8963	0.5535	0.1371	0.3094	0.9747	0.0140	0.0113
150.35	1.0366	0.6587	0.1056	0.2357	0.9804	0.0108	0.0088
33.95	0.2341	0.1143	0.2456	0.6401	0.8551	0.0754	0.0695
54.22	0.3738	0.1973	0.2218	0.5809	0.9139	0.0451	0.0410
73.78	0.5087	0.2770	0.2060	0.5170	0.9383	0.0333	0.0284
89.75	0.6188	0.3526	0.1827	0.4647	0.9563	0.0233	0.0204
111.95	0.7719	0.4588	0.1571	0.3841	0.9658	0.0184	0.0158
130.22	0.8978	0.5518	0.1281	0.3201	0.9720	0.0149	0.0131



COMPONENTS:		ORIGINAL MEASUREMENTS:					
1. Methane; CH <sub>4</sub> ; [74-82-8]		Benedict, M.; Solomon, E.;					
2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1]		Rubin, L. C.					
3. 2-Methylpropane; C <sub>4</sub> H <sub>10</sub> ; [75-28-5]		<i>Ind. Eng. Chem.</i> 1945, 37, 55-59.					
VARIABLES:		PREPARED BY:					
		C. L. Young					
EXPERIMENTAL VALUES:							
T/K (T/°C)	P/MPa (P/atm)	in liquid			Mole fraction in vapor		
		x <sub>CH<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>4</sub></sub>	x <sub>C<sub>4</sub>H<sub>10</sub></sub>	y <sub>CH<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>4</sub></sub>	y <sub>C<sub>4</sub>H<sub>10</sub></sub>
310.93 (37.78)	3.447 (34.02)	0.125 <sub>3</sub>	0.124 <sub>5</sub>	0.752	0.576 <sub>5</sub>	0.224	0.199 <sub>5</sub>
		0.069	0.279	0.652	0.335 <sub>5</sub>	0.481 <sub>5</sub>	0.183
		0.039	0.372	0.589	0.187 <sub>5</sub>	0.640	0.172 <sub>5</sub>
		0.000	0.497	0.503	0.000	0.840 <sub>5</sub>	0.159 <sub>5</sub>
344.26 (71.11)	3.447 (34.02)	0.083	0.078	0.839	0.418	0.163 <sub>5</sub>	0.418 <sub>5</sub>
		0.056 <sub>5</sub>	0.150	0.793 <sub>5</sub>	0.269	0.325 <sub>5</sub>	0.405 <sub>5</sub>
		0.030	0.215	0.755	0.148	0.458 <sub>5</sub>	0.393 <sub>5</sub>
		0.000	0.296	0.704	0.000	0.624	0.376
310.93 (37.78)	6.895 (68.05)	0.284	0.170 <sub>5</sub>	0.545 <sub>5</sub>	0.657	0.187	0.156
		0.252	0.270	0.383 <sub>5</sub>	0.552	0.297	0.151
		0.215 <sub>5</sub>	0.383 <sub>5</sub>	0.401	0.434	0.420 <sub>5</sub>	0.145 <sub>5</sub>
		0.189	0.462	0.349	0.357 <sub>5</sub>	0.500	0.142 <sub>5</sub>
344.26 (71.11)	6.895 (68.05)	0.157 <sub>5</sub>	0.563	0.279 <sub>5</sub>	0.257	0.603 <sub>5</sub>	0.139 <sub>5</sub>
		0.217 <sub>5</sub>	0.181	0.6015	0.459	0.229 <sub>5</sub>	0.311 <sub>5</sub>
		0.159	0.334	0.507	0.283	0.408	0.309
		0.113 <sub>5</sub>	0.458 <sub>5</sub>	0.428	0.162 <sub>5</sub>	0.5175	0.320
AUXILIARY INFORMATION							
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:			
Static equilibrium cell. Complete gas and liquid phases removed by mercury injection. Gas and liquid samples analysed by determination of gas density and mole per cent of olefins present.				1. Crude sample dried and carbon dioxide removed by passage over Ascarite and Drierite. Mass spectrometry revealed 0.35 mole per cent ethane.			
				2. Anesthesia grade, purity about 99.5 mole per cent.			
				3. Phillips Petroleum sample, purity better than 99 mole per cent.			
				ESTIMATED ERROR:			
				REFERENCES:			

COMPONENTS:		ORIGINAL MEASUREMENTS:						
1. Methane; CH <sub>4</sub> ; [74-82-8] 2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1] 3. 2-Methylpropane; C <sub>4</sub> H <sub>10</sub> ; [75-28-5] 4. Hexadecane; C <sub>16</sub> H <sub>34</sub> ; [544-76-3]		Solomon, E.  <i>Chem. Eng. Progr. Symp. Ser. No. 3</i> <u>1952</u> , 48, 93-97.						
VARIABLES:		PREPARED BY:						
Temperature, pressure		C. L. Young						
EXPERIMENTAL VALUES:								
1 MPa = 145.04 psi								
T/K (T/°F)	P/psi	in liquid				Mole fractions in gas		
		x <sub>CH<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>4</sub></sub>	x <sub>C<sub>4</sub>H<sub>10</sub></sub>	x <sub>C<sub>16</sub>H<sub>34</sub></sub>	y <sub>CH<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>4</sub></sub>	y <sub>C<sub>4</sub>H<sub>10</sub></sub>
310.93	500	0.035	0.328	0.373	0.264	0.2305	0.667	0.1025
(100)	500	0.0495	0.3065	0.232	0.412	0.3225	0.617	0.060
377.59	500	0.095	0.0745	0.019	0.8115	0.7595	0.2135	0.009
(220)	500	0.0245	0.1975	0.1805	0.5975	0.2195	0.654	0.1265
	500	0.029	0.2225	0.1035	0.645	0.218	0.708	0.074
	1000	0.132	0.2125	0.1525	0.503	0.5235	0.400	0.0765
AUXILIARY INFORMATION								
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:				
Static equilibrium cell. Complete gas and liquid phases removed by mercury injection. Gas sample analysed by determination of gas density and mole per cent of olefins present. Light hydrocarbons stripped from liquid phase in debutanization still leaving heavy hydrocarbon. Liquid hydrocarbons analysed by same method as gas samples. Details in source and ref. (1).				1. Crude sample dried and carbon dioxide removed by passage over Ascarite and Drierite. Mass spectroscopy revealed 0.35 mole per cent ethane. 2. Anesthesia grade, purity about 99.5 mole per cent. 3. Phillips Petroleum sample, purity better than 99 mole per cent. 4. No details given.				
				ESTIMATED ERROR: $\delta T/K = \pm 0.02$ ; $\delta P/P = \pm 0.1\%$ ; $\delta x, \delta y = \pm 0.0015$ .				
				REFERENCES: 1. Benedict, M.; Solomon, E.; Rubin, L. C. <i>Ind. Eng. Chem.</i> <u>1945</u> , 37, 55.				

COMPONENTS:		ORIGINAL MEASUREMENTS:						
1. Methane; CH <sub>4</sub> ; [74-82-8] 2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1] 3. 2-Methylpropane; C <sub>4</sub> H <sub>10</sub> ; [75-28-5] 4. 1,1'-Bicyclohexyl; C <sub>12</sub> H <sub>22</sub> ; [92-51-3]		Solomon, E. <i>Chem. Eng. Progr. Symp. Ser. No. 3</i> <u>1952</u> , 48, 93-97.						
VARIABLES:		PREPARED BY:						
Temperature, pressure		C. L. Young						
EXPERIMENTAL VALUES:		1 MPa = 145.04 psi						
		Mole fractions						
		in liquid				in gas		
T/K (T/°F)	P/psi	x <sub>CH<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>4</sub></sub>	x <sub>C<sub>4</sub>H<sub>10</sub></sub>	x <sub>C<sub>12</sub>H<sub>22</sub></sub>	y <sub>CH<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>4</sub></sub>	y <sub>C<sub>4</sub>H<sub>10</sub></sub>
310.93 (100)	500	0.0495	0.1985	0.152	0.600	0.434	0.518	0.048
377.59 (220)	500	0.055	0.224	0.425	0.296	0.3725	0.5045	0.123
	500	0.0235	0.1385	0.1265	0.7115	0.2635	0.6195	0.117
	500	0.035	0.1025	0.159	0.7035	0.4005	0.4585	0.141
AUXILIARY INFORMATION								
METHOD/APPARATUS/PROCEDURE:					SOURCE AND PURITY OF MATERIALS:			
Static equilibrium cell. Complete gas and liquid phases removed by mercury injection. Gas sample analysed by determination of gas density and mole per cent of olefins present. Light hydrocarbons stripped from liquid phase in debutanization still leaving heavy hydrocarbon. Liquid hydrocarbons analysed by same method as gas samples. Details in source and ref. (1).					1. Crude sample dried and carbon dioxide removed by passage over Ascarite and Drierite. Mass spectroscopy revealed 0.35 mole per cent ethane.			
					2. Anesthesia grade, purity about 99.5 mole per cent.			
					3. Phillips Petroleum sample, purity better than 99 mole per cent.			
					4. No details given.			
					ESTIMATED ERROR:			
					δT/K = ±0.02; δP/P = ±0.1%;			
					δx, δy = ±0.0015.			
					REFERENCES:			
					1. Benedict, M.; Solomon, E.; Rubin, L. C. <i>Ind. Eng. Chem.</i> <u>1945</u> , 37, 55.			

COMPONENTS:					ORIGINAL MEASUREMENTS:				
1. Methane; CH <sub>4</sub> ; [74-82-8]					Solomon, E.				
2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1]					<i>Chem. Eng. Progr. Symp. Ser. No. 3</i>				
3. 2-Methylpropane; C <sub>4</sub> H <sub>10</sub> ; [75-28-5]					<u>1952</u> , 48, 93-97.				
4. Methylnaphthalene; C <sub>11</sub> H <sub>10</sub> ; [1321-94-4]									
VARIABLES:					PREPARED BY:				
Temperature, pressure					C. L. Young				
EXPERIMENTAL VALUES:									
1 MPa = 145.04 psi									
		in liquid				Mole fractions			in gas
T/K (T/°F)	P/psi	x <sub>CH<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>4</sub></sub>	x <sub>C<sub>4</sub>H<sub>10</sub></sub>	x <sub>C<sub>11</sub>H<sub>10</sub></sub>	y <sub>CH<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>4</sub></sub>	y <sub>C<sub>4</sub>H<sub>10</sub></sub>	
310.93 (100)	500	0.0405	0.079	0.203	0.6775	0.632	0.265	0.103	
	500	0.0395	0.141	0.287	0.5325	0.457	0.4155	0.1275	
377.59 (220)	500	0.013	0.1065	0.068	0.8125	0.2455	0.649	0.1055	
	500	0.0215	0.082	0.060	0.8365	0.3945	0.5085	0.097	
	500	0.023	0.075	0.1085	0.7935	0.3905	0.441	0.1685	
	1000	0.0635	0.0965	0.198	0.642	0.514	0.2975	0.1885	
AUXILIARY INFORMATION									
METHOD/APPARATUS/PROCEDURE:					SOURCE AND PURITY OF MATERIALS:				
Static equilibrium cell. Complete gas and liquid phases removed by mercury injection. Gas sample analysed by determination of gas density and mole per cent of olefins present. Light hydrocarbons stripped from liquid phase in debutanization still leaving heavy hydrocarbon. Liquid hydrocarbons analysed by same method as gas samples. Details in source and ref. (1).					1. Crude sample dried and carbon dioxide removed by passage over Ascarite and Drierite. Mass spectroscopy revealed 0.35 mole per cent ethane.				
					2. Anesthesia grade, purity about 99.5 mole per cent.				
					3. Phillips Petroleum sample, purity better than 99 mole per cent.				
					4. No details given.				
					ESTIMATED ERROR:				
					δT/K = ±0.02; δP/P = ±0.1%; δx, δy = ±0.0015.				
					REFERENCES:				
					1. Benedict, M.; Solomon, E.; Rubin, L. C. <i>Ind. Eng. Chem.</i> <u>1945</u> , 37, 55.				

COMPONENTS:		ORIGINAL MEASUREMENTS:						
1. Methane; CH <sub>4</sub> ; [74-82-8] 2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1] 3. 2-Methylpropane; C <sub>4</sub> H <sub>10</sub> ; [75-28-5] 4. Gas oil		Solomon, E.  <i>Chem. Eng. Progr. Symp. Ser. No. 3</i>  <u>1952</u> , 48, 93-97.						
VARIABLES:		PREPARED BY:						
Temperature, pressure		C. L. Young						
EXPERIMENTAL VALUES:								
1 MPa = 145.04 psi								
		in liquid			Mole fractions in gas			
T/K (T/°F)	P/psi	x <sub>CH<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>4</sub></sub>	x <sub>C<sub>4</sub>H<sub>10</sub></sub>	x <sub>Gas oil</sub>	y <sub>CH<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>4</sub></sub>	y <sub>C<sub>4</sub>H<sub>10</sub></sub>
310.93 (100)	500	0.0785	0.1955	0.1775	0.5485	0.5515	0.402	0.0465
377.59 (220)	500	0.0945	0.125	0.6965	0.084	0.521	0.302	0.177
	500	0.060	0.1225	0.1425	0.675	0.494	0.4015	0.1045
	500	0.058	0.106	0.2475	0.5885	0.457	0.352	0.191
	1000	0.1055	0.211	0.192	0.4915	0.473	0.422	0.105
Properties of Gas oil: <u>Distillation properties</u> °F								
		Initial boiling point		447				
		5%		579		Percentage recovery 98.0		
		10		582				
		20		590				
		30		596		Percentage residue 1.8		
		40		604				
		50		612				
		60		623		Percentage loss 0.2		
		70		642				
		80		664				
		90		700		Molecular weight 275		
		95		734				
		End point		746				
AUXILIARY INFORMATION								
METHOD/APPARATUS/PROCEDURE:				SOURCE AND PURITY OF MATERIALS:				
Static equilibrium cell. Complete gas and liquid phases removed by mercury injection. Gas sample analysed by determination of gas density and mole per cent of olefins present. Light hydrocarbons stripped from liquid phase in debutanization still leaving heavy hydrocarbon. Liquid hydrocarbons analysed by same method as gas samples. Details in source and ref. (1).				1. Crude sample dried and carbon dioxide removed by passage over Ascarite and Drierite. Mass spectroscopy revealed 0.35 mole per cent ethane.				
				2. Anesthesia grade, purity about 99.5 mole per cent.				
				3. Phillips Petroleum sample, purity better than 99 mole per cent.				
				4. Details given above.				
				ESTIMATED ERROR: δT/K = ±0.02; δP/P = ±0.1%; δx, δy = ±0.0015.				
				REFERENCES:  1. Benedict, M.; Solomon, E.; Rubin, L. C. <i>Ind. Eng. Chem.</i> <u>1945</u> , 37, 55.				

COMPONENTS:		ORIGINAL MEASUREMENTS:						
1. Methane; CH <sub>4</sub> ; [74-82-8] 2. Ethene; C <sub>2</sub> H <sub>4</sub> ; [74-85-1] 3. 2-Methylpropane; C <sub>4</sub> H <sub>10</sub> ; [75-28-5] 4. Hydroformer Still Bottoms		Solomon, E. <i>Chem. Eng. Progr. Symp. Ser. No. 3</i> <u>1952</u> , 48, 93-97.						
VARIABLES:		PREPARED BY:						
Temperature, pressure		C. L. Young						
EXPERIMENTAL VALUES:								
1MPa = 145.04 psi								
		in liquid			Mole fractions in gas			
T/K (T/°F)	P/psi	x <sub>CH<sub>4</sub></sub>	x <sub>C<sub>2</sub>H<sub>4</sub></sub>	x <sub>C<sub>4</sub>H<sub>10</sub></sub>	x <sub>HSB</sub>	y <sub>CH<sub>4</sub></sub>	y <sub>C<sub>2</sub>H<sub>4</sub></sub>	y <sub>C<sub>4</sub>H<sub>10</sub></sub>
377.59 (220)	500	0.0255	0.089	0.052	0.8335	0.4075	0.5115	0.081
	500	0.0285	0.063	0.1385	0.770	0.440	0.352	0.208
	1000	0.071	0.070	0.174	0.685	0.598	0.224	0.178
HSB - Hydroformer Still Bottoms								
Properties of Hydroformer Still Bottoms:								
<u>Distillation properties</u>								°F
Initial boiling point					553			
5%					584		Percentage recovery	
10					593		96.5	
20					603			
30					611		Percentage residue	
40					620		3.5	
50					629			
60					643		Percentage loss	
70					659		0.0	
80					683			
90					727		Molecular weight	
95					756		209	
End point					760			
AUXILIARY INFORMATION								
METHOD/APPARATUS/PROCEDURE:					SOURCE AND PURITY OF MATERIALS:			
Static equilibrium cell. Complete gas and liquid phases removed by mercury injection. Gas sample analysed by determination of gas density and mole per cent of olefins present. Light hydrocarbons stripped from liquid phase in debutanization still leaving heavy hydrocarbon. Liquid hydrocarbons analysed by same method as gas samples. Details in source and ref. (1).					1. Crude sample dried and carbon dioxide removed by passage over Ascarite and Drierite. Mass spectroscopy revealed 0.35 mole per cent ethane.			
					2. Anesthesia grade, purity about 99.5 mole per cent.			
					3. Phillips Petroleum sample, purity better than 99 mole per cent.			
					4. Details given above.			
					ESTIMATED ERROR:			
					δT/K = ±0.02; δP/P = ±0.1%;			
					δx, δy = ±0.0015.			
					REFERENCES:			
					1. Benedict, M.; Solomon, E.; Rubin, L. C. <i>Ind. Eng. Chem.</i> <u>1945</u> , 37, 55.			