mum values of M_o (eq 29) assuming minimum and maximum values for both R_{max} and ϵ. The range of ϵ may be taken as 0.7 to 0.9. Compute the corresponding values for μM_o and mark out the vertical band corresponding to these limits in figure 1.

5. For the maximum and minimum limits assumed for both L and ϵ, compute the corresponding limits for L_o (eq 28). Compute the corresponding values of $QL_o/\Delta p$ and mark out the horizontal band corresponding to these limits in figure 1. Steps (4) and (5) result in a design rectangle on figure 1 within which a solution is possible.

6. Further limit this design rectangle by excluding regions of figure 1 representing greater and lesser area A (really μA) than desired.

7. For gas flow, compute the maximum tolerable value of the coefficient of the Knudsen term b and the corresponding minimum value of fiber diameter d. Exclude regions of figure 1 representing smaller values of d (really d/μ). One may then choose design parameters corresponding to any point in the design region that has not been excluded.

8. When the flowmeter is built and tested, adjustment of the resistivity can then be made by the principal technique of changing the weight of glass wool used.

Financial support for this investigation was provided by the Office of Naval Research under a project on Basic Instrumentation of Scientific Research. Grateful acknowledgement is also due W. A. Wildhack, at whose suggestion and under whose supervision the development of the glass wool flowmeter was carried on.

V. References

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Density, Refractive Index, Boiling Point, and Vapor Pressure of Eight Monoolefin (1-Alkene), Six Pentadiene, and Two Cyclomonoolefin Hydrocarbons[1]

By Alphonse F. Forziati,[2] David L. Camin,[3] and Frederick D. Rossini[3]

Density (at 20°, 25°, and 30° C), refractive index (at seven wavelengths at 20°, 25°, and 30° C), vapor pressure, and boiling point (from 48 to 778 mm Hg) of 16 highly purified samples of hydrocarbons of the API–NBS series were measured for 8 monoolefin (1-alkene), 6 pentadiene, and 2 cyclomonoolefin hydrocarbons.

The data on refractive index were adjusted by means of modified Cauchy and Hartmann equations, and values of the constants are given for each compound.

The data on vapor pressure were adjusted by means of the method of least squares and the three-constant Antoine equation. The values of the constants are given for each compound.

Values were calculated for the specfic dispersions, $(n_F - n_C)/d$ and $(n_g - n_D)/d$.

As a cooperative investigation of the National Bureau of Standards, the U. S. Office of Rubber Reserve, and the American Petroleum Institute Research Project 6, measurements of density, refractive index, vapor pressure, and boiling point were made on highly purified samples of eight monoolefin (1-alkene), six pentadiene, and two cyclomonoolefin hydrocarbons of the API–NBS series.

The compounds measured were made available through the American Petroleum Institute Research Project 44 on the "Collection, calculation, and compilation of data on the properties of hydrocarbons." The samples were purified by the American Petroleum Institute Research Project 6 on the "Analysis, purification, and properties of hydrocarbons," from material supplied by the following laboratories:

1-Pentene, by the Phillips Petroleum Co., Bartlesville, Okla.

1-Hexene, 1-heptene, 1-nonene, 1-undecene, and 1,4-pentadiene, by the American Petroleum Institute Research Project 45, at the Ohio State University, Columbus, Ohio.

[1] This investigation was performed at the National Bureau of Standards as part of the work of the American Petroleum Institute Research Project 6 on the "Analysis, purification, and properties of hydrocarbons."
[2] Formerly Research Associate on the American Petroleum Institute Research Project 6.
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1-Octene, 1-decene, 1-dodecene, 2-methyl-1,3-butadiene, and cyclohexene, by the American Petroleum Institute Research Project 6.

1,2-Pentadiene and 2,3-pentadiene, by the Hydrocarbon Laboratory, Pennsylvania State College, State College, Pa.

1,*cis*-3-Pentadiene and 1,*trans*-3-pentadiene, by the Office of Rubber Reserve, Washington, D. C.

Cyclopentene, by the Atlantic Refining Co., Philadelphia, Pa., and the American Petroleum Institute Research Project 45 at the Ohio State University, Columbus, Ohio.

The purification and determination of purity and freezing point of these compounds are described in references [1 to 5].[4]

It is believed that in each case the impurity was of such nature and present in such small amount that the properties measured were not affected beyond the indicated limits of uncertainty.

The measurements of density were made at 20°, 25°, and 30° C with a density balance, the assembly, calibration, and operation of which has been previously described [6]. The experimental results on density are given in table 1. Individual measurements were reproducible within ± 0.00003 g/ml. The accuracy of the tabulated values, including the effect of impurities, is estimated to be ± 0.00005 to ± 0.00010 g/ml for the 10 monoolefins and ± 0.00008 to ± 0.00015 g/ml for the 6 pentadienes.

The refractive index was measured by means of the same apparatus and procedure previously described [7]. The calculations and correlations were also made in the same manner as in [7]. Table 2 gives the values of the constants of the modified Cauchy and Hartmann equations for each of the 16 compounds. The fifth and last columns of the table give the root-mean-square value of the deviations of the observed from the calculated points. Table 3 gives the adjusted values of refractive index at each of seven wavelengths (from 6,678 to 4,358 Angstrom units) at 20°, 25°, and 30° C. Figure 1 is a plot of the values of the constants n_∞ and C of the modified Hartmann equation, as a function of the number of carbon atoms in the normal alkyl radical of the series of 1-alkenes. Table 4 gives the values of the specific dispersions $10^4(n_F - n_C)/d$ and $10^4(n_g - n_D)/d$ calculated from the values of refractive index in table 3 and of density in table 1.

[4] Figures in brackets indicate the literature references at the end of this paper.

TABLE 1. *Values of density*

Compound	Formula	Density [a]			Temperature coefficient of density at 25° C
		20° C	25° C	30° C	
		g/ml	*g/ml*	*g/ml*	*g/ml °C*
1-Pentene	C_5H_{10}	0.64050	0.63533		[b] 0.001034
1-Hexene	C_6H_{12}	.67317	.66848	0.66374	.000943
1-Heptene	C_7H_{14}	.69698	.69267	.68815	.000883
1-Octene	C_8H_{16}	.71492	.71085	.70658	.000834
1-Nonene	C_9H_{18}	.72922	.72531	.72134	.000788
1-Decene	$C_{10}H_{20}$	.74081	.73693	.73304	.000777
1-Undecene	$C_{11}H_{22}$	.75032	.74655	.74276	.000756
1-Dodecene	$C_{12}H_{24}$	.75836	.75474	.75103	.000733
1,2-Pentadiene	C_5H_8	.69257	.68760	.68260	.000997
1,*cis*-3-Pentadiene	C_5H_8	.69102	.68592	.68082	.001020
1,*trans*-3-Pentadiene	C_5H_8	.67603	.67102	.66592	.001011
1,4-Pentadiene	C_5H_8	.66076			
2,3-Pentadiene	C_5H_8	.69502	.69000	.68479	.001023
2-Methyl-1,3-butadiene	C_5H_8	.68095	.67587	.67076	.001019
Cyclopentene	C_5H_8	.77199	.76653	.76124	.001075
Cyclohexene	C_6H_{10}	.81096	.80609	.80141	.000955

[a] For air-saturated hydrocarbon in the liquid state at 1 atm.
[b] This value at 22.5° C.

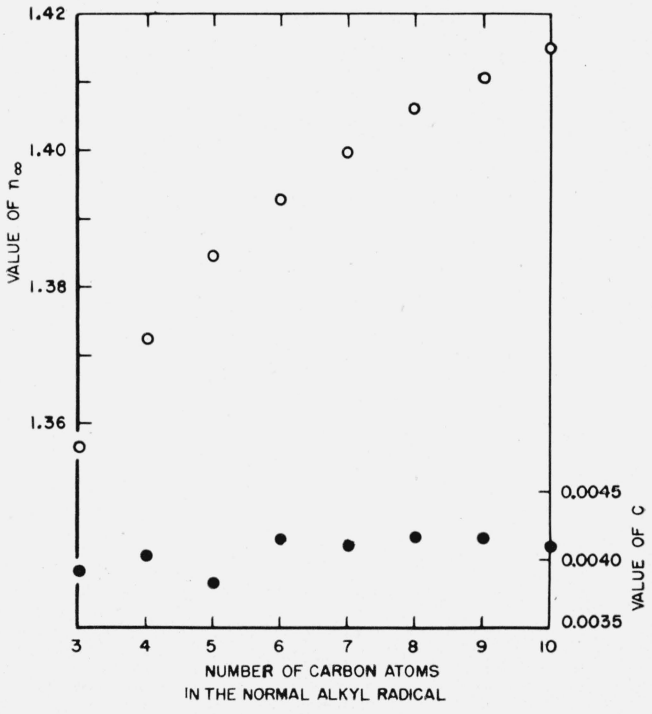

FIGURE 1. *Values of the constants, n_∞ and C, of the modified Hartmann equation, as a function of the number of carbon atoms in the normal alkyl radical for the series of 1-alkenes.*
○=n_∞; ●=C.

TABLE 2. *Values of the constants of the modified Cauchy and Hartman equations*

Compound	Formula	Constants in the equation [a] $\Delta n=a+b/\lambda^2$			Constants in the equation $n_\lambda=n_\infty+C/(\lambda-\lambda^*)^{1.6}$ at 25° C			
		$a\times10^3$	$b\times10^3$	$\rho\times10^5$	n_∞ ;	C	λ^*	$\rho\times10^5$
1-Pentene	C_5H_{10}	2.998	0.0471	7.44	1.35600	0.003924	0.10090	4.11
1-Hexene	C_6H_{12}	2.773	.0308	4.30	1.37241	.004022	.09976	3.25
1-Heptene	C_7H_{14}	2.560	.0382	3.18	1.38474	.003835	.10874	1.60
1-Octene	C_8H_{16}	2.408	.0334	6.47	1.39311	.004271	.09260	5.07
1-Nonene	C_9H_{18}	2.309	.0284	5.76	1.40048	.004103	.09942	1.65
1-Decene	$C_{10}H_{20}$	2.244	.0285	4.10	1.40616	.004169	.09725	2.54
1-Undecene	$C_{11}H_{22}$	2.176	.0295	4.43	1.41081	.004185	.09737	2.07
1-Dodecene	$C_{12}H_{24}$	2.121	.0292	3.96	1.41490	.004111	.10033	1.14
1,2-pentadiene	C_5H_8	3.053	.0433	5.92	1.40119	.004885	.12273	5.31
1,*cis*-3-Pentadiene	C_5H_8	3.218	.0737	4.24	1.41010	.006167	.14772	2.10
1-*trans*-3-Pentadiene	C_5H_8	3.192	.0690	3.42	1.40386	.006289	.14256	3.74
1,4-Pentadiene	C_5H_8				[b] 1.37404	[b] .004320	[b] .12451	[b] 4.47
2,3-Pentadiene	C_5H_8	3.194	.0462	5.19	1.40728	.005353	.11758	1.73
2-Methyl-1,3-butadiene	C_5H_8	3.225	.0694	8.02	1.39722	.005967	.13783	5.54
Cyclopentene	C_5H_8	2.972	.0293	2.00	1.40550	.004350	.10549	1.03
Cyclohexene	C_6H_{10}	2.672	.0326	2.03	1.42947	.004429	.10859	1.57

[a] $\Delta n=\frac{n_{20}-n_{30}}{2}$.

[b] These values at 20° C.

TABLE 3. *Values of refractive index at seven wavelengths and three temperatures*

Wavelength	Spectral line	Index of refraction at—											
		20° C	25° C	30° C	20° C	25° C	30° C	20° C	25° C	30° C	20° C	25° C	30° C
		1-Pentene, C_5H_{10}			1-Hexene, C_6H_{12}			1-Heptene, C_7H_{14}			1-Octene, C_8H_{16}		
A													
6678.1	He_{red}	1.36883	1.36573	----------	1.38519	1.38235	1.37951	1.39711	1.39446	1.39181	1.40594	1.40346	1.40098
6562.8	H_C	1.36916	1.36605	----------	1.38552	1.38268	1.37984	1.39744	1.39479	1.39214	1.40629	1.40380	1.40131
5892.6	Na_D	1.37148	1.36835	----------	1.38788	1.38502	1.38216	1.39980	1.39713	1.39446	1.40870	1.40620	1.40370
5460.7	Hg_e	1.37348	1.37032	----------	1.38991	1.38703	1.38415	1.40183	1.39914	1.39645	1.41077	1.40825	1.40573
5015.7	He_{blue}	1.37614	1.37295	----------	1.39261	1.38971	1.38681	1.40455	1.40184	1.39913	1.41351	1.41097	1.40843
4861.3	H_F	1.37725	1.37405	----------	1.39373	1.39083	1.38793	1.40569	1.40297	1.40025	1.41465	1.41210	1.40955
4358.3	Hg_g	1.38183	1.37858	----------	1.39837	1.39543	1.39249	1.41042	1.40766	1.40490	1.41933	1.41675	1.41417
		1-Nonene, C_9H_{18}			1-Decene, $C_{10}H_{20}$			1-Undecene, $C_{11}H_{22}$			1-Dodecene, $C_{12}H_{24}$		
6678.1	He_{red}	1.41298	1.41061	1.40824	1.41870	1.41639	1.41408	1.42332	1.42108	1.41884	1.42727	1.42508	1.42289
6562.8	H_C	1.41332	1.41095	1.40858	1.41904	1.41673	1.41442	1.42366	1.42142	1.41918	1.42761	1.42542	1.42323
5892.6	Na_D	1.41572	1.41333	1.41094	1.42146	1.41913	1.41680	1.42609	1.42383	1.42157	1.43002	1.42782	1.42562
5460.7	Hg_e	1.41778	1.41538	1.41298	1.42352	1.42118	1.41884	1.42816	1.42589	1.42362	1.43210	1.42988	1.42766
5015.7	He_{blue}	1.42052	1.41810	1.41568	1.42627	1.42391	1.42155	1.43093	1.42864	1.42635	1.43486	1.43262	1.43038
4861.3	H_F	1.42167	1.41924	1.41681	1.42741	1.42505	1.42269	1.43208	1.42978	1.42748	1.43601	1.43377	1.43153
4358.3	Hg_g	1.42639	1.42393	1.42147	1.43213	1.42974	1.42735	1.43682	1.43449	1.43216	1.44077	1.43850	1.43623
		1,2-Pentadiene, C_5H_8			1,*cis*-3-Pentadiene, C_5H_8			1,*trans*-3-Pentadiene, C_5H_8			1,4-Pentadiene, C_5H_8		
6678.1	He_{red}	1.41724	1.41409	1.41094	1.43103	1.42765	1.42427	1.42483	1.42148	1.41813	1.38550	----------	----------
6562.8	H_C	1.41769	1.41454	1.41139	1.43168	1.42829	1.42490	1.42547	1.42212	1.41877	1.38591	----------	----------
5892.6	Na_D	1.42091	1.41773	1.41455	1.43634	1.43291	1.42948	1.43008	1.42669	1.42330	1.38876	----------	----------
5460.7	Hg_e	1.42372	1.42052	1.41732	1.44046	1.43699	1.43352	1.43415	1.43073	1.42731	1.39125	----------	----------
5015.7	He_{blue}	1.42750	1.42428	1.42106	1.44612	1.44261	1.43910	1.43972	1.43625	1.43278	1.39461	----------	----------
4861.3	H_F	1.42910	1.42586	1.42262	1.44854	1.44501	1.44148	1.44209	1.43861	1.43513	1.39603	----------	----------
4358.3	Hg_g	1.43579	1.43251	1.42923	1.45887	1.45526	1.45165	1.45219	1.44863	1.44507	1.40199	----------	----------
		2,3-Pentadiene, C_5H_8			2-Methyl-1,3-butadiene, C_5H_8			Cyclopentene, C_5H_8			Cyclohexene, C_6H_{10}		
6678.1	He_{red}	1.42450	1.42120	1.41790	1.41708	1.41370	1.41032	1.41947	1.41643	1.41339	1.44344	1.44069	1.43794
6562.8	H_C	1.42498	1.42168	1.41838	1.41768	1.41429	1.41090	1.41984	1.41680	1.41376	1.44383	1.44108	1.43833
5892.6	Na_D	1.42842	1.42509	1.42176	1.42194	1.41852	1.41510	1.42246	1.41940	1.41634	1.44654	1.44377	1.44100
5460.7	Hg_e	1.43140	1.42805	1.42470	1.42570	1.42224	1.41878	1.42472	1.42165	1.41858	1.44888	1.44610	1.44332
5015.7	He_{blue}	1.43542	1.43204	1.42866	1.43081	1.42731	1.42381	1.42773	1.42464	1.42155	1.45201	1.44921	1.44641
4861.3	H_F	1.43711	1.43372	1.43033	1.43300	1.42948	1.42596	1.42900	1.42590	1.42280	1.45333	1.45052	1.44771
4358.3	Hg_g	1.44415	1.44071	1.43727	1.44221	1.43862	1.43503	1.43423	1.43110	1.42797	1.45877	1.45593	1.45309

TABLE 4. *Calculated values of the specific dispersion*

Temperature (°C)	$10^4(n_F - n_C)/d$	$10^4(n_g - n_D)/d$	$10^4(n_F - n_C)/d$	$10^4(n_g - n_D)/d$	$10^4(n_F - n_C)/d$	$10^4(n_g - n_D)/d$	$10^4(n_F - n_C)/d$	$10^4(n_g - n_D)/d$
	1-Pentene		1-Hexene		1-Heptene		1-Octene	
20	126.31	161.59	121.96	155.83	118.37	152.37	116.94	148.69
25	125.92	161.02	121.92	155.73	118.09	152.02	116.76	148.41
30			121.89	155.63	117.85	151.71	116.62	148.18
	1-Nonene		1-Decene		1-Undecene		1-Dodecene	
20	114.51	146.32	112.98	144.03	112.22	143.01	110.77	141.75
25	114.30	146.14	112.90	143.98	111.98	142.79	110.63	141.51
30	114.09	145.98	112.82	143.92	111.75	142.58	110.51	141.27
	1,2-Pentadiene		1,*cis*-3-Pentadiene		1,*trans*-3-Pentadiene		1,4-Pentadiene	
20	164.75	214.85	243.99	326.04	245.85	327.06	153.18	200.25
25	164.63	214.95	243.76	325.84	245.75	326.96		
30	164.52	215.06	243.53	325.64	245.68	326.92		
	2,3-Pentadiene		2-Methyl-1,3-butadiene		Cyclopentene		Cyclohexene	
20	174.53	226.32	224.98	297.67	118.65	152.46	117.15	150.81
25	174.49	226.38	224.75	297.39	118.72	152.64	117.11	150.85
30	174.51	226.49	224.52	297.13	118.75	152.78	117.04	150.86

The measurements and calculations of vapo pressures and boiling points were made as previously described [8, 9], except that the samples were introduced into the apparatus without contact with air. Table 5 gives the experimental data on the temperatures and pressures of the liquid-vapor equilibrium for the 16 compounds. Table 6 gives the values of the three constants of the Antoine equation, the normal boiling point at 760 mm Hg, the pressure coefficient of the boiling point at 760 mm Hg, and the range of measurement, in pressure and in temperature. The last column of table 6 gives the root-mean-square value of the ratios of the deviations of the observed points from the Antoine equation to the expected standard deviation [9]. Figure 2 is a plot of the values of the constants B and C of the Antoine equation, as a function of the number of carbon atoms in the normal alkyl radical of the series of 1-alkenes.

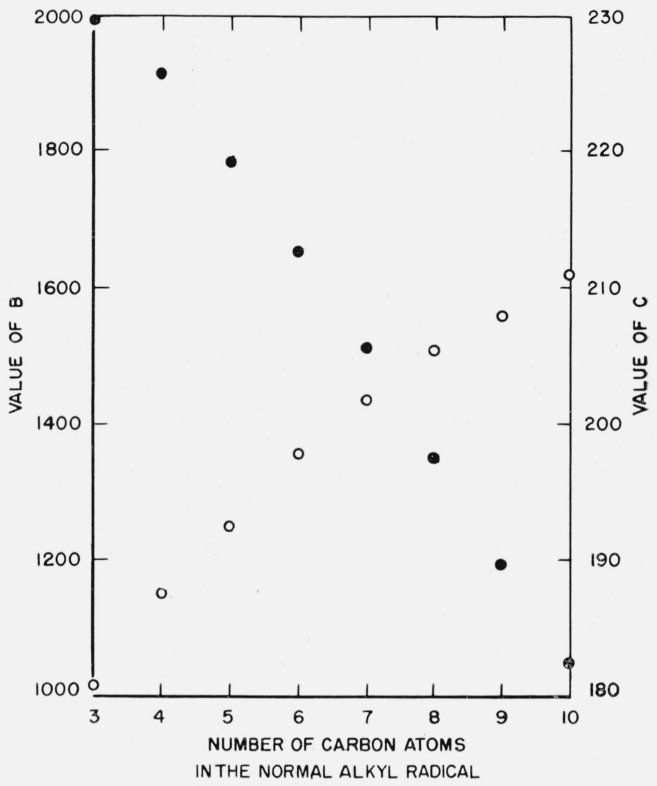

FIGURE 2. *Values of the constants, B and C, of the Antoine equation, as a function of the number of carbon atoms in the normal alkyl radical for the series of 1-alkenes.*

○=B; ●=C.

TABLE 5. *Experimental data on the temperatures and pressures of the liquid-vapor equilibrium*

t	P	t	P	t	P	t	P	t	P	t	P	t	P	t	P
1-Pentene		1-Hexene		1-Heptene		1-Octene		1-Nonene		1-Decene		1-Undecene		1-Dodecene	
°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg
30.723	779.98	64.311	780.03	94.531	780.08	122.223	780.21	147.860	780.22	171.605	780.26	193.742	780.26	214.472	780.36
30.289	768.46	63.837	768.49	94.022	768.53	121.685	768.62	147.289	768.62	171.012	768.65	193.130	768.66	213.826	768.75
29.796	755.52	63.299	755.54	93.444	755.56	121.075	755.64	146.653	755.63	170.345	755.67	192.441	755.69	213.125	755.81
29.362	744.27	62.827	744.29	92.941	744.31	120.539	744.38	146.091	744.38	169.762	744.42	191.832	744.43	212.497	744.57
28.900	732.40	62.323	732.42	92.391	732.44	119.967	732.50	145.488	732.50	169.134	732.53	191.179	732.55	211.823	732.62
24.584	628.21							139.859	628.33			185.091	628.38	205.542	628.45
18.468	501.02	50.914	501.03	80.179	501.05	106.997	501.09	131.881	501.09	154.939	501.12	176.462	501.13	196.624	501.21
12.834	402.81	44.763	402.82	73.563	402.82			124.521	402.84	147.265	402.86	168.501	402.87	188.406	402.97
		38.993	325.27	67.366	325.27	93.428	325.27	117.622	325.26	140.063	325.22	161.031	325.28	180.699	325.41
		33.399	262.04			87.053	262.03	110.935	262.03			153.780	262.05	173.214	262.14
		28.762	217.44	56.384	217.43	81.779	217.44			127.265	217.44	147.780	217.45	167.019	217.54
		23.720	176.15	50.970	176.13	76.022	176.13	99.341	176.13	120.995	176.14	141.240	176.14	160.266	176.24
		19.950	149.61	46.923	149.60	71.736	149.60	94.829	149.60	116.283	149.64	136.350	149.65	155.208	149.72
		15.890	124.85	42.564	124.84	67.096	124.84	89.942	124.84	111.213	124.86	131.081	124.86	149.773	124.95
				38.281	103.85	62.557	103.84	85.202	103.85	106.223	103.87	125.902	103.87	144.428	103.97
				34.525	87.91	58.557	87.91	81.001	87.92	101.844	87.93	121.355	87.94	139.736	88.03
						55.581	77.48	77.861	77.49	98.604	77.51	117.997	77.51	136.258	77.59
				28.768	67.44	52.410	67.46	74.517	67.46	95.134	67.48	114.388	67.48		
				25.492	57.69	48.975	57.68	70.874	57.69	91.308	57.71	110.423	57.72	128.424	57.78
				21.609	47.89	44.893	47.87	66.607	47.89	86.774	47.98	105.866	47.99	123.703	48.02

TABLE 5. *Experimental data on the temperatures and pressures of the liquid-vapor equilibrium*—Continued

1,2-Pentadiene		1,*cis*-3-Pentadiene		1,*trans*-3-Pentadiene		1,4-Pentadiene		2,3-Pentadiene		2-Methyl-1,3-butadiene		Cyclopentene		Cyclohexene	
°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg	°C	mm Hg
45.631	780.27	44.846	780.28	42.810	780.28	26.714	780.26	49.041	780.26	34.834	780.29	45.024	780.13	83.852	780.14
45.191	768.66	44.403	768.68	42.367	768.67	26.287	768.66	48.602	768.66	34.399	768.69	44.576	768.58	83.353	768.59
44.690	755.71	43.902	755.73	41.866	755.72	25.806	755.70	48.101	755.70	33.903	755.74	44.071	755.64	82.791	755.66
44.252	744.47	43.461	744.49	41.423	744.48	25.384	744.46	47.658	744.46	33.469	744.51	43.624	744.41	82.292	744.42
43.778	732.52	42.989	732.54	40.952	732.53	24.931	732.51	47.183	732.51	33.006	732.55	43.146	732.46	81.757	732.47
39.373	628.37	38.578	628.39	36.538	628.39	20.699	628.36	42.781	628.36	28.661	628.40	38.678	628.25	76.766	628.26
33.126	501.13	32.326	501.15	30.282	501.15	14.706	501.12	36.541	501.12	22.506	501.16	32.340	501.09	69.708	501.10
27.374	402.89	26.566	402.91	24.514	402.90			30.803	402.88	16.836	402.92	26.506	402.86	63.200	402.87
21.971	325.32	21.161	325.35	19.109	325.34			25.402	325.31			21.028	325.34	57.107	325.35
16.702	262.08	15.917	262.10									15.718	262.07	51.191	262.07
12.361	217.48											11.325	217.47	46.302	217.48
														40.976	176.20
														36.996	149.70
														32.702	124.89
														28.490	103.94
														24.794	88.01
														22.063	77.59
														19.137	67.55
														15.920	57.82
														12.236	48.13

TABLE 6. *Summary of the results of the correlation of the experimental data with the Antoine equation for vapor pressure*

Compound	Formula	Constants of the Antoine equation $\log_{10}P=A-B/(C+t)$, or $t=B/(A-\log_{10}P)-C$ (P in mm Hg; t in °C)			Normal boiling point at 760 mm Hg	Pressure coefficient dt/dP at 760 mm Hg	Range of measurement		Measure of precision
		A	B	C			Pressure	Temperature	
					°C	°C/mm Hg	mm Hg	°C	ρ
1-Pentene	C_5H_{10}	6.78568	1014.294	229.783	29.968	0.03801	402 to 780	12.8 to 30.7	0.63
1-Hexene	C_6H_{12}	6.86573	1152.971	225.849	63.485	.04149	124 to 780	15.9 to 64.3	.96
1-Heptene	C_7H_{14}	6.90069	1257.505	219.179	93.643	.04447	48 to 780	21.6 to 94.5	.62
1-Octene	C_8H_{16}	6.93262	1353.486	212.764	121.280	.04711	48 to 780	44.8 to 122.2	.78
1-Nonene	C_9H_{18}	6.95389	1435.359	205.535	146.868	.04944	48 to 780	66.6 to 147.9	.97
1-Decene	$C_{10}H_{20}$	6.96036	1501.872	197.578	170.570	.05157	48 to 780	86.7 to 171.6	1.61
1-Undecene	$C_{11}H_{22}$	6.96662	1562.469	189.743	192.671	.05348	48 to 780	105.8 to 193.7	.55
1-Dodecene	$C_{12}H_{24}$	6.97522	1619.862	182.271	213.357	.05522	48 to 780	123.7 to 214.4	.49
1,2-Pentadiene	C_5H_8	7.01099	1154.420	234.652	44.856	.03867	217 to 780	12.3 to 45.6	.76
1,*cis*-3-Pentadiene	C_5H_8	6.94179	1118.371	231.327	44.068	.03875	262 to 780	15.9 to 44.8	.16
1,*trans*-3-Pentadiene	C_5H_8	6.92257	1108.937	232.338	42.032	.03879	325 to 780	19.1 to 42.8	.22
1,4-Pentadiene	C_5H_8	6.84880	1025.016	232.354	25.967	.03720	501 to 780	14.7 to 26.7	.12
2,3-Pentadiene	C_5H_8	6.88603	1086.636	223.040	48.265	.03871	325 to 780	25.4 to 49.0	.49
2-Methyl-1,3-butadiene	C_5H_8	6.90335	1080.996	234.668	34.067	.03818	402 to 780	16.8 to 34.8	.20
Cyclopentene	C_5H_8	6.92066	1121.818	233.446	44.242	.03928	217 to 780	11.3 to 45.0	.46
Cyclohexene	C_6H_{10}	6.88617	1229.973	224.104	82.979	.04381	48 to 780	12.2 to 83.9	.54

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