Reviews

Vapor−Liquid Critical Properties of Elements and Compounds. 7. Oxygen Compounds Other Than Alkanols and Cycloalkanols

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This is part 7 of a series of contributions by the critical properties group of the IUPAC Commission I.2 on Thermodynamics, Subcommittee on Thermodynamic Data. It presents all known experimental data for the critical constants of oxygen compounds other than alkanols and cycloalkanols. Experimental data and recommended values are given together with their uncertainties. The uncertainties are relatively small for the compounds of low molar mass that are stable at the critical temperature but are greater for many of the compounds, particularly those of higher molar mass, because they are unstable at the critical temperature. Where appropriate, critical temperatures have been converted to the ITS-90 scale.

Introduction

In this part we review the vapor−liquid critical properties of C−H−O compounds (other than alkanols and cycloalkanols—see [95-gud/tej]). These include aliphatic compounds (polyols, alkoxyalkanols, alkanals, alkanones, acids, esters, ethers), aromatic compounds, and heterocyclic compounds. In the presentation and evaluation of the experimental data we have followed the guidelines given in parts 1 and 2 of this series [95-amb/you, 95-amb/tso]. Succeeding parts have been by Tsonopoulos and Ambrose [95-tso/amb], Gude and Teja [95-gud/tej], Daubert [96-dau], and Tsonopoulos and Ambrose [96-tso/amb].

Recommended values are in Table 1, and all known data are in Table 2. Where appropriate, the data on which the recommended values are based are indicated by an asterisk. Critical temperatures enclosed in parentheses are not new measurements; they are the values at which investigators determined the critical pressure or critical density. Uncertainties given in Table 2 are those provided by authors or have been inferred from related work. Investigations of critical properties are seldom repeated sufficiently often for standard errors to be evaluated, and the exact significance of such figures is seldom specified. If no uncertainty is given, the number of digits in a value provides an implied guide to its estimated accuracy. Explicit or implied, the errors are frequently greater than the (±) figures, and values from different investigators may differ from each other by more than the sum of their apparent uncertainties. The uncertainties we give in Table 1 (and for the recommended values in Table 2), therefore, are generally greater than those appearing with each experimental value in Table 2. In making our estimates of uncertainty, we not only have considered the spread of the most reliable values for each compound but also have considered groups of compounds and, on the assumption that the properties show a regular progression as the molecular size changes, have plotted the values in various ways, such as critical temperature T_c against n, the number of carbon atoms in the molecule (carbon number). Other useful plots are T_c(homologous series) − T_c(corresponding alkane) against n, the ratio $(M/p_c)^{0.5}$ against n, and critical volume against n. The primary basis of selection of the recommended values has been the assessment of the uncertainty of the experimental values, but in some instances account has been taken of the above relationships when choice was made of best values and uncertainties.

The key to the experimental method used in each investigation is in Table 3. References follow the format used in earlier parts [year-first three letters of first author/first three letters of second author and where required, a sequence number].

Organic oxygen compounds, by and large, are thermally unstable at temperatures close to the critical temperature, and they either decompose into smaller molecules or, less frequently, polymerize to form larger molecules. For example, alkanoic acids are known to dimerize and a sample of an alkanoic acid at the critical temperature may contain both monomer and dimer and also decomposition products. In addition, many compounds containing oxygen are partially or wholly miscible with water and special care must be taken to ensure that an experimental sample is free of water. It is difficult to measure critical constants of such compounds with high accuracy. Generally, if a compound is unstable, it is necessary to make measurements rapidly and this entails sacrifice in accuracy.

Advances in instrumentation and temperature control in recent years have led to the development of improved apparatus for study of unstable compounds that reduce the

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Table 1. Recommended Values of Critical Properties of Oxygen Compounds Other than Alkanols and Cycloalkanols

	molar mass, M/g·mol^{-1} [a]	T_c/K[b]	(±)	p_c/ MPa	(±)	ρ_c/ g·cm^{-3}	(±)	V_c/ cm^3·mol^{-1}	Z_c[c]
Aliphatic C−H−O Compounds									
Polyols									
1,2-ethanediol	62.068	720	(10)	8	(2)				
1,2-propanediol	76.095	676	(1)	5.9	(0.1)				
1,3-propanediol	76.095	722	(5)	6.3	(1.0)				
(±)-1,2-butanediol	90.122	680	(5)	5.2	(0.5)	0.297	(0.01)	303	0.279
(±)-1,3-butanediol	90.122	676	(5)	4.0	(1.0)	0.295	(0.01)	305	0.217
1,4-butanediol	90.122	727	(5)	6.2	(0.5)				
3-oxa-1,5-pentanediol	106.122	750	(15)	4.7	(1)				
3,6-dioxa-1,8-octanediol	150.175	780	(30)	3.3	(1)				
3,6,9-trioxa-1,11-undecanediol	194.228	800	(30)	3.2	(1)				
1,2,3-propanetriol	92.095	850	(30)	7.5	(3)				
Alkoxyalkanols									
2-methoxyethanol	76.095	597.6	(0.2)	5.28	(0.02)	0.289	(0.005)	263	0.279
2-propoxyethanol	104.149	615	(1)	3.65	(0.05)	0.286	(0.005)	364	0.260
2-butoxyethanol	118.176	634	(1)	3.27	(0.05)	0.279	(0.005)	424	0.263
1-methoxy-2-propanol	90.122	579.8	(0.5)	4.11	(0.02)				
2-(2-methoxyethoxy)ethanol	120.148	672	(2)	3.67	(0.2)				
2-(2-ethoxyethoxy)ethanol	134.175	670	(5)	3.17	(0.1)				
2-(2-propoxyethoxy)ethanol	148.202	680	(2)	3.00	(0.05)	0.303	(0.005)	489	0.259
2-(2-butoxyethoxy)ethanol	162.229	692	(2)	2.79	(0.1)				
1-propoxy-2-propanol	118.176	605	(1)	3.0	(0.05)				
1-butoxy-2-propanol	132.203	625	(1)	2.7	(0.05)				
Alkanals									
ethanal	44.053	466	(2)			0.286	(0.005)	154	
propanal	58.080	505	(2)	5.26	(0.2)	0.285	(0.005)	204	0.256
butanal	72.107	537	(3)	4.32	(0.2)	0.280	(0.005)	258	0.250
2-methylpropanal	72.107	544	(10)	5.1	(0.5)				
pentanal	86.134	567	(2)	3.97	(0.2)	0.275	(0.005)	313	0.264
hexanal	100.161	592	(2)	3.46	(0.1)	0.265	(0.005)	378	0.266
heptanal	114.188	617	(1)	3.16	(0.1)	0.263	(0.005)	434	0.267
octanal	128.214	639	(2)	2.96	(0.1)	0.263	(0.005)	488	0.272
nonanal	142.241	659	(2)	2.68	(0.1)	0.262	(0.005)	543	0.266
decanal	156.268	674	(3)	2.60	(0.1)	0.261	(0.005)	599	0.278
Alkanones									
2-propanone	58.080	508.1	(0.1)	4.700	(0.01)	0.273	(0.005)	213	0.237
2-butanone	72.107	536.7	(0.1)	4.207	(0.01)	0.270	(0.025)	267	0.252
2-pentanone	86.134	561.1	(0.2)	3.683	(0.02)	0.268	(0.005)	321	0.253
3-pentanone	86.134	561.4	(0.2)	3.729	(0.01)	0.26	(0.03)	331	0.264
3-methyl-2-butanone	86.134	553.0	(0.5)	3.80	(0.05)	0.28	(0.03)	308	0.255
2-hexanone	100.161	587.1	(0.8)	3.30	(0.05)	0.266	(0.005)	377	0.255
3-hexanone	100.161	583.0	(0.4)	3.320	(0.02)	0.265	(0.005)	378	0.259
4-methyl-2-pentanone	100.161	574.6	(1)	3.270	(0.01)				
3,3-dimethyl-2-butanone	100.161	570.9	(1)	3.43	(0.05)	0.262	(0.005)	382	0.276
2-heptanone	114.188	611.4	(0.5)	2.97	(0.10)	0.262	(0.005)	436	0.256
3-heptanone	114.188	606.6	(0.4)			0.264	(0.005)	433	
4-heptanone	114.188	602.0	(0.4)			0.263	(0.005)	434	
5-methyl-2-hexanone	114.188	604.1	(0.5)						
2-methyl-3-hexanone	114.188	593.3	(0.5)						
2-octanone	128.214	632.7	(0.4)			0.258	(0.005)	497	
3-octanone	128.214	627.7	(0.4)			0.258	(0.005)	497	
4-octanone	128.214	623.8	(0.4)			0.258	(0.005)	497	
2-methyl-3-heptanone	128.214	614.9	(0.5)						
5-methyl-3-heptanone	128.214	619.0	(0.5)						
2-nonanone	142.241	652.2	(0.5)	2.48	(0.05)	0.254	(0.005)	560	0.256
3-nonanone	142.241	648.1	(0.4)			0.254	(0.005)	560	
4-nonanone	142.241	643.7	(0.4)			0.254	(0.005)	560	
5-nonanone	142.241	641.4	(1)	2.32	(0.10)	0.254	(0.005)	560	0.244
2-decanone	156.268	671.8	(1)			0.250	(0.010)	625	
3-decanone	156.268	667.6	(1)			0.249	(0.010)	628	
4-decanone	156.268	662.9	(1)			0.249	(0.010)	628	
5-decanone	156.268	661.0	(0.8)			0.249	(0.010)	628	
2-undecanone	170.295	688	(2)			0.246	(0.010)	692	
3-undecanone	170.295	685	(2)			0.246	(0.010)	692	
4-undecanone	170.295	681	(2)			0.246	(0.010)	692	
5-undecanone	170.295	679	(2)			0.246	(0.010)	692	
6-undecanone	170.295	678	(2)			0.246	(0.010)	692	
2-dodecanone	184.322	702	(4)			0.245	(0.010)	752	
3-dodecanone	184.322	701	(2)			0.245	(0.010)	752	
4-dodecanone	184.322	697	(2)			0.243	(0.010)	759	
5-dodecanone	184.322	695	(5)			0.243	(0.010)	759	
6-dodecanone	184.322	694	(2)			0.242	(0.010)	762	
2-tridecanone	198.349	717	(6)			0.242	(0.010)	820	
3-tridecanone	198.349	716	(5)			0.241	(0.010)	823	
4-tridecanone	198.349	712	(6)			0.241	(0.010)	823	

Table 1. (Continued)

	molar mass, M/g·mol^{-1} [a]	T_c/K[b]	(±)	p_c/ MPa	(±)	ρ_c/ g·cm^{-3}	(±)	V_c/ cm^3·mol^{-1}	Z_c[c]
Aliphatic C−H−O Compounds (Continued)									
5-tridecanone	198.349	710	(8)			0.240	(0.010)	826	
6-tridecanone	198.349	709	(5)			0.240	(0.010)	826	
7-tridecanone	198.349	708	(5)			0.239	(0.010)	830	
2-tetradecanone	212.376	728	(9)			0.237	(0.010)	896	
3-tetradecanone	212.376	727	(6)			0.237	(0.010)	896	
4-tetradecanone	212.376	725	(6)			0.236	(0.010)	900	
7-tetradecanone	212.376	723	(8)			0.235	(0.010)	904	
4-methyl-3-penten-2-one	98.145	605	(2)	4.00	(0.2)	0.278	(0.02)	353	0.281
cyclopentanone	84.118	624	(3)	4.60	(0.10)				
cyclohexanone	98.145	665	(2)	4.6	(0.2)				
2-methylcyclopentanone	98.145	631	(1)						
2-cyclohexylcyclohexanone	180.290	787	(35)						
Ethanoic (Acetic) Anhydride and Acids									
ethanoic anhydride	102.090	606	(10)	4.0	(0.5)				
methanoic acid	46.026	588	(10)						
ethanoic acid	60.053	590.7	(1)	5.78	(0.02)	0.351	(0.005)	171	0.201
propanoic acid	74.079	598.5	(1)	4.67	(0.05)	0.318	(0.005)	233	0.219
butanoic acid	88.106	615.2	(1)	4.06	(0.1)	0.302	(0.005)	292	0.232
2-methylpropanoic acid	88.106	605.0	(2)	3.70	(0.1)	0.304	(0.01)	290	0.213
pentanoic acid	102.133	637.2	(1)	3.63	(0.05)	0.295	(0.01)	346	0.237
3-methylbutanoic acid	102.133	629	(2)	3.40	(0.1)				
hexanoic acid	116.160	655	(2)	3.38	(0.1)	0.281	(0.005)	413	0.256
heptanoic acid	130.187	678	(3)	3.16	(0.1)	0.278	(0.005)	468	0.262
octanoic acid	144.214	693	(2)	2.87	(0.1)	0.278	(0.005)	519	0.259
2-ethylhexanoic acid	144.214	674	(2)	2.78	(0.1)	0.273	(0.005)	528	0.262
nonanoic acid	158.241	712	(4)	2.35	(0.3)				
decanoic acid	172.268	722	(5)	2.10	(0.5)	0.270	(0.005)	638	0.223
cis-2-butenedioic acid	116.073	620	(20)						
Esters									
methyl methanoate	60.053	487.2	(1)	6.00	(0.05)	0.349	(0.005)	172	0.255
ethyl methanoate	74.079	508.4	(1)	4.74	(0.05)	0.323	(0.005)	229	0.257
propyl methanoate	88.106	538.0	(1)	4.06	(0.05)	0.309	(0.005)	285	0.259
1-methylethyl methanoate	88.106	535	(2)	3.95	(0.1)				
2-methylpropyl methanoate	102.133	551	(5)	3.88	(0.2)	0.288	(0.02)	355	0.301
pentyl methanoate	116.160	576	(5)	3.46	(0.2)	0.282	(0.02)	412	0.298
3-methylbutyl methanoate	116.160	578	(8)						
methyl ethanoate	74.079	506.5	(0.1)	4.750	(0.05)	0.325	(0.005)	228	0.257
ethyl ethanoate	88.106	523.3	(0.1)	3.87	(0.05)	0.308	(0.005)	286	0.255
propyl ethanoate	102.133	549.7	(0.1)	3.36	(0.05)	0.296	(0.005)	345	0.254
1-methylethyl ethanoate	102.133	531.0	(1)	3.31	(0.05)	0.297	(0.005)	344	0.258
butyl ethanoate	116.160	575.6	(0.5)	3.14	(0.05)				
1-methylpropyl ethanoate	116.160	571	(2)	3.01	(0.1)				
2-methylpropyl ethanoate	116.160	561	(2)	2.99	(0.1)	0.290	(0.01)	401	0.257
pentyl ethanoate	130.187	599	(2)	2.73	(0.05)	0.277	(0.02)	470	0.258
3-methylbutyl ethanoate	130.187	586.1	(1)	2.76	(0.05)				
hexyl ethanoate	144.214	618.4	(1)						
2-ethylhexyl ethanoate	172.268	642	(2)	2.09	(0.2)	0.253	(0.02)	681	0.267
2-methoxyethyl ethanoate	118.133	603.0	(1)						
2-ethoxyethyl ethanoate	132.159	608.0	(1)	3.17	(0.05)	0.298	(0.005)	443	0.278
1-methoxy-2-propyl ethanoate	132.159	597.8	(1)	3.01	(0.05)	0.306	(0.005)	432	0.262
2-butoxyethyl ethanoate	160.213	640.7	(1)	2.694	(0.05)	0.292	(0.005)	549	0.278
2-(2-ethoxyethoxy)ethyl ethanoate	176.213	663	(2)	2.73	(0.15)				
2-(2-butoxyethoxy)ethyl ethanoate	204.266	681	(2)	3.15	(0.15)				
methyl propanoate	88.106	530.7	(1)	4.00	(0.05)	0.312	(0.01)	282	0.256
ethyl propanoate	102.133	546.7	(1)	3.45	(0.1)	0.299	(0.01)	342	0.260
propyl propanoate	116.160	570	(1)	3.06	(0.05)				
butyl propanoate	130.187	594.5	(1)						
2-methylpropyl propanoate	130.187	584	(1)						
3-methylbutyl propanoate	144.214	611	(5)						
ethyl 3-ethoxypropanoate	146.186	621.0	(1)	2.66	(0.05)	0.319	(0.01)	458	0.236
methyl butanoate	102.133	554.5	(1)	3.47	(0.05)	0.300	(0.01)	340	0.256
ethyl butanoate	116.160	568.8	(1)	3.1	(0.3)	0.28	(0.02)	415	0.263
propyl butanoate	130.187	593.1	(1)	2.72	(0.05)				
butyl butanoate	144.214	612.1	(1)						
2-methylpropyl butanoate	144.214	611	(5)						
3-methylbutyl butanoate	158.241	619	(5)						
methyl 2-methylpropanoate	102.133	540.7	(1)	3.43	(0.05)	0.301	(0.01)	339	0.259
ethyl 2-methylpropanoate	116.160	554	(5)	3.1	(0.3)	0.28	(0.02)	415	0.279
propyl 2-methylpropanoate	130.187	579.4	(1)						
2-methylpropyl 2-methylpropanoate	144.214	602	(5)						
methyl pentanoate	116.160	590	(10)	3.20	(0.05)	0.275	(0.02)	422	0.275
ethyl pentanoate	130.187	593.3	(1)						
ethyl 3-methylbutanoate	130.187	582.4	(1)						
propyl 3-methylbutanoate	144.214	609	(6)						

Table 1. (Continued)

	molar mass, M/g·mol^{-1} [a]	T_c/K[b]	(±)	p_c/ MPa	(±)	ρ_c/ g·cm^{-3}	(±)	V_c/ cm^3·mol^{-1}	Z_c[c]
Aliphatic C−H−O Compounds (Continued)									
2-methylpropyl 3-methylbutanoate	158.241	621	(8)						
ethyl hexanoate	144.214	615.2	(1)						
methyl heptanoate	144.214	628	(2)						
ethyl heptanoate	158.241	634	(2)						
ethyl octanoate	172.268	649	(3)						
ethyl nonanoate	186.294	664	(2)						
methyl dodecanoate	214.348	712	(5)						
vinyl ethanoate	86.090	519.2	(1)	4.185	(0.05)				
ethyl but-2-enoate	114.144	599	(10)						
dimethyl ethanedioate	118.089	see Table 2							
diethyl ethanedioate	146.143	see Table 2							
diethyl butanedioate	174.197	663	(30)						
dimethyl carbonate	90.079	557	(5)	4.80	(0.5)	0.358	(0.05)	252	0.261
Ethers									
dimethyl ether	46.069	400.2	(0.1)	5.34	(0.05)	0.275	(0.01)	168	0.270
ethyl methyl ether	60.096	437.9	(0.1)	4.38	(0.02)	0.271	(0.005)	222	0.267
diethyl ether	74.123	466.7	(0.1)	3.644	(0.01)	0.264	(0.003)	281	0.264
methyl propyl ether	74.123	476.2	(0.1)	3.801	(0.01)				
isopropyl methyl ether	74.123	464.4	(0.1)	3.762	(0.01)				
butyl methyl ether	88.150	512.7	(0.1)	3.37	(0.03)	0.268	(0.005)	329	0.260
tert-butyl methyl ether	88.150	497.1	(0.2)	3.430	(0.01)				
ethyl propyl ether	88.150	500.2	(0.1)	3.370	(0.01)	0.260	(0.010)	339	0.275
methyl pentyl ether	102.177	546.5	(0.1)	3.042	(0.01)	0.261	(0.005)	391	0.262
dipropyl ether	102.177	530.6	(0.2)	3.028	(0.01)				
diisopropyl ether	102.177	500.3	(0.2)	2.832	(0.01)	0.265	(0.01)	386	0.263
1,1-dimethylethyl ethyl ether	102.177	509.4	(1)	2.934	(0.05)	0.259	(0.02)	395	0.274
1,1-dimethylpropyl methyl ether	102.177	535	(1)	3.20	(0.05)	0.273	(0.02)	374	0.269
1,1-dimethylpropyl ethyl ether	116.203	546	(1)	2.935	(0.10)	0.251	(0.02)	463	0.299
dibutyl ether	130.230	584	(1)	3.0	(0.5)				
ethoxyethene	72.107	475	(4)	4.07	(0.1)				
3-ethoxy-1-propene	86.134	518	(10)						
butoxyethene	100.161	540	(1)	3.20	(0.2)	0.261	(0.02)	384	0.274
dimethoxymethane	76.095	491	(1)	3.96	(0.10)	0.357	(0.05)	213	0.207
1,2-dimethoxyethane	90.122	540	(3)	3.90	(0.1)	0.293	(0.02)	308	0.269
diethoxymethane	104.149	531.7	(1)						
1,2-dimethoxypropane	104.149	543.0	(1)						
2,2-dimethoxypropane	104.149	510	(2)						
1,1-diethoxyethane	118.176	540	(3)	3.22	(0.10)				
1,2-diethoxyethane	118.176	542	(3)						
1-*tert*-butoxy-2-methoxyethane	132.203	574	(1)						
2,2-diethoxypropane	132.203	510.7	(1)						
1-*tert*-butoxy-2-ethoxyethane	146.230	585	(1)						
2-methoxyethyl ether	134.175	617	(5)						
2-ethoxyethyl ether	162.229	612	(10)						
Aromatic C−H−O Compounds									
Phenols and Alkylphenols									
phenol	94.113	694.2	(0.2)	5.93	(0.05)				
2-methylphenol	108.140	697.6	(0.3)	4.17	(0.05)				
3-methylphenol	108.140	705.8	(0.5)	4.36	(0.05)				
4-methylphenol	108.140	704.6	(0.4)	4.07	(0.05)				
2-ethylphenol	122.167	703.0	(0.4)						
3-ethylphenol	122.167	716.4	(0.2)						
4-ethylphenol	122.167	716.4	(1)						
2,3-dimethylphenol	122.167	722.8	(0.5)						
2,4-dimethylphenol	122.167	707.6	(0.4)						
2,5-dimethylphenol	122.167	706.9	(0.2)						
2,6-dimethylphenol	122.167	701.0	(0.2)						
3,4-dimethylphenol	122.167	729.8	(1)						
3,5-dimethylphenol	122.167	715.6	(1)						
2-isopropyl-5-methylphenol	150.221	698	(10)						
Miscellaneous Aromatic C−H−O Compounds									
1-phenylethanol	122.167	700	(5)	3.8	(0.2)				
benzaldehyde	106.124	695	(10)	4.7	(1)				
acetophenone	120.151	709.6	(1)	4.01	(0.1)	0.31	(0.01)	388	0.264
benzophenone	182.222	830	(5)	3.35	(0.2)	0.32	(0.01)	568	0.276
methyl 2-hydroxybenzoate	152.150	709	(30)						
methyl phenyl ether	108.140	646.5	(1)	4.24	(0.05)	0.317	(0.01)	341	0.269
ethyl phenyl ether	122.167	647	(5)	3.4	(0.2)				
2-methoxymethylbenzene	122.167	662.0	(1)						
3-methoxymethylbenzene	122.167	665.3	(1)						
4-methoxymethylbenzene	122.167	666	(2)						
1-methoxy-2,4-dimethylbenzene	136.194	682	(3)						
1-methoxy-2,5-dimethylbenzene	136.194	677.3	(1)						
diphenyl ether	170.211	767	(2)			0.322	(0.01)	529	

Table 1. (Continued)

	molar mass, M/g·mol^{-1} [a]	T_c/K[b]	(±)	p_c/ MPa	(±)	ρ_c/ g·cm^{-3}	(±)	V_c/ cm^3·mol^{-1}	Z_c[c]
Heterocyclic C−H−O Compounds									
oxirane	44.053	469	(2)	7.2	(0.1)	0.31	(0.02)	142	0.262
methyloxirane	58.080	485	(3)	5.2	(0.3)	0.305	(0.01)	190	0.245
tetrahydrofuran	72.107	540.5	(0.5)	5.19	(0.1)	0.322	(0.01)	224	0.259
2-methyltetrahydrofuran	86.134	537	(2)	3.76	(0.1)	0.322	(0.02)	267	0.225
furan	68.075	490.2	(0.5)	5.3	(0.2)	0.312	(0.02)	218	0.294
2-methylfuran	82.102	528	(2)	4.7	(0.2)	0.333	(0.02)	247	0.264
dihydropyran	84.118	562	(2)	4.56	(0.1)	0.314	(0.02)	268	0.262
tetrahydropyran	86.134	572	(2)	4.77	(0.1)	0.328	(0.01)	263	0.264
dibenzofuran	168.195	824	(2)	3.64	(0.2)	0.34	(0.02)	495	0.263
1,4-dioxane	88.106	588	(1)	5.21	(0.1)	0.37	(0.02)	238	0.254
2,4,6-trimethyl-1,3,5-trioxane	132.159	563	(10)						
furfural	96.086	see Table 2							
dihydroxy-2(3*H*)-furanone	86.090	731	(1)	5.13	(0.05)				

[a] Molar masses based on carbon = 12.011, hydrogen = 1.007 94, oxygen = 15.9994. [b] Temperatures are expressed on the ITS-90 scale. [c] $Z_c = p_c V_c / R T_c$, where R = 8.314 472 J·mol^{-1}·K^{-1}.

time during which the sample is exposed to the conditions favoring decomposition (or polymerization). When observations are made in the usual sealed tube, the apparent critical temperature may rise or fall. There is usually an accompanying fall or rise in the critical pressure. For example, Teja and co-workers [90-ans/tej, 90-tej/ans, 90-tej/ros, 94-gud/tej] used both the sealed tube and the low residence time flow methods to measure the critical constants of alkanals from ethanal to decanal. The critical temperatures of ethanal, propanal, butanal, pentanal, and hexanal were found to increase with time, whereas those of octanal to decanal decreased. The critical pressures were found to increase with residence time, with those of the lower members of the series changing most rapidly. The ketones provide another example. Pulliam *et al.* [95-pul/gud] found the C_{10} to C_{14} alkanones unstable at their critical points (and their apparent critical temperatures decreased with time), whereas the lower members were stable [94-pul/gud]; this difference in behavior accounts for the larger uncertainties attributed to the properties reported for the higher compounds. However, other workers [55-kob/cra, 75-amb/ell, 91-qua/kud, 95-wil/wil] reported some degree of instability in the lower members of the series, and for example, Ambrose *et al.* [74-amb/bro] were unable to obtain a value for the critical pressure of 5-nonanone.

Of recent investigators, Ambrose and co-workers [63-amb, 72-amb/spr, 74-amb/bro, 74-amb/spr, 75-amb/con, 75-amb/ell, 77-amb/ell, 81-amb/ell, 87-amb/ghi, 87-amb/ghi-1, 87-amb/ghi-2, 88-amb/ghi], Teja and co-workers [90-ans/tej, 90-tej/ans, 90-tej/ans-1, 90-tej/ros, 91-tej/ros, 94-gud/tej, 94-pul/gud, 95-gud/tej, 95-pul/gud], and Young and co-workers [75-lie/you, 75-you, 91-chr/you, 99-mor/lui] have made the largest contributions to our knowledge of the critical constants of the compounds considered here. Quadri *et al.* [91-qua/khi] used a Kay-type apparatus modified so that the experimental tube could be heated quickly. No allowance was made for decomposition of the sample. Nikitin *et al.* [93-nik/pav, 94-nik/pav] developed a method for identification of the critical point by measurement of the temperature of the attainable superheat when the liquid is heated by an electrically pulse-heated thin wire probe. Since the material is exposed to high temperatures for only a few milliseconds, the method is suitable for very unstable compounds.

Steele and co-workers [96-ste/chi, 96-ste/chi-1] have introduced another method of obtaining the critical properties. The properties they measured included vapor pressures by comparative ebulliometry and by use of an inclined piston manometer, saturated liquid densities with a vibrating-tube densitometer, and (vapor + liquid) heat capacities with a differential scanning calorimeter (DSC). For compounds stable up to their critical points, the critical temperature and critical density were obtained graphically from the DSC and density measurements. Critical pressure was then obtained by fitting a Wagner equation to the vapor-pressure values. When the substance decomposed significantly at temperatures below the critical, all three critical properties were estimated from a general fit to the measured properties at lower temperatures, but these estimates have not been included here.

Teja and co-workers used both the sealed tube and low residence time flow methods in which the residence time of the substance in the heated zone was between 10 s and 20 s. A further advance was to simultaneously record the temperature and, on video, the image of the experimental tube. Wilson and co-workers [95-wil/wil, 96-wil/wil, 2000-von/wil] have similarly used static and flow methods, but with larger observation cells (100 cm^3) than those used by Teja and co-workers (<5 cm^3).

In his early work on diethyl ether and ethanoic acid, Young measured critical densities directly [1887-ram/you, 1891-you]. Cailletet and Mathias proposed use of the rectilinear diameter in 1886 [1886-cai/mat], and Mathias recalculated Young's values [1892-mat]. Young adopted this method for his later work and published recalculated values in his 1910 paper [10-you]. In accordance with his comments in that paper, Ambrose and Young [95-amb/you] suggested that values of critical density obtained from the rectilinear diameter were to be preferred. However, precise control of experimental conditions is now so much more easily achieved than previously that investigators are tending to make direct measurement of the critical density [90-tej/ans, 97-gud/men, 95-wil/wil]. Critical densities of all substances fall within a fairly narrow range, and the apparent critical density of an unstable substance is relatively little affected by the length of time the sample is held at temperatures near the critical temperature.

Selection of Best Values

Techniques have so improved since publication of the reviews by Kobe and Lynn [53-kob/lyn] and Kudchadker *et al.* [68-kud/ala] that, with few exceptions, values reported more recently are to be preferred to the earlier values. In the modern period most authors have purified the compounds through elaborate purification procedures, such as crystallization, fractionation, and drying; and the purity of the samples has been characterized by techniques not previously available.

Values for most of the large number of compounds considered in this part have been obtained by a small

Table 2. Critical Properties from the Literature

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
ALIPHATIC C−H−O COMPOUNDS (Other Than Alkanols and Cycloalkanols)						
POLYOLS						
1,2-ETHANEDIOL (Ethylene Glycol): Molar Mass 62.068 g; CASRN 107-21-1						
72-art[a]		790			9	Artemchenko
85-lyo	(446.5 ± 2.3) °C	719.6*	13.08 ± 0.4		1a, 6	Lyons
90-tej/ans			718* ± 9		1	Teja and Anselme
91-tej/ros		>720	>9		2c	Teja and Rosenthal
93-nik/pav		720* ± 10	8.20* ± 0.3		4	Nikitin *et al.*
2000-von/wil		719* ± 6	8.2* ± 0.4		2a, c	VonNiederhausern *et al.*
	recommended values	720 ± 10	8 ± 2			
1,2-PROPANEDIOL (Propylene Glycol): Molar Mass 76.095 g; CASRN 57-55-6						
2000-von/wil		676.4 ± 0.3	5.941 ± 0.007		2a, c	VonNiederhausern *et al.*
1,3-PROPANEDIOL (Trimethylene Glycol): Molar Mass 76.095 g; CASRN 504-63-2						
2000-von/wil		722 ± 4	6.3 ± 0.6		2a, c	VonNiederhausern *et al.*
(±)-1,2-BUTANEDIOL (1,2-Butylene Glycol): Molar Mass 90.122 g; CASRN 26171-83-5						
96-ste/chi[b]		680 ± 1	5.21 ± 0.20	0.297 ± 0.009	4, 6, 7	Steele *et al.*
(±)-1,3-BUTANEDIOL (1,3-Butylene Glycol): Molar Mass 90.122 g; CASRN 107-88-0						
96-ste/chi[b]		676 ± 1	4.02 ± 0.20	0.295 ± 0.009	4, 6, 7	Steele *et al.*
1,4-BUTANEDIOL (Tetramethylene Glycol): Molar Mass 90.122 g; CASRN 110-63-4						
96-wil/wil[b]		727 ± 2	6.22 ± 0.14		2a, c	Wilson *et al.*
3-OXA-1,5-PENTANEDIOL (Diethylene Glycol):[c] Molar Mass 106.122 g; CASRN 111-46-6						
85-lyo	(471.4 ± 3.9) °C	744.6*	4.58* ± 0.22		1a, 6	Lyons
90-ans/tej		>723.5			1	Anselme and Teja
95-nik/pav		753* ± 10	4.77* ± 0.2		4	Nikitin *et al.*
	recommended values	750 ± 15	4.7 ± 1			
3,6-DIOXA-1,8-OCTANEDIOL (Triethylene Glycol):[c] Molar Mass 150.175 g; CASRN 112-27-6						
85-lyo	(496.3 ± 6.3) °C	769.4*	1.77 ± 0.18		1a, 6	Lyons
95-nik/pav		797* ± 12	3.30* ± 0.1		4	Nikitin *et al.*
	recommended values	780 ± 30	3.3 ± 1			
3,6,9-TRIOXA-1,11-UNDECANEDIOL (Tetraethylene Glycol):[c] Molar Mass 194.228 g; CASRN 112-60-7						
95-nik/pav		800 ± 12	3.20 ± 0.1		4	Nikitin *et al.*
1,2,3-PROPANETRIOL (Glycerol, Glycerine): Molar Mass 92.095 g; CASRN 56-81-5						
93-nik/pav		850	7.5		4	Nikitin *et al.*
ALKOXYALKANOLS						
2-METHOXYETHANOL (Ethylene Glycol Monomethyl Ether, Methyl Cellosolve): Molar Mass 76.095 g; CASRN 109-86-4						
96-wil/wil		597.6 ± 0.1	5.285 ± 0.014	0.289 ± 0.005	1a	Wilson *et al.*
2-PROPOXYETHANOL (Ethylene Glycol Monopropyl Ether, Propyl Cellosolve): Molar Mass 104.149 g; CASRN 2807-30-9						
90-tej/ans		614.6* ± 0.3		0.286 ± 0.005	1	Teja and Anselme
91-tej/ros		615.2* ± 0.6	3.65 ± 0.02		2c	Teja and Rosenthal
	recommended values	615 ± 1	3.65 ± 0.05	0.286 ± 0.005		
2-BUTOXYETHANOL (Ethylene Glycol Monobutyl Ether, Butyl Cellosolve): Molar Mass 118.176 g; CASRN 111-76-2						
90-tej/ans		633.9* ± 1.1		0.279 ± 0.005	1	Teja and Anselme
91-tej/ros		633.9* ± 0.6	3.27 ± 0.02		2c	Teja and Rosenthal
	recommended values	634 ± 1	3.27 ± 0.05	0.279 ± 0.005		
1-METHOXY-2-PROPANOL (Propylene Glycol Monomethyl Ether): Molar Mass 90.122 g; CASRN 107-98-2						
96-wil/wil		579.8 ± 0.2	4.113 ± 0.007		2a, c	Wilson *et al.*
2-(2-METHOXYETHOXY)ETHANOL (Diethylene Glycol Monomethyl Ether, Methyl Carbitol): Molar Mass 120.148 g; CASRN 111-77-3						
96-wil/wil		672 ± 1	3.67 ± 0.10		2a, c	Wilson *et al.*
2-(2-ETHOXYETHOXY)ETHANOL (Diethylene Glycol Monoethyl Ether, Ethyl Carbitol): Molar Mass 134.175 g; CASRN 111-90-0						
96-wil/wil		670 ± 3	3.167 ± 0.021		2a, c	Wilson *et al.*
2-(2-PROPOXYETHOXY)ETHANOL (Diethylene Glycol Monopropyl Ether, Propyl Carbitol): Molar Mass 148.202 g; CASRN 6881-94-3						
90-ans/tej		687 ± 13		0.303 ± 0.005	1	Teja and Anselme
91-tej/ros		679.8* ± 1.0	3.00 ± 0.02		2c	Teja and Rosenthal
	recommended values	680 ± 2	3.00 ± 0.05	0.303 ± 0.005		
2-(2-BUTOXYETHOXY)ETHANOL (Diethylene Glycol Monobutyl Ether, Butyl Carbitol): Molar Mass 162.229 g; CASRN 112-34-5						
91-tej/ros		692.3 ± 1.4	2.79 ± 0.07		2c	Teja and Rosenthal
1-PROPOXY-2-PROPANOL (Propylene Glycol Monopropyl Ether): Molar Mass 118.176 g; CASRN 1569-01-3						
2000-von/wil		605.1 ± 0.2	3.051 ± 0.005		2a, c	VonNiederhausern *et al.*
1-BUTOXY-2-PROPANOL (Propylene Glycol Monobutyl Ether): Molar Mass 132.203 g; CASRN 5131-66-8						
2000-von/wil		624.9 ± 0.1	2.739 ± 0.001		2a, c	VonNiederhausern *et al.*
ALKANALS						
ETHANAL (Acetaldehyde): Molar Mass 44.053 g; CASRN 75-07-0						
1881-van	181.5 °C	454.6			1	van der Waals
03-hol	188 °C	461			1	Hollmann
90-tej/ans		466.0* ± 2.0		0.286 ± 0.005	1	Teja and Anselme
	recommended values	466 ± 2		0.286 ± 0.005		

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
		PROPANAL (Propionaldehyde): Molar Mass 58.080 g; CASRN 123-38-6				
90-ans/tej		509.1 ± 3.9		0.285 ± 0.005	1	Anselme and Teja
90-tej/ros		504.4* ± 1.2	5.27* ± 0.1		2c	Teja and Rosenthal
94-gud/tej		504.4* ± 0.6	5.26* ± 0.05		2c	Gude and Teja
	recommended values	505 ± 2	5.26 ± 0.2	0.285 ± 0.005		
		BUTANAL (Butyraldehyde): Molar Mass 72.107 g; CASRN 123-72-8				
90-ans/tej		537.1* ± 3.4		0.280 ± 0.005	1	Anselme and Teja
90-tej/ros		537.2* ± 0.8	4.32 ± 0.1		2c	Teja and Rosenthal
	recommended values	537 ± 3	4.32 ± 0.2	0.280 ± 0.005		
		2-METHYLPROPANAL (Isobutyraldehyde): Molar Mass 72.107 g; CASRN 78-84-2				
95-ma/wan[d]	270.46 °C	543.61	5.120		1	Ma *et al.*
		PENTANAL (Valeraldehyde): Molar Mass 86.134 g; CASRN 110-62-3				
90-ans/tej		568.3* ± 1.6		0.275 ± 0.005	1	Anselme and Teja
90-tej/ros		566.1* ± 0.8	3.97 ± 0.1		2c	Teja and Rosenthal
	recommended values	567 ± 2	3.97 ± 0.2	0.275 ± 0.005		
		HEXANAL (Caproaldehyde): Molar Mass 100.161 g; CASRN 66-25-1				
90-tej/ros		591.0* ± 0.7	3.46 ± 0.05		2c	Teja and Rosenthal
94-gud/tej		592.8* ± 2.5		0.265 ± 0.004	1	Gude and Teja
	recommended values	592 ± 2	3.46 ± 0.1	0.265 ± 0.005		
		HEPTANAL (Heptaldehyde): Molar Mass 114.188 g; CASRN 111-71-7				
94-gud/tej		616.7* ± 0.6		0.263 ± 0.003	1	Gude and Teja
94-gud/tej		616.8* ± 0.4	3.16 ± 0.02		2c	Gude and Teja
	recommended values	617 ± 1	3.16 ± 0.1	0.263 ± 0.005		
		OCTANAL (Caprylic Aldehyde): Molar Mass 128.214 g; CASRN 124-13-0				
90-tej/ros		638.1* ± 0.7	2.96 ± 0.05		2c	Teja and Rosenthal
94-gud/tej		639.3* ± 0.3		0.263 ± 0.003	1	Gude and Teja
	recommended values	639 ± 2	2.96 ± 0.1	0.263 ± 0.005		
		NONANAL (Nonyl Aldehyde): Molar Mass 142.241 g; CASRN 124-19-6				
94-gud/tej		659.7* ± 1.5		0.262 ± 0.004	1	Gude and Teja
94-gud/tej		658.5* ± 0.6	2.68 ± 0.03		2c	Gude and Teja
	recommended values	659 ± 2	2.68 ± 0.1	0.262 ± 0.005		
		DECANAL (Decyl Aldehyde): Molar Mass 156.268 g; CASRN 112-31-2				
90-tej/ros		674.2*	2.60		2c	Teja and Rosenthal
94-gud/tej		674.0* ± 2.2		0.261 ± 0.005	1	Gude and Teja
	recommended values	674 ± 3	2.60 ± 0.1	0.261 ± 0.005		
		ALKANONES				
		2-PROPANONE (Acetone): Molar Mass 58.080 g; CASRN 67-64-1				
		$T_{90} - T_{48} = 0.016$ K; $T_{90} - T_{68} = -0.040$ K at 508 K				
1874-ave	246.1 °C	519.2			1	Avenarius
1878-saj	232.8 °C, 52.2 atm	506.0	5.29		1	Sajotschewsky
1878-saj	237.5 °C, 60.0 atm	510.6	6.08		1	Sajotschewsky
1890-gal	234.4 °C	507.6			1	Galitzine
02-kue/rob	233.7 °C, 46.78 atm	506.8	4.74		1	Kuenen and Robson
23-her/neu	(235.6 ± 0.2) °C	508.8		0.252	1, 7	Herz and Neukirch
43-fis/rei	235.8 °C	509.0			1	Fischer and Reichel
51-ros	(235.5 ± 1) °C, (46.6 ± 0.6) atm	508.6	4.72	0.273* ± 0.004	3, 5	Rosenbaum
54-swi/kre-1	(234.95 ± 0.05) °C	508.12*			1	Swietoslawski and Kreglewski
55-kob/cra	(457.3 ± 0.7) °F, (694 ± 5) psi, (3.60 ± 0.15) mL·g^{-1}	509.4	4.78	0.278*	3, 5	Kobe *et al.*
64-kay	(234.5 ± 0.2) °C, (46.4 ± 0.13) atm	507.6	4.70*		1, 5	Kay
68-cam/cha	(235.0 ± 0.05) °C, 46.96 atm	508.2	4.758	0.234	1, 7	Campbell and Chatterjee
69-cam/cha[e]	(235.0 ± 0.05) °C, 46.96 atm	508.2	4.758	0.269*	5, 7	Campbell and Chatterjee
70-cam/mus	(235.0 ± 0.1) °C	508.2			1	Campbell and Musbally
70-rae		509.1 ± 0.1			1	Rätzsch
72-rae/str		508.7			1	Rätzsch and Strauch
74-amb/spr, 74-amb/bro		508.06* ± 0.05	4.700* ± 0.005		1, 5	Ambrose *et al.*
74-mar/jon	(238.0 ± 0.4) °C	511.2			1	Marshall and Jones
83-mce/has		508.31			1	McElroy *et al.*
	recommended values	508.1 ± 0.1	4.700 ± 0.01	0.273 ± 0.005		
		2-BUTANONE (Methyl Ethyl Ketone): Molar Mass 72.107 g; CASRN 78-93-3				
		$T_{90} - T_{48} = 0.025$ K; $T_{90} - T_{68} = -0.040$ K at 537 K				
38-she	260 °C, 43.3 atm	533.2	4.39		?	Shell Chemical Company
51-ros	260.5 °C, 39.46 atm	533.6	3.998	0.252	3, 5	Rosenbaum

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
		2-BUTANONE (continued)				
55-kob/cra	(504.5 ± 0.7) °F, (602 ± 5) psi, (3.7 ± 0.3) mL·g^{-1}	535.7	4.15	0.270*	3, 5	Kobe *et al.*
69-kre/kay	(604.2 ± 2) psi	535.73 ± 0.1	4.166		1	Kreglewski and Kay
74-amb/bro, 75-amb/ell		536.74* ± 0.03	4.207* ± 0.005		1, 5	Ambrose *et al.*
	recommended values	536.7 ± 0.1	4.207 ± 0.01	0.270 ± 0.025		
	2-PENTANONE (Methyl *n*-Propyl Ketone): Molar Mass 86.134 g; CASRN 107-87-9 $T_{90} - T_{48} = 0.032$ K; $T_{90} - T_{68} = -0.039$ K at 561 K					
55-kob/cra	(555.5 ± 1.0) °F, (564 ± 7) psi, (3.50 ± 0.10) mL·g^{-1}	564.0	3.89	0.286	3, 5	Kobe *et al.*
74-amb/bro		561.04* ± 0.1	3.694* ± 0.01		1	Ambrose *et al.*
95-wil/wil	(0.321 ± 0.001) L·mol^{-1}	561.19* ± 0.05	3.672* ± 0.005	0.268*	1a	Wilson *et al.*
	recommended values	561.1 ± 0.2	3.683 ± 0.02	0.268 ± 0.005		
	3-PENTANONE (Diethyl Ketone): Molar Mass 86.134 g; CASRN 96-22-0 T_{90}-$T_{48} = 0.032$ K; T_{90}-$T_{68} = -0.039$ K at 561 K					
55-kob/cra	(550.0 ± 1.0) °F, (542 ± 6) psi, (3.9 ± 0.5) mL·g^{-1}	561.0	3.74	0.256	3, 5	Kobe *et al.*
74-amb/bro		561.42* ± 0.1	3.729* ± 0.005		1	Ambrose *et al.*
	recommended values	561.4 ± 0.2	3.729 ± 0.01	0.26 ± 0.03		
	3-METHYL-2-BUTANONE (Methyl Isopropyl Ketone): Molar Mass 86.134 g; CASRN 563-80-4					
55-kob/cra	(536.4 ± 1.5) °F, (558 ± 7) psi, (3.6 ± 0.4) mL·g^{-1}	553.4	3.85	0.278	3, 5	Kobe *et al.*
91-qua/kud		553.1* ± 0.3	3.80* ± 0.02		1	Quadri and Kudchadker
99-mor/lui		552.8* ± 0.3			1	Morton *et al.*
	recommended values	553.0 ± 0.5	3.80 ± 0.05	0.28 ± 0.03		
	2-HEXANONE (Butyl Methyl Ketone): Molar Mass 100.161 g; CASRN 591-78-6					
74-amb/bro		587.0* ± 0.3	3.32* ± 0.05		1	Ambrose *et al.*
94-pul/gud		586.6* ± 0.4		0.267* ± 0.003	1	Pulliam *et al.*
95-wil/wil	(0.378 ± 0.001) L·mol^{-1}	587.61* ± 0.2	3.287* ± 0.04	0.265*	1a	Wilson *et al.*
	recommended values	587.1 ± 0.8	3.30 ± 0.05	0.266 ± 0.005		
	3-HEXANONE (Ethyl Propyl Ketone): Molar Mass 100.161 g; CASRN 589-38-8 $T_{90} - T_{48} = 0.035$ K; $T_{90} - T_{68} = -0.039$ K at 583 K					
74-amb/bro		582.78* ± 0.2	3.320 ± 0.010		1	Ambrose *et al.*
94-pul/gud		583.2* ± 0.2		0.265 ± 0.003	1	Pulliam *et al.*
	recommended values	583.0 ± 0.4	3.320 ± 0.02	0.265 ± 0.005		
	4-METHYL-2-PENTANONE (Methyl Isobutyl Ketone): Molar Mass 100.161 g; CASRN 108-10-1					
55-kob/cra	(569 ± 2) °F, (475 ± 14) psi	571	3.27		3, 5	Kobe *et al.*
88-amb/ghi		574.6* ± 0.5	3.270* ± 0.005		1	Ambrose *et al.*
91-qua/kud		575.5 ± 0.4	3.39 ± 0.02		1	Quadri and Kudchadker
	recommended values	574.6 ± 1	3.270 ± 0.01			
	3,3-DIMETHYL-2-BUTANONE (*tert*-Butyl Methyl Ketone): Molar Mass 100.161 g: CASRN 75-97-8					
95-ma/wan	(297.77 ± 0.12) °C	570.92	3.432 ± 0.02	0.2615 ± 0.0019	1, 7	Ma *et al.*
	2-HEPTANONE (Methyl Pentyl Ketone): Molar Mass 114.188 g; CASRN 110-43-0					
74-amb/bro		611.5* ± 0.2	3.436 ± 0.002		1	Ambrose *et al.*
75-amb/ell		(611.5)	2.99*		6	Ambrose *et al.*
94-pul/gud		611.4* ± 0.3		0.262* ± 0.003	1	Pulliam *et al.*
95-wil/wil		611.4* ± 0.2	2.940* ± 0.01		2a, c	Wilson *et al.*
95-wil/wil	(0.434 ± 0.001) L·mol^{-1}	611.1* ± 0.2	2.992* ± 0.04	0.263*	1a	Wilson *et al.*
	recommended values	611.4 ± 0.5	2.97 ± 0.10	0.262 ± 0.005		
	3-HEPTANONE (Ethyl Butyl Ketone): Molar Mass 114.188 g; CASRN 106-35-4					
94-pul/gud		606.6 ± 0.2		0.264 ± 0.003	1	Pulliam *et al.*
	4-HEPTANONE (Dipropyl Ketone): Molar Mass 114.188 g; CASRN 123-19-3					
94-pul/gud		602.0 ± 0.2		0.263 ± 0.003	1	Pulliam *et al.*
	5-METHYL-2-HEXANONE (Isopentyl Methyl Ketone): Molar Mass 114.188 g; CASRN 110-12-3					
99-mor/lui		604.1 ± 0.3			1	Morton *et al.*
	2-METHYL-3-HEXANONE (Isopropyl Propyl Ketone): Molar Mass 114.188 g; CASRN 7379-12-6					
99-mor/lui		593.3 ± 0.3			1	Morton *et al.*
	2-OCTANONE (Hexyl Methyl Ketone): Molar Mass 128.214 g; CASRN 111-13-7					
94-pul/gud		632.7 ± 0.2		0.258 ± 0.003	1	Pulliam *et al.*
	3-OCTANONE (Ethyl Pentyl Ketone): Molar Mass 128.214 g; CASRN 106-68-3					
94-pul/gud		627.7 ± 0.2		0.258 ± 0.003	1	Pulliam *et al.*

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
		4-OCTANONE (Butyl Propyl Ketone): Molar Mass 128.214 g; CASRN 589-63-9				
94-pul/gud		623.8 ± 0.2		0.258 ± 0.003	1	Pulliam *et al.*
		2-METHYL-3-HEPTANONE: Molar Mass 128.214; CASRN 13019-20-0				
99-mor/lui		614.9 ± 0.3			1	Morton *et al.*
		5-METHYL-3-HEPTANONE: Molar Mass 128.214; CASRN 541-85-5				
99-mor/lui		619.0 ± 0.3			1	Morton *et al.*
		2-NONANONE (Methyl Heptyl Ketone): Molar Mass 142.241 g; CASRN 821-55-6				
94-pul/gud		652.5* ± 0.2		0.254 ± 0.003	1	Pulliam *et al.*
96-wil/wil		651.9* ± 0.1	2.482 ± 0.007		2a, c	Wilson *et al.*
	recommended values	652.2 ± 0.5	2.48 ± 0.05	0.254 ± 0.005		
		3-NONANONE (Ethyl Hexyl Ketone): molar mass 142.241 g; CASRN 925−78−0				
94-pul/gud		648.1 ± 0.2		0.254 ± 0.003	1	Pulliam *et al.*
		4-NONANONE (Propyl Pentyl Ketone): Molar Mass 142.241 g; CASRN 4485-09-0				
94-pul/gud		643.7 ± 0.2		0.254 ± 0.003	1	Pulliam *et al.*
		5-NONANONE (Dibutyl Ketone): Molar Mass 142.241 g; CASRN 502-56-7				
74-amb/bro		640 ± 2			1	Ambrose *et al.*
75-amb/ell		(640)	2.32		6	Ambrose *et al.*
94-pul/gud		641.4* ± 0.3		0.254 ± 0.003	1	Pulliam *et al.*
	recommended values	641.4 ± 1.0	2.32 ± 0.10	0.254 ± 0.005		
		2-DECANONE (Methyl Octyl Ketone): Molar Mass 156.268 g; CASRN 693-54-9				
95-pul/gud		671.8 ± 0.5		0.250 ± 0.007	1	Pulliam *et al.*
		3-DECANONE (Ethyl Heptyl Ketone): Molar Mass 156.268 g; CASRN 928-80-3				
95-pul/gud		667.6 ± 0.5		0.249 ± 0.007	1	Pulliam *et al.*
		4-DECANONE (Propyl Hexyl Ketone): Molar Mass 156.268 g; CASRN 624-16-8				
95-pul/gud		662.9 ± 0.5		0.249 ± 0.007	1	Pulliam *et al.*
		5-DECANONE (Butyl Pentyl Ketone): Molar Mass 156.268 g; CASRN 820-29-1				
95-pul/gud		661.0 ± 0.4		0.249 ± 0.007	1	Pulliam *et al.*
		2-UNDECANONE (Methyl Nonyl Ketone): Molar Mass 170.295 g; CASRN 112-12-9				
95-pul/gud		687.8 ± 1.6		0.246 ± 0.007	1	Pulliam *et al.*
		3-UNDECANONE (Ethyl Octyl Ketone): Molar Mass 170.295 g; CASRN 2216-87-7				
95-pul/gud		684.6 ± 1.3		0.246 ± 0.007	1	Pulliam *et al.*
		4-UNDECANONE (Propyl Heptyl Ketone): Molar Mass 170.295 g; CASRN 14476-37-0				
95-pul/gud		680.9 ± 1.6		0.246 ± 0.007	1	Pulliam *et al.*
		5-UNDECANONE (Butyl Hexyl Ketone): Molar Mass 170.295 g; CASRN 33083-83-9				
95-pul/gud		679.4 ± 1.5		0.246 ± 0.007	1	Pulliam *et al.*
		6-UNDECANONE (Dipentyl Ketone): Molar Mass 170.295 g; CASRN 927-49-1				
95-pul/gud		678.5 ± 1.5		0.246 ± 0.007	1	Pulliam *et al.*
		2-DODECANONE (Methyl Decyl Ketone): Molar Mass 184.322 g; CASRN 6175-45-1				
95-pul/gud		702.1 ± 2.7		0.245 ± 0.007	1	Pulliam *et al.*
		3-DODECANONE (Ethyl Nonyl Ketone): Molar Mass 184.322 g; CASRN 1534-27-6				
95-pul/gud		700.7 ± 1.4		0.245 ± 0.007	1	Pulliam *et al.*
		4-DODECANONE (Propyl Octyl Ketone): Molar Mass 184.322 g; CASRN 6137-26-4				
95-pul/gud		696.6 ± 1.5		0.243 ± 0.007	1	Pulliam *et al.*
		5-DODECANONE (Butyl Heptyl Ketone): Molar Mass 184.322 g; CASRN 19780-10-0				
95-pul/gud		695.2 ± 3.0		0.243 ± 0.007	1	Pulliam *et al.*
		6-DODECANONE (Pentyl Hexyl Ketone): Molar Mass 184.322 g; CASRN 6064-27-3				
95-pul/gud		694.2 ± 1.2		0.242 ± 0.007	1	Pulliam *et al.*
		2-TRIDECANONE (Methyl Undecyl Ketone): Molar Mass 198.349 g; CASRN 593-08-8				
95-pul/gud		717.0 ± 3.3		0.242 ± 0.007	1	Pulliam *et al.*
		3-TRIDECANONE (Ethyl Decyl Ketone): Molar Mass 198.349 g; CASRN 1534-26-5				
95-pul/gud		716.1 ± 2.7		0.241 ± 0.007	1	Pulliam *et al.*
		4-TRIDECANONE (Propyl Nonyl Ketone): Molar Mass 198.349 g; CASRN 26215-90-7				
95-pul/gud		711.6 ± 3.5		0.241 ± 0.007	1	Pulliam *et al.*
		5-TRIDECANONE (Butyl Octyl Ketone): Molar Mass 198.349 g; CASRN 30692-16-1				
95-pul/gud		709.7 ± 4.5		0.240 ± 0.007	1	Pulliam *et al.*
		6-TRIDECANONE (Pentyl Heptyl Ketone): Molar Mass 198.349 g; CASRN 22026-12-6				
95-pul/gud		709.3 ± 2.7		0.240 ± 0.007	1	Pulliam *et al.*
		7-TRIDECANONE (Dihexyl Ketone): Molar Mass 198.349 g; CASRN 462-18-0				
95-pul/gud		708.2 ± 2.8		0.239 ± 0.007	1	Pulliam *et al.*
		2-TETRADECANONE (Methyl Dodecyl Ketone): Molar Mass 212.376 g; CASRN 2345-27-9				
95-pul/gud		727.7 ± 4.8		0.237 ± 0.007	1	Pulliam *et al.*
		3-TETRADECANONE (Ethyl Undecyl Ketone): Molar Mass 212.376 g; CASRN 629-23-2				
95-pul/gud		726.8 ± 3.7		0.237 ± 0.007	1	Pulliam *et al.*

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
		4-TETRADECANONE (Propyl Decyl Ketone): Molar Mass 212.376 g; CASRN 26496-20-8				
95-pul/gud		725.2 ± 3.7		0.236 ± 0.007	1	Pulliam *et al.*
		7-TETRADECANONE (Hexyl Heptyl Ketone): Molar Mass 212.376 g; CASRN 6137-34-4				
95-pul/gud		722.9 ± 4.2		0.235 ± 0.007	1	Pulliam *et al.*
		4-METHYL-3-PENTEN-2-ONE (Mesityl Oxide): Molar Mass 98.145 g, CASRN 141-79-7				
97-ste/chi-2		605 ± 1	4.00 ± 0.1	0.278 ± 0.01	4, 6, 7	Steele *et al.*
		CYCLOPENTANONE: Molar Mass 84.118 g; CASRN 120-92-3				
87-amb/ghi-1		624.5 ± 2.0	4.60 ± 0.05		1	Ambrose and Ghiassee
		CYCLOHEXANONE: Molar Mass 98.145 g; CASRN 108-94-1				
57-gla/rue	356 °C, 38 atm	629	3.85		3	Glaser and Rüland
87-amb/ghi-1		653 ± 3	4.00 ± 0.05		1	Ambrose and Ghiassee
91-qua/kud		664.3* ± 0.8	4.60* ± 0.03		1	Quadri and Kudchadker
99-mor/lui		665.5* ± 0.4			1	Morton *et al.*
	recommended values	665 ± 2	4.6 ± 0.2			
		2-METHYLCYCLOPENTANONE: Molar Mass 98.145 g; CASRN 1120-72-5				
99-mor/lui		630.8 ± 0.3			1	Morton *et al.*
		2-CYCLOHEXYLCYCLOHEXANONE: Molar Mass 180.290 g; CASRN 90-42-6				
90-ans/tej		787 ± 35			1	Anselme and Teja
		ETHANOIC (ACETIC) ANHYDRIDE AND ACIDS				
		ETHANOIC ANHYDRIDE (Acetic Anhydride): Molar Mass 102.090 g; CASRN 108-24-7				
03-ves	296 °C, 46.2 atm	569	4.68		1	Vespignani
87-amb/ghi-2[f]		606*	4.0*		1, 6	Ambrose and Ghiassee
	recommended values	606 ± 10	4.0 ± 0.5			
		METHANOIC ACID (Formic Acid):[g] Molar Mass 46.026 g; CASRN 64-18-6				
87-amb/ghi		588* ± 10			1	Ambrose and Ghiassee
90-ans/tej		>577			1	Anselme and Teja
	recommended values	588 ± 10				
		ETHANOIC ACID (Acetic Acid): Molar Mass 60.053 g; CASRN 64-19-7 $T_{90} - T_{48} = 0.036$ K; $T_{90} - T_{68} = -0.039$ K at 591 K				
1883-paw	321.5 °C	594.6			1	Pawlewski
1891-you, 10-you	321.6 °C, 43400 mmHg	594.75	5.786*	0.3506*	1, 7	Young
54-swi/kre	321.30 °C	594.49			1	Swietoslawski and Kreglewski
57-kre	(321.2, 321.3) °C	594.4			1	Kreglewski
77-amb/ell		592.67 ± 0.05	5.786* ± 0.005		1	Ambrose *et al.*
95-van/tej		592.9 ± 0.6		0.351* ± 0.005	1	Vandana and Teja
97-ros/gud		590.7* ± 0.6	5.78* ± 0.02		2c	Rosenthal *et al.*
	recommended values	590.7 ± 1	5.78 ± 0.02	0.351 ± 0.005		
		PROPANOIC ACID (Propionic Acid): Molar Mass 74.079 g; CASRN 79-09-4				
1883-paw	339.9 °C	613.0			1	Pawlewski
1891-sch	337.6 °C	610.8			1	Schmidt
02-guy/mal	326.8 °C	600.0			1	Guye and Mallet
03-ves	339 °C, 52.9 atm	612	5.36		1	Vespignani
28-ict[h]				0.315	7	*International Critical Tables*
72-efr/sok	329.0 °C, 40.7 atm	602.2	4.12	0.334	1	Efremova and Sokolova
87-amb/ghi		604.0 ± 0.5	4.53 ± 0.05		1	Ambrose and Ghiassee
97-gud/men		601.3 ± 0.3		0.318* ± 0.005	1	Gude *et al.*
97-ros/gud		598.5* ± 0.6	4.67* ± 0.03		2c	Rosenthal *et al.*
	recommended values	598.5 ± 1	4.67 ± 0.05	0.318 ± 0.005		
		BUTANOIC ACID (Butyric Acid): Molar Mass 88.106 g; CASRN 107-92-6				
06-bro	354.74 °C	627.9			1	Brown
51-hud[i]	52 atm	(627.9)	5.3	0.302*	6, 7	Hudel
87-amb/ghi		624 ± 1	3.95 ± 0.05		1	Ambrose and Ghiassee
97-gud/men		618.3 ± 0.3		0.302* ± 0.005	1	Gude *et al.*
97-ros/gud		615.2* ± 0.6	4.06* ± 0.02		2c	Rosenthal *et al.*
	recommended values	615.2 ± 1	4.06 ± 0.1	0.302 ± 0.005		
		2-METHYLPROPANOIC ACID (Isobutyric Acid): Molar Mass 88.106 g; CASRN 79-31-2				
06-bro	336.25 °C	609.4			1	Brown
51- hud[i]	40 atm	(609.4)	4.1	0.304	6, 7	Hudel
87-amb/ghi		605.0* ± 1.5	3.700* ± 0.025		1	Ambrose and Ghiassee
	recommended values	605.0 ± 2	3.70 ± 0.1	0.304 ± 0.01		
		PENTANOIC ACID (Valeric Acid): Molar Mass 102.133 g; CASRN 109-52-4				
06-bro	378.87 °C	652.0			1	Brown
87-amb/ghi		643 ± 2	3.60 ± 0.10		1	Ambrose and Ghiassee
90-tej/ans		639.9 ± 0.4		0.300* ± 0.006	1	Teja and Anselme
91-tej/ros		637.2* ± 0.7	3.63* ± 0.03		2c	Teja and Rosenthal
97-gud/men		639.7 ± 0.3		0.291* ± 0.005	1	Gude *et al.*
97-ros/gud		637.2* ± 0.7	3.63* ± 0.03		2c	Rosenthal *et al.*
	recommended values	637.2 ± 1	3.63 ± 0.05	0.295 ± 0.01		

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
	3-METHYLBUTANOIC ACID (Isovaleric Acid): Molar Mass 102.133 g: CASRN 503-74-2					
06-bro	360.68 °C	633.8			1	Brown
87-amb/ghi		629* ± 1	3.400 ± 0.025		1	Ambrose and Ghiassee
	recommended values	629 ± 2	3.40 ± 0.1			
	HEXANOIC ACID (Caproic Acid): Molar Mass 116.160 g; CASRN 142-62-1					
87-amb/ghi		663 ± 1	3.20 ± 0.10		1	Ambrose and Ghiassee
97-gud/men		660.2 ± 0.6		0.281 ± 0.005	1	Gude *et al.*
97-ros/gud		655.1* ± 0.7	3.38* ± 0.03		2c	Rosenthal *et al.*
	recommended values	655 ± 2	3.38 ± 0.1	0.281 ± 0.005		
	HEPTANOIC ACID (Enanthic Acid): Molar Mass 130.187 g; CASRN 111-14-8					
87-amb/ghi		679* ± 1	2.88 ± 0.10		1	Ambrose and Ghiassee
97-gud/men		677.3* ± 0.7		0.278 ± 0.005	1	Gude *et al.*
97-ros/gud		677.8* ± 3.0	3.16* ± 0.03		2c	Rosenthal *et al.*
	recommended values	678 ± 3	3.16 ± 0.1	0.278 ± 0.005		
	OCTANOIC ACID (Caprylic Acid): Molar Mass 144.214 g; CASRN 124-07-2					
87-amb/ghi		694.0* ± 1.5	2.70 ± 0.25		1	Ambrose and Ghiassee
97-gud/men		694.0* ± 1.0		0.278 ± 0.005	1	Gude *et al.*
97-ros/gud		693.0* ± 0.8	2.87* ± 0.04		2c	Rosenthal *et al.*
	recommended values	693 ± 2	2.87 ± 0.1	0.278 ± 0.005		
	2-ETHYLHEXANOIC ACID: Molar Mass 144.214 g; CASRN 149-57-5					
90-tej/ans-1		673.6* ± 1.2		0.273 ± 0.005	1	Teja and Anselme
90-tej/ros		674.6* ± 0.6	2.778 ± 0.03		2c	Teja and Rosenthal
	recommended values	674 ± 2	2.78 ± 0.1	0.273 ± 0.005		
	NONANOIC ACID (Pelargonic Acid): Molar Mass 158.241 g; CASRN 112-05-0					
87-amb/ghi		712 ± 3	2.35 ± 0.2		1	Ambrose and Ghiassee
	DECANOIC ACID (Capric Acid): Molar Mass 172.268 g; CASRN 334-48-5					
87-amb/ghi		726 ± 4	2.10 ± 0.40		1	Ambrose and Ghiassee
97-gud/men		721.6* ± 3.5		0.270 ± 0.005	1	Gude *et al.*
	recommended values	722 ± 5	2.10 ± 0.5	0.270 ± 0.005		
	cis-2-BUTENEDIOIC ACID (Maleic Acid): Molar Mass 116.073 g; CASRN 110-16-7					
90-ans/tej		>616			1	Anselme and Teja
	ESTERS					
	METHYL METHANOATE (Methyl Formate): Molar Mass 60.053 g; CASRN 107-31-3					
1887-nad	212.0 °C, 61.65 atm	485.2	6.247		1	Nadezhdin
1888-deh	250.5 °C	523.6			?	de Heen
1893-you/tho, 10-you	214.0 °C, 45030 mmHg	487.2*	6.004*	0.3489	1, 7	Young and Thomas, Young
	recommended values	487.2 ± 1	6.00 ± 0.05	0.349 ± 0.005		
	ETHYL METHANOATE (Ethyl Formate): Molar Mass 74.079 g; CASRN 109-94-4					
1878-saj	230.0 °C, 48.7 atm	503.2	4.94		1	Sajotchewsky
1882-paw	238.6 °C	511.8			1	Pawlewski
1887-nad	233.1 °C, 49.16 atm	506.2	4.981	0.315	1	Nadezhdin
1893-you/tho, 10-you	235.3 °C, 35535 mmHg	508.4*	4.738*	0.3232*	1, 7	Young and Thomas, Young
	recommended values	508.4 ± 1	4.74 ± 0.05	0.323 ± 0.005		
	PROPYL METHANOATE (Propyl Formate): Molar Mass 88.106 g; CASRN 110-74-7					
1882-paw	267.4 °C	540.6			1	Pawlewski
1887-nad	260.8 °C, 42.7 atm	534.0	4.33	0.305	1	Nadezhdin
1888-deh	260.5 °C	533.6			?	de Heen
1893-you/tho, 10-you	264.85 °C, 30460 mmHg	538.0*	4.061*	0.3093*	1, 7	Young and Thomas, Young
	recommended values	538.0 ± 1	4.06 ± 0.05	0.309 ± 0.005		
	1-METHYLETHYL METHANOATE (Isopropyl Formate): Molar Mass 88.106 g; CASRN 625-55-8					
95-ma/wan	261.45 °C	534.60	3.946		1	Ma *et al.*
	2-METHYLPROPYL METHANOATE (Isobutyl Formate): Molar Mass 102.133 g; CASRN 542-55-2					
1887-nad	278.2 °C, 38.29 atm	551.4	3.880	0.2879	1	Nadezhdin
	PENTYL METHANOATE (Pentyl Formate): Molar Mass 116.160 g; CASRN 638-49-3					
1887-nad	302.6 °C, 34.12 atm	575.8	3.457	0.282	1	Nadezhdin
	3-METHYLBUTYL METHANOATE (Isopentyl Formate): Molar Mass 116.160 g; CASRN 110-45-2					
1882-paw	304.6 °C	577.8			1	Pawlewski
	METHYL ETHANOATE (Methyl Acetate): Molar Mass 74.079 g; CASRN 79-20-9 $T_{90} - T_{48} = 0.015$ K; $T_{90} - T_{68} = -0.040$ K at 506 K					
1878-saj	229.8 °C, 57.6 atm	503.0	5.84		1	Sajotschewsky
1882-paw	239.8 °C	513.0			1	Pawlewski
1887-nad	232.9 °C, 47.54 atm	506.0	4.817	0.32	1	Nadezhdin
1888-deh	278.7 °C	551.8			?	de Heen
1891-sch	(235.8, 235.9) °C	509.0			1	Schmidt
1893-you/tho, 10-you	233.7 °C, 35212 mmHg	506.8	4.695	0.3252*	1, 7	Young and Thomas, Young
81-amb/ell		506.51*	4.750*		1	Ambrose *et al.*
83-mce/has		506.61*			1	McElroy *et al.*
	recommended values	506.5 ± 0.1	4.750 ± 0.05	0.325 ± 0.005		

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
ETHYL ETHANOATE (Ethyl Acetate): Molar Mass 88.106 g: CASRN 141-78-6						
$T_{90} - T_{48} = 0.021$ K; $T_{90} - T_{68} = -0.040$ K at 523 K						
1878-saj	239.8 °C, 42.6 atm	513.0	4.32		1	Sajotschewsky
1882-paw	256.5 °C	529.6			1	Pawlewski
1887-nad	249.5 °C, 39.65 atm	522.6	4.017	0.2993	1	Nadezhdin
1888-deh	275.7 °C	548.8			?	de Heen
1893-you/tho, 10-you	250.1 °C, 28877 mmHg	523.2*	3.850*	0.3077*	1, 7	Young and Thomas, Young
81-amb/ell		523.26*	3.882*		1	Ambrose *et al.*
	recommended values	523.3 ± 0.1	3.87 ± 0.05	0.308 ± 0.005		
PROPYL ETHANOATE (Propyl Acetate): Molar Mass 102.133 g; CASRN 109-60-4						
$T_{90} - T_{48} = 0.029$ K; $T_{90} - T_{68} = -0.039$ K at 550 K						
1882-paw	282.4 °C	555.6			1	Pawlewski
1887-nad	276.3 °C, 34.8 atm	549.4	3.53	0.29	1	Nadezhdin
1888-deh	264.5 °C	537.6			?	de Heen
1893-you/tho, 10-you	276.2 °C, 25227 mmHg	549.4	3.363*	0.2957*	1, 7	Young and Thomas, Young
81-amb/ell		549.69*			1	Ambrose *et al.*
	recommended values	549.7 ± 0.1	3.36 ± 0.05	0.296 ± 0.005		
1-METHYLETHYL ETHANOATE (Isopropyl Acetate): Molar Mass 102.133 g; CASRN 108-21-4						
$T_{90} - T_{48} = 0.023$ K; $T_{90} - T_{68} = -0.040$ K at 531 K						
81-amb/ell		530.96*			1	Ambrose *et al.*
91-qua/kud		532.0* ± 0.5	3.29* ± 0.02		1	Quadri and Kudchadker
91-ma/ma	(257.77 ± 0.34) °C	530.92*	3.519 ± 0.025	0.2960* ± 0.0009	1, 7	Ma *et al.*
92-zha/zha		531.09* ± 0.11	3.361* ± 0.020	0.2966* ± 0.0022	1, 7	Zhang *et al.*
95-wil/wil	(0.343 ± 0.001) L·mol^{-1}	530.16* ± 0.2	3.283* ± 0.04	0.298*	1a	Wilson *et al.*
	recommended values	531.0 ± 1	3.31 ± 0.05	0.297 ± 0.005		
BUTYL ETHANOATE (Butyl Acetate): Molar Mass 116.160 g; CASRN 123-86-4						
1882-paw	305.9 °C	579.0			1	Pawlewski
1888-deh	287.0 °C	560.2			?	de Heen
91-qua/kud		575.4* ± 0.3	3.09* ± 0.02		1	Quadri and Kudchadker
95-ma/wan	312.01 °C	585.16	3.181*		1	Ma *et al.*
99-mor/lui		575.7* ± 0.3			1	Morton *et al.*
	recommended values	575.6 ± 0.5	3.14 ± 0.05			
1-METHYLPROPYL ETHANOATE (*sec*-Butyl Acetate): Molar Mass 116.160 g; CASRN 105-46-4						
95-ma/wan	297.99 °C	571.14	3.014		1	Ma *et al.*
2-METHYLPROPYL ETHANOATE (Isobutyl Acetate): Molar Mass 116.160 g; CASRN 110-19-0						
1882-paw	295.8 °C	569.0			1	Pawlewski
1887-nad	288.3 °C, 31.4 atm	561.4*	3.18	0.281*	1	Nadezhdin
91-qua/kud		560.8* ± 0.4	3.01* ± 0.02		1	Quadri and Kudchadker
92-ma/fan		562.57* ± 0.12	2.972* ± 0.010	0.2942* ± 0.0009	1, 7	Ma *et al.*
	recommended values	561 ± 2	2.99 ± 0.1	0.290 ± 0.01		
PENTYL ETHANOATE (Pentyl Acetate): Molar Mass 130.187 g; CASRN 628-63-7						
91-qua/kud		599.9* ± 0.4	2.77* ± 0.02		1	Quadri and Kudchadker
96-ste/chi		600* ± 1	2.685* ± 0.1	0.277 ± 0.009	4, 6, 7	Steele *et al.*
99-mor/lui		597.8* ± 0.3			1	Morton *et al.*
	recommended values	599 ± 2	2.73 ± 0.05	0.277 ± 0.02		
3-METHYLBUTYL ETHANOATE (Isopentyl Acetate): Molar Mass 130.187 g; CASRN 123-92-2						
06-bro	326.18 °C	599.3			1	Brown
91-qua/kud		586.1* ± 0.4	2.76 ± 0.02		1	Quadri and Kudchadker
	recommended values	586.1 ± 1	2.76 ± 0.05			
HEXYL ETHANOATE (Hexyl Acetate): Molar Mass 144.214 g; CASRN 142-92-7						
99-mor/lui		618.4 ± 0.4			1	Morton *et al.*
2-ETHYLHEXYL ETHANOATE (2-Ethylhexyl Acetate): Molar Mass 172.268 g; CASRN 103-09-3						
94-ste/chi		642.4	2.090	0.253 ± 0.013	4, 6, 7	Steele *et al.*
2-METHOXYETHYL ETHANOATE (Methyl Cellosolve Acetate): Molar Mass 118.133 g; CASRN 110-49-6						
99-mor/lui		603.0 ± 0.3			1	Morton *et al.*
2-ETHOXYETHYL ETHANOATE (Ethylene Glycol Ethyl Ether Acetate, Cellosolve Acetate): Molar Mass 132.159 g; CASRN 111-15-9						
90-tej/ans-1		608.7* ± 0.6		0.298* ± 0.005	1	Teja and Anselme
90-tej/ros		607.3* ± 0.7	3.166* ± 0.04		2c	Teja and Rosenthal
96-ste/chi		611 ± 1	3.180 ± 0.1	0.300 ± 0.009	4, 6, 7	Steele *et al.*
	recommended values	608.0 ± 1	3.17 ± 0.05	0.298 ± 0.005		
1-METHOXY-2-PROPYL ETHANOATE (1-Methoxy-2-Propyl Acetate): Molar Mass 132.159 g; CASRN 108-65-6						
90-tej/ans-1		597.6* ± 1.1		0.306 ± 0.005	1	Teja and Anselme
91-tej/ros		597.9* ± 0.6	3.01 ± 0.02		2c	Teja and Rosenthal
	recommended values	597.8 ± 1	3.01 ± 0.05	0.306 ± 0.005		
2-BUTOXYETHYL ETHANOATE (2-Butoxyethyl Acetate): Molar Mass 160.213 g: CASRN 112-07-2						
90-tej/ans-1		641.2* ± 1.6		0.292 ± 0.005	1	Teja and Anselme
90-tej/ros		640.2* ± 0.8	2.694 ± 0.03		2c	Teja and Rosenthal
	recommended values	640.7 ± 1	2.694 ± 0.05	0.292 ± 0.005		

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
2-(2-ETHOXYETHOXY)ETHYL ETHANOATE (Diethylene Glycol Monoethyl Ether Acetate): Molar Mass 176.213 g; CASRN 112-15-2						
96-wil/wil		663 ± 2	2.73 ± 0.14		2a, c	Wilson *et al.*
2-(2-BUTOXYETHOXY)ETHYL ETHANOATE (Diethylene Glycol Monobutyl Ether Acetate): Molar Mass 204.266 g; CASRN 124-17-4						
96-wil/wil		681 ± 2	3.15 ± 0.14		2a, c	Wilson *et al.*
METHYL PROPANOATE (Methyl Propionate): Molar Mass 88.106 g; CASRN 554-12-1						
1882-paw	262.7 °C	535.8			1	Pawlewski
1887-nad	255.7 °C, 39.88 atm	528.8	4.041	0.300	1	Nadezhdin
1888-deh	261.0 °C	534.2			?	de Heen
1893-you/tho, 10-you	257.4 °C, 30032 mmHg	530.6*	4.004*	0.3124*	1, 7	Young and Thomas, Young
99-mor/lui		530.8* ± 0.2			1	Morton *et al.*
	recommended values	530.7 ± 1	4.00 ± 0.05	0.312 ± 0.01		
ETHYL PROPANOATE (Ethyl Propionate): Molar Mass 102.133 g; CASRN 105-37-3						
1882-paw	280.6 °C	553.8			1	Pawlewski
1887-nad	272.4 °C, 34.64 atm	545.6	3.510	0.286	1	Nadezhdin
1888-deh	279.5 °C	552.6			?	de Heen
1893-you/tho, 10-you	272.9 °C, 25217 mmHg	546.0*	3.362*	0.2965*	1, 7	Young and Thomas, Young
92-zha/zha		547.40* ± 0.11	3.529* ± 0.020	0.3017* ± 0.0023	1, 7	Zhang *et al.*
99-mor/lui		546.5* ± 0.2			1	Morton *et al.*
	recommended values	546.7 ± 1	3.45 ± 0.1	0.299 ± 0.01		
PROPYL PROPANOATE (Propyl Propionate): Molar Mass 116.160 g; CASRN 106-36-5						
1882-paw	304.8 °C	578.0			1	Pawlewski
1888-deh	290.5 °C	563.6			?	de Heen
91-qua/kud		568.6* ± 0.5	3.06 ± 0.03		1	Quadri and Kudchadker
99-mor/lui		571.0* ± 0.3			1	Morton *et al.*
	recommended values	570 ± 1	3.06 ± 0.05			
BUTYL PROPANOATE (Butyl Propionate): Molar Mass 130.187 g; CASRN 590-01-2						
99-mor/lui		594.5 ± 0.3			1	Morton *et al.*
2-METHYLPROPYL PROPANOATE (Isobutyl Propionate): Molar Mass 130.187 g; CASRN 540-42-1						
1882-paw	318.7 °C	591.8			1	Pawlewski
99-mor/lui		584.2* ± 0.4			1	Morton *et al.*
	recommended value	584 ± 1				
3-METHYLBUTYL PROPANOATE (Isopentyl Propionate): Molar Mass 144.214 g; CASRN 105-68-0						
06-bro	338.24 °C	611.4			1	Brown
ETHYL 3-ETHOXYPROPANOATE (Ethyl 3-Ethoxypropionate): Molar Mass 146.186 g; CASRN 763-69-9						
90-tej/ans		618.7 ± 1.8		0.319 ± 0.006	1	Teja and Anselme
91-tej/ros		621.0* ± 0.6	2.66 ± 0.02		2c	Teja and Rosenthal
	recommended values	621.0 ± 1	2.66 ± 0.05	0.319 ± 0.01		
METHYL BUTANOATE (Methyl Butyrate): Molar Mass 102.133 g; CASRN 623-42-7						
1887-nad	278.0 °C, 36.02 atm	551.2	3.650	0.291	1	Nadezhdin
1888-deh	271.5 °C	544.6			?	de Heen
1893-you/tho, 10-you	281.3 °C, 26055 mmHg	554.5*	3.473*	0.3002*	1, 7	Young and Thomas, Young
	recommended values	554.5 ± 1	3.47 ± 0.05	0.300 ± 0.01		
ETHYL BUTANOATE (Ethyl Butyrate): Molar Mass 116.160 g; CASRN 105-54-4						
1882-paw	304.3 °C	577.4			1	Pawlewski
1887-nad	292.8 °C, 30.24 atm	566.0	3.064	0.276	1	Nadezhdin
1888-deh	285.5 °C	558.6			?	de Heen
99-mor/lui		568.8* ± 0.2			1	Morton *et al.*
	recommended values	568.8 ± 1	3.1 ± 0.3	0.28 ± 0.02		
PROPYL BUTANOATE (Propyl Butyrate): Molar Mass 130.187 g; CASRN 105-66-8						
1882-paw	326.6 °C	599.8			1	Pawlewski
91-qua/kud		593.7* ± 0.5	2.72 ± 0.03		1	Quadri and Kudchadker
99-mor/lui		592.5* ± 0.3			1	Morton *et al.*
	recommended values	593.1 ± 1	2.72 ± 0.05			
BUTYL BUTANOATE (Butyl Butyrate): Molar Mass 144.214 g; CASRN 109-21-7						
99-mor/lui		612.1 ± 0.4			1	Morton *et al.*
2-METHYLPROPYL BUTANOATE (Isobutyl Butyrate): Molar Mass 144.214 g; CASRN 539-90-2						
06-bro	338.25 °C	611.4			1	Brown
3-METHYLBUTYL BUTANOATE (Isopentyl Butyrate): Molar Mass 158.241 g; CASRN 106-27-4						
06-bro	345.68 °C	618.8			1	Brown
METHYL 2-METHYLPROPANOATE (Methyl Isobutyrate): Molar Mass 102.133 g; CASRN 547-63-7						
1882-paw	273.6 °C	546.8			1	Pawlewski
1893-you/tho, 10-you	267.55 °C, 25740 mmHg	540.70*	3.432	0.3012	1, 7	Young and Thomas, Young
	recommended values	540.7 ± 1	3.43 ± 0.05	0.301 ± 0.01		
ETHYL 2-METHYLPROPANOATE (Ethyl Isobutyrate): Molar Mass 116.160 g; CASRN 97-62-1						
1882-paw	290.4 °C	563.6			1	Pawlewski
1887-nad	280.4 °C, 30.13 atm	553.6*	3.053	0.276	1	Nadezhdin
	recommended values	554 ± 5	3.1 ± 0.3	0.28 ± 0.02		

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
	PROPYL 2-METHYLPROPANOATE (Propyl Isobutyrate): Molar Mass 130.187 g; CASRN 644-49-5					
1882-paw	316.0 °C	589.2			1	Pawlewski
99-mor/lui		579.4* ± 0.3			1	Morton *et al.*
	recommended value	579.4 ± 1				
	2-METHYLPROPYL 2-METHYLPROPANOATE (Isobutyl Isobutyrate): Molar Mass 144.214 g; CASRN 97-85-8					
06-bro	328.74 °C	601.9			1	Brown
	METHYL PENTANOATE (Methyl Valerate): Molar Mass 116.160 g; CASRN 624-24-8					
1887-nad	293.7 °C, 31.5 atm	566.8	3.19*	0.279*	1	Nadezhdin
1888-deh	283.5 °C	556.6			?	de Heen
1899-rad	294 °C	567			1	Radice
95-ma/wan	(315.77 ± 0.12) °C	588.92*	3.203* ± 0.02	0.2724* ± 0.0019	1, 7	Ma *et al.*
	recommended values	590 ± 10[j]	3.20 ± 0.05	0.275 ± 0.02		
	ETHYL PENTANOATE (Ethyl Valerate): Molar Mass 130.187 g; CASRN 539-82-2					
1888-deh	297.0 °C	570.2			?	de Heen
99-mor/lui		593.3* ± 0.4			1	Morton *et al.*
	recommended value	593.3 ± 1				
	ETHYL 3-METHYLBUTANOATE (Ethyl Isovalerate): Molar Mass 130.187 g; CASRN 108-64-5					
06-bro	314.87 °C	588.0			1	Brown
99-mor/lui		582.4* ± 0.5			1	Morton *et al.*
	recommended value	582.4 ± 1				
	PROPYL 3-METHYLBUTANOATE (Propyl Isovalerate): Molar Mass 144.214 g; CASRN 557-00-6					
06-bro	335.93 °C	609.1			1	Brown
	2-METHYLPROPYL 3-METHYLBUTANOATE (Isobutyl Isovalerate): Molar Mass 158.241 g; CASRN 589-59-3					
06-bro	348.25 °C	621.4			1	Brown
	ETHYL HEXANOATE (Ethyl Caproate): Molar Mass 144.214 g; CASRN 123-66-0					
99-mor/lui		615.2 ± 0.3			1	Morton *et al.*
	METHYL HEPTANOATE (Methyl Enanthate): Molar Mass 144.214 g; CASRN 106-73-0					
99-mor/lui		628 ± 1			1	Morton *et al.*
	ETHYL HEPTANOATE (Ethyl Enanthate): Molar Mass 158.241 g; CASRN 106-30-9					
99-mor/lui		634.3 ± 0.3			1	Morton *et al.*
	ETHYL OCTANOATE (Ethyl Caprylate): Molar Mass 172.268 g; CASRN 106-32-1					
06-bro	385.56 °C	658.7			1	Brown
99-mor/lui		649* ± 3			1	Morton *et al.*
	recommended value	649 ± 3				
	ETHYL NONANOATE (Ethyl Pelargonate): Molar Mass 186.294 g; CASRN 123-29-5					
06-bro	400.81 °C	674.0			1	Brown
99-mor/lui		663.9* ± 0.4			1	Morton *et al.*
	recommended value	664 ± 2				
	METHYL DODECANOATE (Methyl Laurate): Molar Mass 214.348 g; CASRN 111-82-0					
63-amb	(439 ± 2) °C	712			1	Ambrose
	VINYL ETHANOATE (Vinyl Acetate): Molar Mass 86.090 g; CASRN 108-05-4					
87-dau/jal[k]	(246.0 ± 0.1) °C, ± 0.5 psi	519.2	4.185		1	Daubert *et al.*
	ETHYL BUT-2-ENOATE (Ethyl *trans*-Crotonate): Molar Mass 114.144 g; CASRN 623-70-1					
1883-paw	326.0 °C	599.2			1	Pawlewski
	DIMETHYL ETHANEDIOATE (Dimethyl Oxalate):[l] Molar Mass 118.089 g; CASRN 553-90-2					
1862-reg	260 °C, 9.48 atm	533	0.96		1	Regnault
1883-weg	260 °C	533			?	Weger
57-ste/kay[m]	(355 ± 7) °C, (39.3 ± 4) atm	628	3.98		1, 6	Stern and Kay
	DIETHYL ETHANEDIOATE (Diethyl Oxalate): Molar Mass 146.143 g; CASRN 95-92-1					
94-ste/chi-1[n]		618	2.140	0.33 ± 0.01	4, 6, 7	Steele *et al.*
	DIETHYL BUTANEDIOATE (Diethyl Succinate): Molar Mass 174.197 g; CASRN 123-25-1					
1899-rad[o]	390 °C	663			1	Radice
	DIMETHYL CARBONATE: Molar Mass 90.079 g; CASRN 616-38-6					
97-ste/chi, 97-ste/chi-1		557 ± 1	4.80 ± 0.5	0.358 ± 0.01	4, 6, 7	Steele *et al.*
	ETHERS					
	DIMETHYL ETHER (Methoxymethane): Molar Mass 46.069 g; CASRN 115-10-6 $T_{90} - T_{48} = -0.021$ K; $T_{90} - T_{68} = -0.031$ K at 400 K					
1883-nad	129.6 °C	402.8			1	Nadezhdin
1897-led/sac	57 atm		5.8		1	Leduc and Sacerdote
07-bri/car	127 °C, 53 atm	400	5.4		1a	Briner and Cardoso
08-bri/car	(127 ± 0.1) °C, (53 ± 0.1) atm	400.2*	5.4*		1a	Briner and Cardoso
23-car/bru	(126.9 ± 0.05) °C, (52.00 ± 0.05) atm	400.0*	5.27*		1a	Cardoso and Bruno
23-car/cop[p]				0.2714*	7	Cardoso and Coppola
32-win/maa	126.2 °C, 53 atm	399.4	5.4		1	Winkler and Maass
33-win/maa	126.5 °C	399.6			1	Winkler and Maass
33-tap/ste	126.9 °C	400.0*		0.2255	1, 7	Tapp *et al.*

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
		DIMETHYL ETHER (continued)				
35-edw/maa	126.9 °C, 52.6 atm	400.0*	5.33*	0.2465	1, 7	Edwards and Maass
36-pal/maa	126.9 °C	400.0*			1	Pall and Maass
70-osi/str[q]	170 cm^3·mol^{-1}	400		(0.271)	1, 7	Osipiuk and Stryjek
70-zaw/glo	127.18 °C, 52.89 atm, 0.164 L·mol^{-1}	400.30*	5.359*	0.281*	1, 7	Zawisza and Glowka
92-nol/zol		399.40	5.264		4	Noles and Zollweg
	recommended values	400.2 ± 0.1	5.34 ± 0.05	0.275 ± 0.01		
		ETHYL METHYL ETHER (Methoxyethane): Molar Mass 60.096 g; CASRN 540-67-0				
		$T_{90} - T_{48} = -0.011$ K; $T_{90} - T_{68} = -0.038$ K at 438 K				
1883-nad	167.7 °C	440.8			1	Nadezhdin
1887-nad	168.4 °C, 46.27 atm	441.6	4.688	0.307	1	Nadezhdin
24-ber/bru	(164.7 ± 0.1) °C, 43.4 atm	437.8*	4.40*	0.2722*	1, 7	Berthoud and Brum
70-osi/str[q]	221 cm^3·mol^{-1}	437.8		(0.272)	1, 7	Osipiuk and Stryjek
70-zaw/glo	164.88 °C, 43.04 atm, 0.222 L·mol^{-1}	437.99*	4.361*	0.271*	1, 7	Zawisza and Glowka
	recommended values	437.9 ± 0.1	4.38 ± 0.02	0.271 ± 0.005		
		DIETHYL ETHER (Ethoxyethane): Molar Mass 74.123 g; CASRN 60-29-7				
		$T_{90} - T_{48} = 0.0$ K; $T_{90} - T_{68} = -0.039$ K at 467 K				
1822-del	160 Reaumur, (37−38) atm	473	3.8		1	de la Tour
1823-del	160 Reaumur, (30.7, 42.3) atm	473	3.11, 4.29		1	de la Tour
1859-dri	190.5 °C	463.6			1	Drion
1874-ave	196.2 °C	469.4			1	Avenarius
1878-lad	196 °C	469			1	Ladenburg
1878-saj	190.0 °C, 36.9 atm	463.2	3.74		1	Sajotchewsky
1880-str	196.5 °C	468.6			?	Strauss
1881-ram	195.5 °C, 40 atm	468.6	4.1		1	Ramsay
1887-ram/you	194 °C, 20 760 mmHg, 4.06 cm^3·g^{-1}	467	3.608	0.246	1	Ramsay and Young
1890-gal	190.8 °C	464.0			1	Galitzine
1891-sch	193.5, 193.8 °C	466.8			1	Schmidt
1892-bat	197.0 °C, 35.768 atm, 4.8 cm^3·g^{-1}	470.2	3.624	0.208	3	Battelli
1895-dev	193.6 °C	466.8			?	de Vries
00-von	194.7 °C	467.8			1	von Hirsch
01-gal/wil	193.61 °C, 36.28 atm	466.76	3.676	0.2604	?	Galitzine and Wilip
02-eve	191.2 °C	464.4			1	Eversheim
04-cen	194.4 °C	467.6		0.258	1, 7	Centnerszwer
05-smi	193 °C, 36 atm	466	3.6		1a	Smits
06-cen/pak	(194.0 to 194.7) °C, 36.2 atm	467.5	3.67		1	Centerszwer and Pakalneet
06-tra/ush	193.6 °C	466.8			1	Travers and Usher
08-sch	193.04 °C, 36.90 atm	466.19	3.739		?	Schamhardt
10-you	193.8 °C, 27060 mmHg	467.0	3.608	0.2625*	1, 7	Young
13-sch	193.9 °C	467			1	Scheffer
20-aud	193.26 °C	466.41			1	Audant
24-wil	193.61 °C, 27565 mmHg	466.76	3.675	0.2665	?	Wilip
29-sch	(193.4 ± 0.15) °C, (36.15 ± 0.05) kg·cm^{-2}	466.6	3.545	0.265* ± 0.004	1, 7	Schröer
29-sch-1	(194.6 ± 0.3) °C, (36.7 ± 0.2) kg·cm^{-2}, (3.77 ± 0.02) cm^3·g^{-1}	467.8	3.60	0.265*	3	Schröer
43-fis/rei	192.3 °C	465.4			1	Fischer and Reichel
55-kay/don	193.41 °C, 529.6 psi	466.56*	3.651*	0.265*	1, 7	Kay and Donham
56-kob/rav	(378.8 ± 0.4) °F, (523 ± 4) psi, (3.70 ± 0.1) cm^3·g^{-1}	465.8	3.61	0.270	3	Kobe *et al.*
65-str/kre	193.6 °C	466.8			1	Stryjek and Kreglewski
67-zaw[r]	193.55 °C, 35.90 atm, 0.2803 L·mol^{-1}	466.70*	3.638*	0.2619*	1, 7	Zawisza
70-rae		467.4 ± 0.05			1	Rätzsch
72-amb/spr		(466.70)[s]	3.642* ± 0.004		5	Ambrose *et al.*
75-lie/you		466.7*			1	Lie and Young
	recommended values	466.7 ± 0.1	3.644 ± 0.01	0.264 ± 0.003		
		METHYL PROPYL ETHER (1-Methoxypropane): Molar Mass 74.123 g; CASRN 557-17-5				
		$T_{90} - T_{48} = 0.004$ K; $T_{90} - T_{68} = -0.040$ K at 476 K				
74-amb/bro		476.21 ± 0.02	3.801 ± 0.002		1	Ambrose *et al.*
		ISOPROPYL METHYL ETHER (2-Methoxypropane): Molar Mass 74.123 g; CASRN 598-53-8				
		$T_{90} - T_{48} = 0.0$ K; $T_{90} - T_{68} = -0.039$ K at 464 K				
74-amb/bro		464.44 ± 0.02	3.762 ± 0.002		1	Ambrose *et al.*

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
	BUTYL METHYL ETHER (1-Methoxybutane): Molar Mass 88.150 g; CASRN 628-28-4					
	$T_{90} - T_{48} = 0.018$ K; $T_{90} - T_{68} = -0.040$ K at 513 K					
70-osi/str[q]	329 cm^3·mol^{-1}	512.7		(0.268)	1, 7	Osipiuk and Stryjek
71-zaw/glo	239.57 °C, 32.75 atm, 0.329 L·mol^{-1}	512.68*	3.318	0.268* ± 0.002	1, 7	Zawisza and Glowka
74-amb/bro		512.74* ± 0.01	3.371* ± 0.004		1	Ambrose *et al.*
	recommended values	512.7 ± 0.1	3.37 ± 0.03	0.268 ± 0.005		
	tert-BUTYL METHYL ETHER (2-Methoxy-2-methylpropane): Molar Mass 88.150 g; CASRN 1634-04-4					
	$T_{90} - T_{48} = 0.012$ K; $T_{90} - T_{68} = -0.040$ K at 497 K					
74-amb/bro		497.1* ± 0.1	3.430* ± 0.005		1	Ambrose *et al.*
87-dau/jal[k]	(223.3 ± 0.1) °C, ± 0.5 psi	496.4	3.397		1	Daubert *et al.*
	recommended values	497.1 ± 0.2	3.430 ± 0.01			
	ETHYL PROPYL ETHER (1-Ethoxypropane): Molar Mass 88.150 g; CASRN 628-32-0					
	$T_{90} - T_{48} = 0.013$ K; $T_{90} - T_{68} = -0.040$ K at 500 K					
1883-paw	233.4 °C	506.6			1	Pawlewski
24-ber/bru	(227.4 ± 0.1) °C, 32.1 atm	500.6	3.25	0.2601	1, 7	Berthoud and Brum
74-amb/bro		500.19* ± 0.05	3.370* ± 0.003		1	Ambrose *et al.*
	recommended values	500.2 ± 0.1	3.370 ± 0.01	0.260 ± 0.010		
	METHYL PENTYL ETHER (1-Methoxypentane): Molar Mass 102.177 g; CASRN 628-80-8					
	$T_{90} - T_{48} = 0.028$ K; $T_{90} - T_{68} = -0.039$ K at 546 K					
70-osi/str[q]	380 cm^3·mol^{-1}	544.9		(0.269)	1, 7	Osipiuk and Stryjek
71-zaw/glo	273.38 °C, 30.02 atm, 392 cm^3·mol^{-1}	546.49*	3.042	0.261*	1, 7	Zawisza and Glowka
	recommended values	546.5 ± 0.1	3.042 ± 0.01	0.261 ± 0.005		
	DIPROPYL ETHER (1-Propoxypropane): Molar Mass 102.177 g; CASRN 111-43-3					
	$T_{90} - T_{48} = 0.023$ K; $T_{90} - T_{68} = -0.040$ K at 531 K					
74-amb/bro		530.56 ± 0.1	3.028 ± 0.003		1	Ambrose *et al.*
	DIISOPROPYL ETHER (1-Methyl-1-(1-methylethoxy)ethane): Molar Mass 102.177 g; CASRN 108-20-3					
	$T_{90} - T_{48} = 0.013$ K; $T_{90} - T_{68} = -0.040$ K at 500 K					
56-kob/rav	(440.4 ± 0.3) °F, (417 ± 2) psi, (3.78 ± 0.1) cm^3·g^{-1}	500.0	2.88	0.265	3	Kobe *et al.*
74-amb/bro		500.28* ± 0.01	2.832* ± 0.003		1	Ambrose *et al.*
75-you		499.6			1	Young
	recommended values	500.3 ± 0.2	2.832 ± 0.01	0.265 ± 0.01		
	1,1-DIMETHYLETHYL ETHYL ETHER (*tert*-Butyl Ethyl Ether, 2-Ethoxy-2-methylpropane): Molar Mass 102.177 g; CASRN 637-92-3					
95-wil/wil	(0.394 ± 0.001) L·mol^{-1}	509.40 ± 0.2	2.934 ± 0.04	0.259	1a	Wilson *et al.*
	1,1-DIMETHYLPROPYL METHYL ETHER (*tert*-Methyl Pentyl Ether, 2-Methoxy-2-methylbutane): Molar Mass 102.177 g; CASRN 994-05-8					
94-ste/chi		534*	3.200*	0.275* ± 0.013	4, 6, 7	Steele *et al.*
95-wil/wil	(0.377 ± 0.001) L·mol^{-1}	536.20* ± 0.2	3.191* ± 0.04	0.271*	1a	Wilson *et al.*
	recommended values	535 ± 1	3.20 ± 0.05	0.273 ± 0.02		
	1,1-DIMETHYLPROPYL ETHYL ETHER (*tert*- Ethyl Pentyl Ether, 2-Ethoxy-2-methylbutane): Molar Mass 116.203 g; CASRN 919-94-8					
94-ste/chi		546	2.935	0.251 ± 0.012	4, 6, 7	Steele *et al.*
	DIBUTYL ETHER (1-Butoxybutane): Molar Mass 130.230 g; CASRN 142-96-1					
80-toc/you		584.1	3.01[t]		1	Toczylkin and Young
	ETHOXYETHENE (Ethyl Vinyl Ether): Molar Mass 72.107 g; CASRN 109-92-2					
56-kob/rav	(396 ± 0.13) °F, (591 ± 10) psi	475	4.07		3	Kobe *et al.*
	3-ETHOXY-1-PROPENE (Allyl Ethyl Ether): Molar Mass 86.134 g; CASRN 557-31-3					
1883-paw	245.0 °C	518.2			1	Pawlewski
	BUTOXYETHENE (Butyl Vinyl Ether): Molar Mass 100.161; CASRN 111-34-2					
96-ste/chi-1		540.5	3.200	0.2611	4, 6, 7	Steele *et al.*
	DIMETHOXYMETHANE (Methylal): Molar Mass 76.095 g; CASRN 109-87-5					
1883-paw	223.6 °C	496.8			1	Pawlewski
24-bou	215.2 °C	488.4			3	Bourgom
70-kob/mat	(405.5 ± 1.5) °F, (574 ± 6) psi	480.6	3.96	0.357 ± 0.02	3	Kobe and Mathews
99-mor/lui		490.9* ± 0.3			1	Morton *et al.*
	recommended values	491 ± 1	3.96 ± 0.10	0.357 ± 0.05		
	1,2-DIMETHOXYETHANE (Ethylene Glycol Dimethyl Ether): Molar Mass 90.122 g; CASRN 110-71-4					
56-kob/rav	(505 ± 1) °F, (562 ± 4) psi, (3.0 ± 0.1) cm^3·g^{-1}	536	3.87	0.333	3	Kobe *et al.*
91-qua/kud		539.2* ± 0.4	3.86* ± 0.02		1	Quadri and Kudchadker
96-ste/chi-1		537* ± 1	3.960* ± 0.1	0.293* ± 0.01	4, 6, 7	Steele *et al.*
99-mor/lui		542.7* ± 0.5			1	Morton *et al.*
	recommended values	540 ± 3	3.90 ± 0.1	0.293 ± 0.02		
	DIETHOXYMETHANE: Molar Mass 104.149 g; CASRN 462-95-3					
99-mor/lui		531.7 ± 0.4			1	Morton *et al.*
	1,2-DIMETHOXYPROPANE: Molar Mass 104.149 g; CASRN 7778-85-0					
99-mor/lui		543.0 ± 0.3			1	Morton *et al.*
	2,2-DIMETHOXYPROPANE: Molar Mass 104.149 g; CASRN 77-76-9					
99-mor/lui		509.8 ± 0.5			1	Morton *et al.*

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
	1,1-DIETHOXYETHANE (Acetal): Molar Mass 118.176 g; CASRN 105-57-7					
1883-paw	254.4 °C	527.6			1	Pawlewski
91-qua/kud		539.7* ± 0.4	3.22 ± 0.02		1	Quadri and Kudchadker
99-mor/lui		539* ± 2			1	Morton *et al.*
	recommended values	540 ± 3	3.22 ± 0.10			
	1,2-DIETHOXYETHANE (Ethylene Glycol Diethyl Ether): Molar Mass 118.176 g; CASRN 629-14-1					
99-mor/lui		542 ± 1			1	Morton *et al.*
	1-*tert*-BUTOXY-2-METHOXYETHANE: Molar Mass 132.203 g; CASRN 66728-50-5					
99-mor/lui		574.4 ± 0.5			1	Morton *et al.*
	2,2-DIETHOXYPROPANE: Molar Mass 132.203 g; CASRN 126-84-1					
99-mor/lui		510.7 ± 0.2			1	Morton *et al.*
	1-*tert*-BUTOXY-2-ETHOXYETHANE: Molar Mass 146.230 g; CASRN 51422-54-9					
99-mor/lui		584.6 ± 0.3			1	Morton *et al.*
	2-METHOXYETHYL ETHER: Molar Mass 134.175 g; CASRN 111-96-6					
99-mor/lui		617 ± 2			1	Morton *et al.*
	2-ETHOXYETHYL ETHER: Molar Mass 162.229 g; CASRN 112-36-7					
99-mor/lui		612 ± 5			1	Morton *et al.*
	AROMATIC C−H−O COMPOUNDS					
	PHENOL AND ALKYLPHENOLS					
	PHENOL (Hydroxybenzene): Molar Mass 94.113 g; CASRN 108-95-2					
1899-rad	419.2 °C	692.4			1	Radice
23-her/neu	(60.5 ± 0.5) atm		6.13		1	Herz and Neukirch
63-amb	(421.1 ± 0.1) °C	694.2*			1	Ambrose
68-del	60.5 kg·cm^{-2}	(694.2)[u]	5.93*		6	Delaunois
	recommended values	694.2 ± 0.2	5.93 ± 0.05			
	2-METHYLPHENOL (*o*-Cresol): Molar Mass 108.140 g; CASRN 95-48-7					
1899-rad	422.3 °C	695.4			1	Radice
23-her/neu	(49.4 ± 0.5) atm		5.01		1	Herz and Neukirch
57-gla/rue	422 °C, 48 atm	695	4.9		3	Glaser and Rüland
63-amb	(424.4 ± 0.15) °C	697.6*			1	Ambrose
68-del	42.5 kg·cm^{-2}	(697.6)[u]	4.17*		6	Delaunois
	recommended values	697.6 ± 0.3	4.17 ± 0.05			
	3-METHYLPHENOL (*m*-Cresol): Molar Mass 108.140 g; CASRN 108-39-4					
02-guy/mal[v]	432.0 °C, (45.0 ± 0.05) atm	705.2	4.56		1	Guye and Mallet
57-gla/rue	432 °C, 45 atm	705	4.6		3	Glaser and Rüland
63-amb	(432.6 ± 0.3) °C	705.8*			1	Ambrose
68-del	44.5 kg·cm^{-2}	(705.8)[u]	4.36*		6	Delaunois
	recommended values	705.8 ± 0.5	4.36 ± 0.05			
	4-METHYLPHENOL (*p*-Cresol): Molar Mass 108.140 g; CASRN 106-44-5					
1899-rad	426.0 °C	699.2			1	Radice
23-her/neu	(50.8 ± 0.5) atm		5.15		1	Herz and Neukirch
57-gla/rue[w]	45 atm	699	4.6		3	Glaser and Rüland
63-amb	(431.4 ± 0.2) °C	704.6*			1	Ambrose
68-del	41.5 kg·cm^{-2}	(704.6)[u]	4.07*		6	Delaunois
	recommended values	704.6 ± 0.4	4.07 ± 0.05			
	2-ETHYLPHENOL (*o*-Ethylphenol): Molar Mass 122.167 g; CASRN 90-00-6					
63-amb	(429.8 ± 0.2) °C	703.0			1	Ambrose
	3-ETHYLPHENOL (*m*-Ethylphenol): Molar Mass 122.167 g; CASRN 620-17-7					
63-amb	(443.3 ± 0.1) °C	716.4			1	Ambrose
	4-ETHYLPHENOL (*p*-Ethylphenol): Molar Mass 122.167 g; CASRN 123-07-9					
63-amb	(443.3 ± 0.5) °C	716.4			1	Ambrose
	2,3-DIMETHYLPHENOL (2,3-Xylenol): Molar Mass 122.167 g; CASRN 526-75-0					
63-amb	(449.7 ± 0.25) °C	722.8			1	Ambrose
	2,4-DIMETHYLPHENOL (2,4-Xylenol): Molar Mass 122.167 g; CASRN 105-67-9					
63-amb	(434.4 ± 0.2) °C	707.6			1	Ambrose
	2,5-DIMETHYLPHENOL (2,5-Xylenol): Molar Mass 122.167 g; CASRN 95-87-4					
74-amb/bro[x]		706.9 ± 0.1			1	Ambrose *et al.*
	2,6-DIMETHYLPHENOL (2,6-Xylenol): Molar Mass 122.167 g; CASRN 576-26-1					
63-amb	(427.8 ± 0.1) °C	701.0			1	Ambrose
	3,4-DIMETHYLPHENOL (3,4-Xylenol): Molar Mass 122.167 g; CASRN 95-65-8					
63-amb	(456.7 ± 0.5) °C	729.8			1	Ambrose
	3,5-DIMETHYLPHENOL (3,5-Xylenol): Molar Mass 122.167 g; CASRN 108-68-9					
63-amb	(442.4 ± 0.5) °C	715.6			1	Ambrose
	2-ISOPROPYL-5-METHYLPHENOL (Thymol): Molar Mass 150.221 g; CASRN 89-83-8					
1899-rad	425.1 °C	698.2			1	Radice

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
		MISCELLANEOUS AROMATIC C−H−O COMPOUNDS				
		1-PHENYLETHANOL (α-Methylbenzyl Alcohol): Molar Mass 122.167 g; CASRN 98-85-1				
2000-von/wil		699 ± 2	3.77 ± 0.07		2a, c	VonNiederhausern *et al.*
		BENZALDEHYDE (Phenylmethanal):[y] Molar Mass 106.124 g; CASRN 100-52-7				
57-gla/rue	352 °C, 21.5 atm	625	2.18		3	Glaser and Rüland
75-amb/con		695* ± 5	4.65*		1, 6	Ambrose *et al.*
90-ans/tej		>690			1	Anselme and Teja
	recommended value	695 ± 10	4.7 ± 1			
		ACETOPHENONE (Methyl Phenyl Ketone): Molar Mass 120.151 g; CASRN 98-86-2				
90-tej/ans		709.5* ± 0.4		0.311* ± 0.006	1	Teja and Anselme
91-tej/ros		709.6* ± 1.0	4.01* ± 0.03		2c	Teja and Rosenthal
96-ste/chi		713 ± 1	4.40 ± 0.1	0.316* ± 0.009	4, 6, 7	Steele *et al.*
	recommended values	709.6 ± 1	4.01 ± 0.1	0.31 ± 0.01		
		BENZOPHENONE (Diphenyl Ketone): Molar Mass 182.222 g; CASRN 119-61-9				
94-ste/chi-1		830	3.352	0.32	4, 6, 7	Steele *et al.*
		METHYL 2-HYDROXYBENZOATE (Methyl Salicylate): Molar Mass 152.150 g; CASRN 119-36-8				
1899-rad	436 °C	709			1	Radice
		METHYL PHENYL ETHER (Methoxybenzene; Anisole): Molar Mass 108.140 g; CASRN 100-66-3				
02-guy/mal	368.5 °C, (41.25 ± 0.05) atm	641.6	4.180		1	Guye and Mallet
57-gla/rue	368.5 °C, 41.25 atm	641.6	4.180		3	Glaser and Rüland
74-amb/bro[z]		645.6* ± 0.5	4.25* ± 0.05		1, 6	Ambrose *et al.*
96-wil/wil		646.1* ± 0.1	4.222* ± 0.014	0.317 ± 0.007	1a	Wilson *et al.*
99-mor/lui		647.4* ± 0.5			1	Morton *et al.*
	recommended values	646.5 ± 1	4.24 ± 0.05	0.317 ± 0.01		
		ETHYL PHENYL ETHER (Ethoxybenzene; Phenetole): Molar Mass 122.167 g; CASRN 103-73-1				
02-guy/mal	374.0 °C, (33.8 ± 0.1) atm	647.2	3.42		1	Guye and Mallet
		2-METHOXYMETHYLBENZENE (2-Methyl Anisole): Molar Mass 122.167 g; CASRN 578-58-5				
99-mor/lui		662.0 ± 0.5			1	Morton *et al.*
		3-METHOXYMETHYLBENZENE (3-Methyl Anisole): Molar Mass 122.167 g; CASRN 100-84-5				
99-mor/lui		665.3 ± 0.3			1	Morton *et al.*
		4-METHOXYMETHYLBENZENE (4-Methyl Anisole): Molar Mass 122.167 g; CASRN 104-93-8				
99-mor/lui		666.7 ± 0.3			1	Morton et al.
		1-METHOXY-2,4-DIMETHYLBENZENE (2,4-Dimethyl Anisole): Molar Mass 136.194 g; CASRN 6738-23-4				
99-mor/lui		682 ± 1			1	Morton *et al.*
		1-METHOXY-2,5-DIMETHYLBENZENE (2,5-Dimethyl Anisole): Molar Mass 136.194 g; CASRN 1706-11-2				
99-mor/lui		677.3 ± 0.3			1	Morton *et al.*
		DIPHENYL ETHER (Phenoxybenzene): Molar Mass 170.211 g; CASRN 101-84-8				
37-zhu	494 °C	767*		0.3216	1, 7	Zhuravlev
74-amb/bro		766.8* ± 0.5			1	Ambrose *et al.*
	recommended value	767 ± 2		0.322 ± 0.01		
		HETEROCYCLIC C−H−O COMPOUNDS				
		OXIRANE (1,2-Epoxyethane, Ethylene Oxide): Molar Mass 44.053 g; CASRN 75-21-8				
22-maa/boo	192.0 °C	465.2			1	Maass and Boomer
50-hes/til[aa]	195.8 °C, 1043 psia	469.0*	7.191		?	Hess and Tilton
50-pos				0.32 ± 0.02	7	Post
52-wal/smi[bb]	(0.051 ± 3%) ft^3 lb^{-1}			0.31*	3, 7	Walters and Smith
	recommended values	469 ± 2	7.2 ± 0.1	0.31 ± 0.02		
		METHYLOXIRANE (1,2-Epoxypropane, Propylene Oxide): Molar Mass 58.080 g; CASRN 75-56-9				
56-kob/rav	(408.5 ± 0.7) °F, (714 ± 5) psi, (3.2 ± 0.1) cm^3·g^{-1}	482.3*	4.92*	0.312*	3	Kobe *et al.*
73-rut/sha	(215.0 ± 0.3) °C, (53.7 ± 0.2) atm, (194 ± 2.0) cm^3·mol^{-1}	488.2*	5.44*	0.299*	1, 5	Rutenberg and Shakhova
	recommended values	485 ± 3	5.2 ± 0.3	0.305 ± 0.01		
		TETRAHYDROFURAN (Tetramethylene Oxide, Oxolane): Molar Mass 72.107 g; CASRN 109-99-9				
56-kob/rav	(514 ± 2) °F, (753 ± 10) psi, (3.1 ± 0.1) cm^3·g^{-1}	541*	5.19	0.322	3	Kobe *et al.*
62-che/mcc		540.1* ± 0.1			1	Cheng *et al.*
74-mar/jon	(270.5 ± 0.4) °C	543.6			1	Marshall and Jones
	recommended values	540.5 ± 0.5	5.19 ± 0.1	0.322 ± 0.01		
		2-METHYLTETRAHYDROFURAN (2-Methyloxolane): Molar Mass 86.134 g; CASRN 96-47-9				
56-kob/rav	(507 ± 2) °F, (545 ± 10) psi, (3.1 ± 0.2) cm^3·g^{-1}	537	3.76	0.322	3	Kobe *et al.*
		FURAN (Oxole): Molar Mass 68.075 g; CASRN 110-00-9				
56-kob/rav	(417 ± 3) °F, (772 ± 15) psi, (3.2 ± 0.1) cm^3·g^{-1}	487	5.32	0.312	3	Kobe *et al.*
62-che/mcc		490.2* ± 0.1			1	Cheng *et al.*
	recommended values	490.2 ± 0.5	5.3 ± 0.2[cc]	0.312 ± 0.02		

Table 2. (Continued)

ref	values reported in nonstandard units	T_{90}/K	p/MPa	ρ/g·cm^{-3}	method	authors
	2-METHYLFURAN (2-Methyloxole): Molar Mass 82.102 g; CASRN 534-22-5					
56-kob/rav	(490 ± 3) °F, (685 ± 15) psi, (3.0 ± 0.2) cm^3·g^{-1}	528	4.72	0.333	3	Kobe *et al.*
	DIHYDROPYRAN (3,4-Dihydro-2*H*-pyran): Molar Mass 84.118 g; CASRN 110-87-2					
70-kob/mat	(551.0 ± 1.5) °F, (662 ± 7) psi	561.7	4.56	0.314 ± 0.02	3	Kobe and Mathews
	TETRAHYDROPYRAN (Oxane, Pentamethylene Oxide): Molar Mass 86.134 g; CASRN 142-68-7					
70-kob/mat	(570.0 ± 0.5) °F, (692 ± 2) psi	572	4.77	0.328 ± 0.01	3	Kobe and Mathews
	DIBENZOFURAN: Molar Mass 168.195 g; CASRN 132-64-9					
90-chi/gam		824 ± 2	3.64	0.340 ± 0.010	4, 6, 7	Chirico *et al.*
	1,4-DIOXANE (*p*-Dioxane): Molar Mass 88.106 g; CASRN 123-91-1					
46-hoj[dd]	(312 ± 2) °C	585	5.0 ± 0.3	0.36* ± 0.01	1, 6, 7	Højendahl
56-kob/rav	(598 ± 2) °F, (755 ± 10) psi, (2.7 ± 0.1) cm^3·g^{-1}	588*	5.21*	0.370*	3	Kobe *et al.*
57-gla/rue	315 °C, 54 atm	588	5.5		3	Glaser and Rüland
74-mar/jon	(315.3 ± 0.4) °C	588.4			1	Marshall and Jones
91-chr/you		587.3*			1	Christou *et al.*
	recommended values	588 ± 1	5.21 ± 0.1	0.37 ± 0.02		
	2,4,6-TRIMETHYL-1,3,5-TRIOXANE (Paraldehyde): Molar Mass 132.159 g; CASRN 123-63-7					
03-hol	290 °C	563			1	Hollmann
	FURFURAL (Furfuraldehyde, 2-Furancaboxaldehyde): Molar Mass 96.086 g; CASRN 98-01-1					
60-li[ee]	397 °C, 56.2 kg·cm^{-2}	670	5.51		?	Li
	DIHYDRO-2(3H)-FURANONE (4-Butyrolactone, 4-Hydroxybutanoic Acid Lactone): Molar Mass 86.090 g; CASRN 96-48-0					
96-wil/wil		731.0 ± 0.2	5.131 ± 0.034		2a, c	Wilson *et al.*

[a] The value by Artemchenko [72-art] depended on measurements of viscosity up to 373 K and a correlation, not fully explained in the reference, of the viscosities of compounds containing hydroxyl groups. Artemchenko also quoted the value 798 K obtained by Ravikovich (Thesis, Moscow, 1950) from the concentration dependence of the critical temperatures of alkanols. [b] Comparison of the values of critical pressure of the three butanediols suggests that the pressure for 1,3-butanediol is too low, and the estimated error in Table 1 has been adjusted accordingly. [c] The values for di-, tri-, tetra-, and pentaethylene glycols given by Stephens and Tamplin [79-ste/tam] appear not to be based on experiment, and they are not included here. Nikitin *et al.* [95-nik/pav] also determined values for three polyethylene glycols. Since these materials are mixtures defined by their nominal average molar mass, we have not included them in this paper. [d] A large uncertainty is attributed to T_c in Table 1 because Ma *et al.* [95-ma/wan] found the compound to be unstable; and a critical temperature lower than that of butanal would be expected. [e] Campbell and Chatterjee [69-cam/cha] explained that the difference between their new value of the critical density and that reported in [68-cam/cha] arose because a different method of plotting the measurements had been used in the earlier paper. [f] Ambrose and Ghiassee [87-amb/ghi-2] found this compound decomposes so rapidly they were unable to measure the critical temperature and pressure, but their observations suggested values between 580 and 610 K and 3.5 and 4.5 MPa. The values given were derived from study of the vapor pressure curve. [g] This compound decomposes even at room temperature. Only an approximate indication of the value of the critical temperature was obtained by Ambrose and Ghiassee [87-amb/ghi], and it was not possible to measure the critical pressure. Anselme and Teja [90-ans/tej] reported rapid decomposition upon heating leading to an explosion. [h] It appears that the value of density given in the *International Critical Tables* [28-ict] was derived by extrapolation of density measurements by von Hirsch [1899-von]. [i] Hudel [51-hud] determined p_c by extrapolating the vapor pressure data of Stull [47-stu] and ρ_c by extrapolating the density data of von Hirsch [1899-von]. [j] A large uncertainty has been assigned to the recommended T_c because (a) the recent value of Ma *et al.* [95-ma/wan] is much higher than relatively reliable earlier data [1887-nad, 1899-rad] and (b) the same recent source [95-ma/wan] reports a value for butyl ethanoate that is 10 K higher than the recommended value. [k] [87-dau/jal] used a Bourdon gauge graduated, presumably, in psi. They stated the uncertainty in psi but reported the pressure in MPa. [l] Linde and Manning [62-lin/man] stated that Regnault [1862-reg] did not purport to determine the critical point of dimethyl ethanedioate and that values given in that reference were wrongly quoted in the *International Critical Tables* [28-ict] as the critical temperature and the critical pressure. [m] Stern and Kay [57-ste/kay] found that the compound decomposed above 200 °C. At T_c they observed a p_c of 55.4 atm, "indicating the presence of gaseous decomposition products". The reported p_c was therefore obtained by extrapolation of a simple equation fitted to vapor pressures measured at temperatures up to 200 °C. [n] Steele *et al.* [94-ste/chi-1] values of T_c, p_c, and ρ_c give a low value of the compression (compressibility) factor, and their critical temperature is lower than that given by Kay and Stern for dimethyl ethanedioate. One of these temperatures must be wrong. No values are recommended for dimethyl and diethyl ethanedioates. [o] Radice [1899-rad] reported that diethyl butanedioate decomposed, as would be expected, and so a large uncertainty is assigned to this value in Table 1. We have attributed the same uncertainty to the value for methyl 2-hydroxybenzoate, also due to Radice. [p] Cardoso and Coppola's [23-car/cop] critical density value is given incorrectly as 0.2417 in Kobe and Lynn [53-kob/lyn]. [q] The critical density reported by Osipiuk and Stryjek [70-osi/str] was an unpublished value by Zawisza. [r] It appears probable that the value given for critical volume, 0.2803 L·mol^{-1}, by Zawisza [67-zaw] is a misprint for 0.2830, which is consistent with the value that he reported for the critical density, 0.2619 g·cm^{-3}. [s] Taken from [67-zaw]. [t] A large uncertainty has been assigned in Table 1 for the critical pressure because it appears high in relation to the critical pressures of lower members of the series. [u] Taken from [63-amb]. [v] The value 0.346 g·cm^{-3} for the critical density of 3-methylphenol attributed to Guye and Mallet [02-guy/mal] in [53-kob/lyn] was an estimate and is not included in Table 1. [w] Glaser and Rüland [57-gla/rue] tabulated temperatures in degrees Celsius, but for this compound they incorrectly entered temperature in kelvins. [x] Ambrose *et al.* [74-amb/bro] reported that the critical temperature given in [63-amb] was incorrect. [y] The instability of this substance is such that several tubes burst when heated in the experiments by Ambrose *et al.* [75-amb/con], and those authors were unable to observe the critical pressure. The value given was obtained by extrapolation of the equation fitting their vapor pressure measurements. The value given by Glaser and Rüland [57-gla/rue] is close to that equation value at their temperature. [z] Ambrose *et al.* [74-amb/bro] reported that the p_c value is based on the direct observations combined with extrapolation to the critical temperature of vapor pressure measurements up to 615 K. [aa] Hess and Tilton [50-hes/til] is a review of Union Carbide Corporation data, and no experimental details are given. [bb] Walters and Smith [52-wal/smi] took the critical temperature and critical pressure from Hess and Tilton [50-hes/til]. [cc] The recommended critical pressure has been calculated by extrapolation to the recommended critical temperature of the vapor pressure measurements by Kobe *et al.* [56-kob/rav]. [dd] Højendahl's [46-hoj] values are taken from *Chem. Abstr.* **1947**, *41*, 4985. The value given for p_c, (50 ± 3) bar, is in conflict with that reported by Kobe and Lynn [53-kob/lyn], (50.7 ± 3) atm. (Note that 50 atm = 50.7 bar.) [ee] This paper was a review of the physical properties of the compound, and it appears probable that the values were not based on experiment [97-ma]. So they are omitted from Table 1.

Table 3. Keys to Methods of Critical Point Determination (Reprinted with Permission from 95-amb/you. Copyright 1995 American Chemical Society)[a]

1. visual—in glass tube
2. visual—in cell with windows
3. nonvisual—*pVT* measurements
4. other nonvisual methods
5. critical pressure measurements combined with vapor pressure measurements up to the critical point
6. critical pressure by extrapolation of vapor pressure curve
7. orthobaric density measurements
8. equation of state, thermodynamic study
9. calculation from another physical property
10. literature survey
(a) with stirring
(b) instrumental detection of critical point
(c) special feature of apparatus

[a] In this paper the qualifier (c), applying to the work by Teja and co-workers and by Wilson and co-workers, indicates use of a flow apparatus.

number of groups of investigators who have established a good reputation for this type of work. They have taken care to use samples of adequate purity and used proven methods, and generally their work has been preferred. The values recommended take account of the present authors' assessments of the accuracy associated with each experimental result. For unstable compounds values obtained by flow methods, if available, have generally, but not always, been preferred to those obtained by static methods. Instability of compounds at the critical temperature usually increases with molar mass, but some reactive compounds, which may be of low molar mass, present extreme difficulty for the determination of their critical properties; these include, for example, ethanal, ethanoic anhydride, methanoic acid, and benzaldehyde. With the static method, decomposition frequently leads to bursting of the experimental tubes after a few (or even only one) observations. For such compounds it is necessary to allocate large uncertainties. Details not already dealt with are in the notes for each compound in Table 2.

For some compounds it is still necessary to rely on early work, such as that by Brown [06-bro] on the higher esters, and for these generally stable compounds the uncertainties are relatively high because, where comparison can be made with reliable values for other compounds, Brown's values of critical temperature tend to be high by 5 K or more. Large uncertainties also have to be applied to the values of critical temperature by Pawlewski [1882-paw, 1883-paw] and Nadezhdin [1887-nad] for compounds not studied more recently. Where more recent data are available, Pawlewski's values are up to 10 K high and those of Nadezhdin are up to 4 K low (and Nadezhdin's critical pressures are up to 0.3 MPa high, and critical densities are up to 0.02 g·cm^{-3} low). On the other hand, the work by Young [1893-you/tho, 10-you] is of quality comparable to that of all but the best modern work.

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