

On the Waring and Riedel functions for the liquid-vapor coexistence curve

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Supporting Information.

Table S1: Critical temperature T_c (K), Waring temperature T_W (K), and Riedel temperature T_R (K) obtained from Refprop 9.0¹ for the 105 fluids considered in this work

Fluid	T_c (K)	T_W (K)	T_R (K)
1-butene	419.29	348.74	405.85
acetone	508.1	429.01	496.37
ammonia	405.4	341.51	396.90
argon	150.69	108.55	147.40
benzene	562.02	474.43	546.13
butane	425.12	354.57	413.13
dodecane	658.1	591.31	641.38
methylcyclohexane	572.2	490.47	551.96
cis-butene	435.75	364.66	424.13
propylcyclohexane	630.8	549.30	608.58
perfluorobutane	386.33	343.01	376.92
perfluoropentane	420.56	382.61	411.86
trifluoroiodomethane	396.44	328.57	386.88

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Fluid	T_c (K)	T_W (K)	T_R (K)
carbon monoxide	132.86	103.34	129.65
carbon dioxide	304.13	264.05	297.92
carbonyl sulfide	378.77	303.41	367.13
cyclohexane	553.64	469.93	547.32
cyclopentane	511.69	426.02	—
cyclopropane	398.3	319.66	390.00
deuterium	38.34	—	—
heavy water	643.85	548.38	629.45
D4	586.49	544.63	574.66
D5	619.23	560.46	595.06
D6	645.78	573.62	633.17
decane	617.7	549.41	599.98
DMC	557.38	466.02	—
DME	400.38	333.85	388.79
ethane	305.32	240.55	298.30
ethanol	513.9	506.15	—
ethylene	282.35	224.00	276.05
fluorine	144.41	112.63	140.87
hydrogen sulfide	373.1	300.18	362.50
helium	5.2	—	4.97
heptane	540.13	469.46	—
hexane	507.82	436.96	491.84
hydrogen	33.15	—	31.99
isobutene	418.09	348.19	407.79
isohexane	497.7	426.02	484.68
isopentane	460.35	388.21	448.61
isobutane	407.81	339.53	399.69
krypton	209.48	150.39	203.96
MD2M	599.4	527.81	574.44
MD3M	628.36	581.15	622.88
MD4M	653.2	586.56	629.90
MDM	564.09	509.88	553.83
methane	190.56	136.08	186.16
methanol	513.38	475.59	—
methyl linoleate	799.	704.20	760.88
methyl linolenate	772.	667.19	719.39
MM	518.7	468.96	503.22

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Fluid	T_c (K)	T_w (K)	T_R (K)
methyl oleate	782.	678.53	726.83
methyl palmitate	755.	652.38	703.40
methyl stearate	775.	666.69	717.31
nitrous oxide	309.52	259.89	301.37
neon	44.49	26.94	43.96
neopentane	433.74	367.94	422.68
nitrogen trifluoride	234.	190.05	228.45
nitrogen	126.19	95.47	123.43
nonane	594.55	524.72	573.99
octane	569.32	502.84	555.02
orthohydrogen	33.22	—	32.42
oxygen	154.58	113.92	151.12
parahydrogen	32.94	—	31.95
pentane	469.7	398.20	457.55
propane	369.89	302.88	361.29
propylene	364.21	297.66	356.08
propyne	402.38	289.62	396.76
R11	471.11	396.84	459.88
R113	487.21	418.32	475.14
R114	418.83	356.76	415.67
R115	353.1	301.69	339.89
R116	293.03	250.92	285.11
R12	385.12	320.41	374.09
R123	456.83	394.91	445.51
R1234yf	367.85	313.96	359.21
R1234ze	382.52	332.32	373.43
R124	395.42	342.49	386.72
R125	339.17	295.92	331.08
R13	302.	252.09	293.62
R134a	374.21	326.33	365.52
R14	227.51	187.04	220.51
R141b	477.5	410.20	463.12
R142b	410.26	349.45	397.81
R143a	345.86	291.60	337.12
R152a	386.41	328.45	376.21
R161	375.3	313.03	358.26
R21	451.48	386.27	436.67

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Fluid	T_c (K)	T_W (K)	T_R (K)
R218	345.02	300.90	333.26
R22	369.3	313.36	362.16
R227ea	374.9	331.24	367.63
R23	299.29	252.91	292.02
R236ea	412.44	369.08	—
R236fa	398.07	347.23	392.89
R245ca	447.57	391.65	434.62
R245fa	427.16	382.84	417.13
R32	351.26	293.36	343.07
R365mfc	460.	395.51	445.87
R41	317.28	252.70	308.25
RC318	388.38	344.61	378.31
sulfur hexafluoride	318.72	269.16	311.44
sulfur dioxide	430.64	371.85	419.45
trans-butene	428.61	355.52	414.52
toluene	591.75	498.01	577.63
water	647.1	545.09	632.32
xenon	289.73	211.14	281.89

Table S2: Acentric factor ω , reduced Waring temperature T_{rW} , minimum value of the reduced Waring function $\psi_{r,\min}$, reduced Riedel temperature T_{rR} , and minimum value of the Riedel function $\alpha_{\min}$ obtained from Refprop 9.0¹ for the 105 fluids considered in this work

Fluid	ω	T_{rW}	$\psi_{r,\min}$	T_{rR}	$\alpha_{\min}$
1-butene	0.192	0.8317	6.3093	0.9679	6.8284
acetone	0.3071	0.8443	6.9177	0.9769	7.4134
ammonia	0.256	0.8424	6.6682	0.9790	7.1161
argon	−0.0022	0.7204	5.2528	0.9782	5.7904
benzene	0.211	0.8442	6.4094	0.9717	6.8871
butane	0.201	0.8340	6.3652	0.9718	6.8550
dodecane	0.574	0.8985	8.2164	0.9746	8.6660
methylcyclohexane	0.23	0.8572	6.5432	0.9646	7.0334
cis-butene	0.202	0.8368	6.3748	0.9733	6.8624
propylcyclohexane	0.33	0.8708	6.9931	0.9648	7.5024
perfluorobutane	0.374	0.8879	7.2233	0.9757	7.6137
perfluoropentane	0.423	0.9098	7.5422	0.9793	7.8795
trifluoroiodomethane	0.18	0.8288	6.2488	0.9759	6.6822
carbon monoxide	0.0497	0.7778	5.5652	0.9758	6.0433

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Fluid	ω	T_{rW}	$\psi_{r,\min}$	T_{rR}	$\alpha_{\min}$
carbon dioxide	0.2239	0.8682	6.4834	0.9796	6.8557
carbonyl sulfide	0.0978	0.8011	5.8178	0.9693	6.3137
cyclohexane	0.2093	0.8488	6.4151	0.9886	6.7908
cyclopentane	0.195	0.8326	6.3694	—	—
cyclopropane	0.1305	0.8026	5.9943	0.9792	6.4292
deuterium	−0.175	—	—	—	—
heavy water	0.364	0.8517	7.2312	0.9776	7.6921
D4	0.592	0.9286	8.1597	0.9798	8.4950
D5	0.658	0.9051	8.5504	0.9610	9.1002
D6	0.736	0.8883	9.0079	0.9805	9.5458
decane	0.4884	0.8894	7.7934	0.9713	8.2717
DMC	0.3333	0.8361	7.0475	—	—
DME	0.196	0.8338	6.3347	0.9711	6.8384
ethane	0.0995	0.7878	5.8305	0.9770	6.3139
ethanol	0.644	0.9849	8.3509	—	—
ethylene	0.0866	0.7933	5.7641	0.9777	6.2292
fluorine	0.0449	0.7799	5.5594	0.9755	6.0518
hydrogen sulfide	0.1005	0.8046	5.8366	0.9716	6.3170
helium	−0.385	—	—	0.9568	3.8618
heptane	0.349	0.8692	7.1224	—	—
hexane	0.299	0.8605	6.8685	0.9685	7.3788
hydrogen	−0.219	—	—	0.9653	4.7638
isobutene	0.193	0.8328	6.3243	0.9754	6.8056
isohexane	0.2797	0.8560	6.7698	0.9738	7.2529
isopentane	0.2274	0.8433	6.5045	0.9745	6.9699
isobutane	0.184	0.8326	6.2828	0.9801	6.7091
krypton	−0.0009	0.7179	5.2532	0.9737	5.8240
MD2M	0.668	0.8806	8.6692	0.9584	9.3521
MD3M	0.722	0.9249	8.8227	0.9913	9.1318
MD4M	0.836	0.8980	9.3845	0.9643	10.0203
MDM	0.529	0.9039	7.9610	0.9818	8.3373
methane	0.0114	0.7141	5.3193	0.9769	5.8777
methanol	0.5625	0.9264	8.1841	—	—
methyl linoleate	0.805	0.8814	9.3430	0.9523	10.1099
methyl linolenate	1.14	0.8642	11.0526	0.9319	12.2243
MM	0.418	0.9041	7.4083	0.9702	7.8162
methyl oleate	0.91	0.8677	9.7608	0.9295	10.7980

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Table S2 – continued from previous page

Fluid	ω	T_{rW}	$\psi_{r,\min}$	T_{rR}	$\alpha_{\min}$
methyl palmitate	0.91	0.8641	9.8474	0.9317	10.8894
methyl stearate	1.02	0.8602	10.3570	0.9256	11.5258
nitrous oxide	0.1613	0.8397	6.1657	0.9737	6.5978
neon	-0.0387	0.6055	4.9773	0.9881	5.5900
neopentane	0.1961	0.8483	6.3401	0.9745	6.7729
nitrogen trifluoride	0.126	0.8122	5.9886	0.9763	6.3923
nitrogen	0.0372	0.7565	5.4868	0.9781	5.9840
nonane	0.4433	0.8825	7.5688	0.9654	8.0890
octane	0.393	0.8832	7.3381	0.9749	7.7865
orthohydrogen	-0.219	—	—	0.9761	4.7468
oxygen	0.0222	0.7370	5.3945	0.9776	5.9171
parahydrogen	-0.219	—	—	0.9700	4.7476
pentane	0.251	0.8478	6.6283	0.9741	7.0984
propane	0.1521	0.8188	6.1154	0.9768	6.5745
propylene	0.146	0.8173	6.0827	0.9777	6.5368
propyne	0.204	0.7198	6.3740	0.9860	6.8290
R11	0.1888	0.8423	6.3125	0.9762	6.7228
R113	0.2525	0.8586	6.6339	0.9752	7.0501
R114	0.2523	0.8518	6.6385	0.9925	7.0248
R115	0.25	0.8544	6.5927	0.9626	7.1094
R116	0.2566	0.8563	6.6505	0.9730	7.1065
R12	0.1795	0.8320	6.2559	0.9714	6.7186
R123	0.2819	0.8644	6.7802	0.9752	7.2052
R1234yf	0.276	0.8535	6.7632	0.9765	7.1899
R1234ze	0.313	0.8688	6.9474	0.9762	7.3684
R124	0.2881	0.8661	6.8137	0.9780	7.2233
R125	0.3052	0.8725	6.9027	0.9761	7.2978
R13	0.1723	0.8347	6.2137	0.9723	6.6780
R134a	0.3268	0.8721	7.0132	0.9768	7.4301
R14	0.1785	0.8221	6.2612	0.9692	6.7623
R141b	0.2195	0.8591	6.4530	0.9699	6.8984
R142b	0.2321	0.8518	6.5213	0.9696	6.9937
R143a	0.2615	0.8431	6.6889	0.9747	7.1508
R152a	0.2752	0.8500	6.7600	0.9736	7.2117
R161	0.217	0.8341	6.4514	0.9546	7.0540
R21	0.2061	0.8556	6.3772	0.9672	6.8529
R218	0.3172	0.8721	6.9396	0.9659	7.4328

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Fluid	ω	T_{rW}	$\psi_{r,\min}$	T_{rR}	$\alpha_{\min}$
R22	0.2208	0.8485	6.4775	0.9807	6.8838
R227ea	0.357	0.8835	7.1588	0.9806	7.5412
R23	0.263	0.8450	6.6958	0.9757	7.1511
R236ea	0.3794	0.8949	7.1857	—	—
R236fa	0.3772	0.8723	7.2449	0.9870	7.7105
R245ca	0.3536	0.8751	7.1340	0.9711	7.5852
R245fa	0.3776	0.8962	7.2341	0.9765	7.6161
R32	0.2769	0.8352	6.7746	0.9767	7.2469
R365mfc	0.38	0.8598	7.2532	0.9693	7.8134
R41	0.2004	0.7965	6.3648	0.9715	6.9113
RC318	0.3553	0.8873	7.1266	0.9741	7.5381
sulfur hexafluoride	0.21	0.8445	6.4635	0.9771	6.8967
sulfur dioxide	0.2557	0.8635	6.6448	0.9740	7.0681
trans-butene	0.21	0.8295	6.4006	0.9671	6.9353
toluene	0.2657	0.8416	6.6962	0.9761	7.2138
water	0.3443	0.8424	7.1309	0.9772	7.6302
xenon	0.0036	0.7287	5.2862	0.9729	5.8381

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