SUPPORTING INFORMATION

(R)Evolution of Refrigerants

Mark O. McLinden[†] and Marcia L. Huber

Applied Chemicals and Materials Division, National Institute of Standards and Technology
325 Broadway, Boulder, Colorado 80305 USA

Table S1. Pure-fluid refrigerants in REFPROP version 10.0 and sources of property formulations. Values for T_{NBP} and T_c are computed from the cited EOS.

ASHRAE designation	Chemical name	CAS number	Property Sources	T_{NBP}/K	T_c/K
CFCs					
R-11	Trichlorofluoromethane	75-69-4	EOS: Jacobsen et al. (1992)[1] σ: Mulero et al. (2012)[2] λ: McLinden et al. (2000)[3] η: Klein et al. (1997)[4]	296.86	471.11
R-12	Dichlorodifluoromethane	75-71-8	EOS: Marx et al. (1992)[5] σ: Mulero et al. (2012)[2] λ: McLinden et al. (2000)[3] η: Klein et al. (1997)[4]	243.40	385.12
R-13	Chlorotrifluoromethane	75-72-9	EOS: Magee at al. (2000)[6] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	191.67	302.00
R-113	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	EOS: Marx et al. (1992)[5] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	320.74	487.21
R-114	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	EOS: Platzer et al. (1990)[8] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	276.74	418.83
R-115	Chloropentafluoroethane	76-15-3	EOS: Lemmon and Span(2015)[10] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	233.93	353.10
HCFCs and HCCs					
R-21	Dichlorofluoromethane	75-43-4	EOS: Platzer et al. (1990)[8] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	282.01	451.48
R-22	Chlorodifluoromethane	75-45-6	EOS: Kamei et al. (1995)[11] σ: Mulero et al. (2012)[2] λ: McLinden et al. (2000)[3] η: Klein et al. (1997)[4]	232.34	369.30

[†] markm@boulder.nist.gov

ASHRAE designation	Chemical name	CAS number	Property Sources	T_{NBP}/K	T_c/K
R-40	Methyl chloride	74-87-3	EOS: Thol et al. (2014)[12] σ: Mulero and Cachadiña (2014)[13] λ: Huber (2018)[9] η: Huber (2018)[9]	249.17	416.30
R-123	2,2-Dichloro-1,1,1-trifluoroethane	306-83-2	EOS: Younglove and McLinden (1994)[14] σ: Mulero et al. (2012)[2] λ: Laesecke et al. (1996)[15] η: Tanaka and Sotari (1995)[16]	300.97	456.83
R-124	1-Chloro-1,2,2,2-tetrafluoroethane	2837-89-0	EOS: de Vries et al. (1995)[17] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	261.19	395.43
R-141b	1,1-Dichloro-1-fluoroethane	1717-00-6	EOS: Lemmon and Span (2006)[18] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	305.20	477.50
R-142b	1-Chloro-1,1-difluoroethane	75-68-3	EOS: Lemmon and Span (2006)[18] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	264.03	410.26
R-150	1,2-Dichloroethane	107-06-2	EOS: Thol et al. (2017)[19] σ: Huber (2018)[9] λ: Huber (2018)[9] η: Huber (2018)[9]	356.65	561.60
HFCs					
R-14	Tetrafluoromethane	75-73-0	EOS: Platzer et al. (1990)[8] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	145.10	227.51
R-23	Trifluoromethane	75-46-7	EOS: Penoncello at al. (2003)[20] σ: Mulero et al. (2012)[2] λ: Shan et al. (2000)[21] η: Shan et al. (2000)[21]	191.13	299.29
R-32	Difluoromethane	75-10-5	EOS: Tillner-Roth and Yokozeki (1997)[22] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	221.50	351.26
R-41	Fluoromethane	593-53-3	EOS: : Lemmon and Span (2006)[18] σ: : Lemmon and Span (2006)[18] λ: McLinden et al. (2000)[3] η: Klein et al. (1997)[4]	194.84	317.28
R-116	Hexafluoroethane	76-16-4	EOS: Lemmon and Span (2006)[18] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	195.06	293.03
R-125	Pentafluoroethane	354-33-6	EOS: Lemmon and Jacobsen (2005)[23] σ: Mulero et al. (2012)[2] λ: Perkins and Huber (2006)[24] η: Huber and Laesecke (2006)[25]	225.06	339.17

ASHRAE designation	Chemical name	CAS number	Property Sources	T_{NBP}/K	T_c/K
R-134a	1,1,1,2-Tetrafluoroethane	811-97-2	EOS: Tillner-Roth and Baehr (1994)[26] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7] η: Perkins et al. (2000)[27]	247.08	374.21
R-143a	1,1,1-Trifluoroethane	420-46-2	EOS: Lemmon and Jacobsen (2000)[28] σ: Mulero and Cachadiña (2014)[13] λ: Huber (2018)[9] η: Huber (2018)[9]	225.91	345.86
R-152a	1,1-Difluoroethane	75-37-6	EOS: Outcalt and McLinden (1996)[29] σ: Mulero et al. (2012)[2] λ: Krauss et al. (1996)[30] η: Klein et al. (2000)[4]	249.13	386.41
R-161	Fluoroethane	353-36-6	EOS: Qi et al. (2016)[31] σ: Mulero et al. (2012)[2] λ: Tsolakidou et al. (2017)[32] η: Tsolakidou et al. (2017)[32]	235.61	375.25
R-218	Octafluoropropane	76-19-7	EOS: Lemmon and Span (2006)[18] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	236.36	345.02
R-227ea	1,1,1,2,3,3,3-Heptafluoropropane	431-89-0	EOS: Lemmon and Span (2015)[10] σ: Mulero et al. (2012)[2] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	256.81	374.90
R-236ea	1,1,1,2,3,3-Hexafluoropropane	431-63-0	EOS: Rui et al. (2013)[33] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	279.32	412.44
R-236fa	1,1,1,3,3,3-Hexafluoropropane	690-39-1	EOS: Pan et al. (2012)[34] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	271.66	398.07
R-245ca	1,1,2,2,3-Pentafluoropropane	679-86-7	EOS: Zhou and Lemmon (2016)[35] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	298.41	447.57
R-245fa	1,1,1,3,3-Pentafluoropropane	460-73-1	EOS: Akasaka et al. (2015)[36] σ: Mulero et al. (2012)[2] λ: Perkins et al. (2016)[37] η: Perkins et al. (2016)[37]	288.20	427.01
R-365mfc	1,1,1,3,3-Pentafluorobutane	406-58-6	EOS: Lemmon and Span (2015)[10] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	313.34	460.00
R-C318	Octafluorocyclobutane	115-25-3	EOS: Platzer et al. (1990)[8] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	267.18	388.38

ASHRAE designation	Chemical name	CAS number	Property Sources	T_{NBP}/K	T_c/K
			HFOs		
R-1123	Trifluoroethene	359-11-5	EOS: Akasaka et al. (2016)[38] σ: Huber (2018)[9] λ: Huber (2018)[9] η: Huber (2018)[9]	214.06	331.73
R-1140	Chloroethylene (vinyl chloride)	75-01-4	EOS: Thol (2014)[39] σ: Huber (2018)[9] λ: Huber (2018)[9] η: Huber (2018)[9]	259.44	424.96
R-1216	Hexafluoropropene	116-15-4	EOS: Zhou (2018)[40] σ: Mulero and Cachadiña (2014)[13] λ: Huber et al. (2003)[7,*] η: Huber et al. (2003)[7,*]	242.81	358.90
R-1224yd(Z)	(*Z*)-1-Chloro-2,3,3,3-tetrafluoropropene	111512-60-8	EOS: Akasaka et al. (2017)[41] σ: Huber (2018)[9] λ: Huber (2018)[9] η: Huber (2018)[9]	287.77	428.69
R-1233zd(E)	*trans*-1-Chloro-3,3,3-trifluoro-1-propene	102687-65-0	EOS: Mondejar et al. (2015)[42] σ: Kondou et al.(2015)[43] λ: Perkins et al. (2017)[44] η: Huber (2018)[9]	291.41	439.60
R-1234yf	2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	EOS: Richter et al. (2011)[45] σ: Mulero et al. (2012)[2] λ: Perkins and Huber (2011)[46] η: Huber and Assael (2016)[47]	243.67	367.85
R-1234ze(E)	*trans*-1,3,3,3-Tetrafluoropropene	29118-24-9	EOS: Thol and Lemmon (2016)[48] σ: Mulero and Cachadiña (2014)[13] λ: Perkins and Huber (2011)[46] η: Huber and Assael (2016)[47]	254.18	382.51
R-1234ze(Z)	*cis*-1,3,3,3-Tetrafluoropropene	29118-25-0	EOS: Akasaka and Lemmon (2019)[49] σ: Kondou et al. (2015)[43] λ: Huber (2018)[9] η: Huber (2018)[9]	282.88	423.27
R-1243zf	3,3,3-Trifluoropropene	677-21-4	EOS: Akasaka and Lemmon (2019)[49] σ: Kondou et al. (2015)[43] λ: Huber (2018)[9] η: Huber (2018)[9]	247.73	376.93
R-1336mzz(Z)	(*Z*)-1,1,1,4,4,4-Hexafluoro-2-butene	692-49-9	EOS: McLinden and Akasaka (2020)[50] σ: Huber (2018)[9] λ: Huber (2018)[9],** η: Huber (2018)[9]	306.60	444.50

ASHRAE designation	Chemical name	CAS number	Property Sources	T_{NBP}/K	T_c/K
hydrocarbons					
R-170	Ethane	74-84-0	EOS: Bücker and Wagner (2006)[51] σ: Mulero et al. (2012)[2] λ: Friend et al.(1991)[52] η: Vogel et al.(2015)[53]	184.57	305.32
R-290	Propane	74-98-6	EOS: Lemmon et al. (2009)[54] σ: Mulero et al. (2012)[2] λ: Marsh et al. (2002)[55] η: Vogel and Herrmann (2016)[56]	231.04	369.89
R-600	*n*-Butane	106-97-8	EOS: Bücker and Wagner (2006)[57] σ: Mulero et al. (2012)[2] λ: Perkins et al. (2002)[58] η: Herrmann and Vogel (2018)[59]	272.66	425.13
R-600a	2-Methylpropane (isobutane)	75-28-5	EOS: Bücker and Wagner (2006)[57] σ: Mulero et al. (2012)[2] λ: Perkins (2002)[60] η: Vogel et al. (2000)[61]	261.40	407.81
R-601	*n*-Pentane	109-66-0	EOS: Thol (2018)[62] σ: Mulero et al. (2012)[2] λ: Vassiliou et al. (2015)[63] η: Huber (2018)[9]	309.21	469.70
R-1150	Ethene (ethylene)	74-85-1	EOS: Smukala et al. (2000)[64] σ: Mulero et al. (2012)[2] λ: Assael et al. (2016)[65] η: Holland et al. (1983)[66]	169.38	282.35
R-1270	Propene (propylene)	115-07-1	EOS: Lemmon (2018)[67] σ: Mulero et al. (2012)[2] λ: Assael et al. (2016)[65] η: Huber (2018)[9]	225.53	364.21
Ethers					
R-E143a	Methyl trifluoromethyl ether	421-14-7	EOS: Akasaka and Kayukawa (2012)[68] σ: Huber (2018)[9] λ: Huber (2018)[9] η: Huber (2018)[9]	249.57	377.92
R-E170	Methoxymethane (dimethyl ether)	115-10-6	EOS: Wu et al. (2011)[69] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Meng et al. (2012)[70]	248.37	400.38
R-E245cb2	Methyl pentafluoroethyl-ether	22410-44-2	EOS: Zhou (2018)[40] σ: Mulero and Cachadiña (2014)[13] λ: Huber (2018)[9] η: Huber (2018)[9]	278.76	406.81
R-E245fa2	2,2,2-Trifluoroethyl-difluoromethyl-ether	1885-48-9	EOS: Zhou (2018)[40] σ: Mulero and Cachadiña (2014)[13] λ: Huber (2018)[9] η: Huber (2018)[9]	302.40	444.88
R-E347mcc	1,1,1,2,2,3,3-Heptafluoro-3-methoxypropane	375-03-1	EOS: Zhou (2018)[40] σ: Mulero and Cachadiña (2014)[13] λ: Huber (2018)[9] η: Huber (2018)[9]	307.33	437.70

ASHRAE designation	Chemical name	CAS number	Property Sources	T_{NBP}/K	T_c/K
n.a.	1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone (Novec 649)	756-13-8	EOS: McLinden et al. (2015)[71] σ: Cui et al. (2018)[72] λ: Perkins et al. (2018)[73] η: Wen et al. (2017)[74]	322.20	441.81
other					
R-13I1	Trifluoroiodomethane	2314-97-8	EOS: Lemmon and Span (2015)[10] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	251.29	396.44
R-717	Ammonia	7664-41-7	EOS: Gao (2018) [75] σ: Mulero et al. (2012)[2] λ: Monogenidou et al. (2018)[76] η: Monogenidou et al. (2018)[77]	239.83	405.56
R-718	Water	7732-18-5	EOS: Wagner and Pruß (2002)[78] σ: IAPWS (2014)[79] λ: Huber et al. (2012)[80] η: Huber et al. (2009)[81]	373.12	647.10
R-744	Carbon dioxide	124-38-9	EOS: Span and Wagner (1996)[82] σ: Mulero et al. (2012)[2] λ: Huber et al. (2016)[83] η: Laesecke and Muzny (2017)[84]	194.69	304.13
R-764	Sulfur dioxide	7446-09-5	EOS: Gao et al. (2016)[85] σ: Mulero et al. (2012)[2] λ: Huber (2018)[9] η: Huber (2018)[9]	263.14	430.64

*Coefficients are in Ref.[86] using method described in Ref.[7] **Now superceded by Ref.[87]

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