Tetrafluoromethane

Other names:	Arcton 0
	CF4
	CFC 14
	Carbon fluoride
	Carbon fluoride (CF4)
	Carbon tetrafluoride
	F 14
	FC 14
	Freon 14
	Halocarbon 14
	Halon 14
	Methane, tetrafluo-
	Methane, tetrafluoro-
	Perfluoromethane
	R 14
	R 14 (Refrigerant)
	R-14
	Refrigerant 14
	Refrigerant R 14
	UN 1982
Inchi:	InChI=1S/CF4/c2-1(3,4)5
InchiKey:	TXEYQDLBPFQVAA-UHFFFAOYSA-N
Formula:	CF4
SMILES:	FC(F)(F)F
Mol. weight [g/mol]:	88.00
CAS:	75-73-0

Physical Properties

Property code	Value	Unit	Source
affp	529.30	kJ/mol	NIST Webbook
basg	503.70	kJ/mol	NIST Webbook
chl	-1519.89	kJ/mol	NIST Webbook
chl	-2222.30	kJ/mol	NIST Webbook
gf	-818.86	kJ/mol	Joback Method
hf	-917.10 ± 9.60	kJ/mol	NIST Webbook
hf	-933.20 ± 0.75	kJ/mol	NIST Webbook
hf	-908.80 ± 5.00	kJ/mol	NIST Webbook

hf	-933.00	kJ/mol	NIST Webbook
hf	-912.00 ± 8.00	kJ/mol	NIST Webbook
hf	-953.40 ± 1.60	kJ/mol	NIST Webbook
hf	-678.00 ± 8.00	kJ/mol	NIST Webbook
hf	-934.00 ± 2.00	kJ/mol	NIST Webbook
hf	-920.90 ± 5.90	kJ/mol	NIST Webbook
hf	-933.20 ± 0.80	kJ/mol	NIST Webbook
hf	-922.20	kJ/mol	NIST Webbook
hf	-913.40	kJ/mol	NIST Webbook
hfus	3.25	kJ/mol	Joback Method
hvap	13.26	kJ/mol	Joback Method
ie	16.50	eV	NIST Webbook
ie	16.20	eV	NIST Webbook
ie	15.70	eV	NIST Webbook
ie	16.26	eV	NIST Webbook
ie	14.70	eV	NIST Webbook
ie	16.20	eV	NIST Webbook
ie	15.30	eV	NIST Webbook
ie	16.20 ± 0.10	eV	NIST Webbook
ie	14.70	eV	NIST Webbook
ie	16.20	eV	NIST Webbook
ie	16.25 ± 0.04	eV	NIST Webbook
log10ws	-1.25		Crippen Method
logp	1.476		Crippen Method
mcvol	32.030	ml/mol	McGowan Method
pc	3745.00 ± 10.00	kPa	NIST Webbook
rhoc	629.67 ± 0.88	kg/m3	NIST Webbook
rinpol	82.00		NIST Webbook
sl	143.97	J/mol×K	NIST Webbook
tb	216.13	K	Joback Method
tc	227.50 ± 0.10	K	NIST Webbook
tc	227.50 ± 0.02	K	NIST Webbook
tf	89.50 ± 0.50	K	NIST Webbook
tf	86.85 ± 1.00	K	NIST Webbook
tf	89.00 ± 1.50	K	NIST Webbook
vc	0.142 ± 800.000	m3/kmol	NIST Webbook

Temperature Dependent Properties

Property code	Value	Unit	Temperature [K]	Source
cpg	49.05	J/mol×K	216.13	Joback Method

cpg	52.53	J/mol×K	237.22	Joback Method
cpg	55.83	J/mol×K	258.31	Joback Method
cpg	58.96	J/mol×K	279.41	Joback Method
cpg	61.92	J/mol×K	300.50	Joback Method
cpg	64.72	J/mol×K	321.59	Joback Method
cpg	67.36	J/mol×K	342.68	Joback Method
cpl	80.08	J/mol×K	145.00	NIST Webbook
hfust	0.69	kJ/mol	88.40	NIST Webbook
hfust	1.73	kJ/mol	76.10	NIST Webbook
hfust	0.71	kJ/mol	89.56	NIST Webbook
hfust	1.71	kJ/mol	76.27	NIST Webbook
hfust	0.71	kJ/mol	89.56	NIST Webbook
hfust	1.46	kJ/mol	76.10	NIST Webbook
hfust	0.71	kJ/mol	89.50	NIST Webbook
hsubt	14.70	kJ/mol	87.50	NIST Webbook
hsubt	14.00	kJ/mol	83.00	NIST Webbook
hsubt	17.00	kJ/mol	76.00	NIST Webbook
hvapt	11.90	kJ/mol	178.50	NIST Webbook
hvapt	11.81	kJ/mol	145.12	NIST Webbook
hvapt	12.80	kJ/mol	119.50	NIST Webbook
hvapt	12.40	kJ/mol	131.00	NIST Webbook
hvapt	12.10	kJ/mol	211.00	NIST Webbook
hvapt	12.30	kJ/mol	126.00	NIST Webbook
pvap	269.00	kPa	161.58	Vapor-Liquid Equilibrium Data of the Methane + Tetrafluoromethane System at Temperatures from (159.61 to 178.93) K
pvap	517.00	kPa	173.90	Vapor-Liquid Equilibrium Data of the Methane + Tetrafluoromethane System at Temperatures from (159.61 to 178.93) K
pvap	651.00	kPa	178.93	Vapor-Liquid Equilibrium Data of the Methane + Tetrafluoromethane System at Temperatures from (159.61 to 178.93) K

pvap	243.00	kPa	159.61	Vapor-Liquid Equilibrium Data of the Methane + Tetrafluoromethane System at Temperatures from (159.61 to 178.93) K
pvap	1575.00	kPa	200.68	Isothermal Vapor-Liquid Equilibrium Data for Tetrafluoromethane + Ethane over a Temperature Range from (179.68 to 210.03) K
pvap	1058.00	kPa	190.14	Isothermal Vapor-Liquid Equilibrium Data for Tetrafluoromethane + Ethane over a Temperature Range from (179.68 to 210.03) K
pvap	679.00	kPa	179.68	Isothermal Vapor-Liquid Equilibrium Data for Tetrafluoromethane + Ethane over a Temperature Range from (179.68 to 210.03) K
pvap	1205.31	kPa	193.43	Vapor-liquid and vapor-liquid-liquid equilibrium measurements and correlation of the binary mixtures 2,3,3,3-tetrafluoroprop-1-ene (R1234yf) p (tetrafluoromethane (R14), trifluoromethane (R23), octafluoropropane (R218), nitrogen (R728) and argon (R740)) and ethane (R170) p trifluoromethane (R23)

pvap	171.92	kPa	153.23	Vapor-liquid and vapor-liquid-liquid equilibrium measurements and correlation of the binary mixtures 2,3,3,3-tetrafluoroprop-1-ene (R1234yf) p (tetrafluoromethane (R14), trifluoromethane (R23), octafluoropropane (R218), nitrogen (R728) and argon (R740)) and ethane (R170) p trifluoromethane (R23)
pvap	431.00	kPa	169.38	Vapor-Liquid Equilibrium Data of the Methane + Tetrafluoromethane System at Temperatures from (159.61 to 178.93) K
pvap	2163.00	kPa	210.03	Isothermal Vapor-Liquid Equilibrium Data for Tetrafluoromethane + Ethane over a Temperature Range from (179.68 to 210.03) K
sfust	7.90	J/mol×K	89.50	NIST Webbook
sfust	19.20	J/mol×K	76.10	NIST Webbook
sfust	7.70	J/mol×K	88.40	NIST Webbook
sfust	21.40	J/mol×K	76.10	NIST Webbook
sfust	7.95	J/mol×K	89.56	NIST Webbook
sfust	22.43	J/mol×K	76.27	NIST Webbook
svapt	81.41	J/mol×K	145.12	NIST Webbook

Correlations

Information	Value
Property code	pvap
Equation	ln(Pvp) = A + B/(T + C)
Coeff. A	1.39902e+01
Coeff. B	-1.23425e+03

Coeff. C	-1.34020e+01
Temperature range (K), min.	103.48
Temperature range (K), max.	227.51

Sources

McGowan Method:	http://link.springer.com/article/10.1007/BF02311772
Solubility of gases in fluoroorganic alcohols. Part III. Solubilities of several non-polar gases in water + 1,1,1,3,3,3-hexafluoropropan-2-ol at 298.15 K and 101.33 kPa:	https://www.doi.org/10.1016/j.jct.2018.12.027
Solubilities of Nonpolar Gases in Triethylene Glycol Dimethyl Ether, Diethyl Carbonate, and Propylene Carbonate at 298.15 K and 101.33 kPa:	https://www.doi.org/10.1021/je020199q
Solubilities of hydrofluorocarbons in primarily solvents and alcohols at 298.15 K and 101.33 kPa:	https://www.doi.org/10.1016/j.fluid.2012.09.013
Vapor-Liquid Equilibrium Data for the Nitrogen + Tetrafluoromethane System at Temperatures from (159.61 to 178.93) K:	https://www.doi.org/10.1021/je0604030
Vapor Pressure of Gas + Liquid and Liquid + Liquid equilibrium measurements and correlation of the binary mixtures 2,3,3,3-tetrafluoroprop-1-ene (R1234yf) + (tetrafluoromethane (R14), octafluoropropane (R218), nitrogen (R728) and argon (R740)) and ethane (R170) p trifluoromethane (R23):	https://www.doi.org/10.1016/j.fluid.2017.07.002
Solubilities of gases in cycloethers. The solubility of 13 nonpolar gases in 2,2,4,4-tetramethyltetrahydrofuran at 273.15 to 303.15 K and 101.33 kPa:	https://www.doi.org/10.1016/j.jct.2018.12.037
Pressure:	https://www.cheric.org/files/research/kdb/mol/mol1513.mol
Solubility of CF4 in lower alcohols:	https://www.sciencedirect.com/book/9780128029992/the-yaws-handbook-of-vapor-pressure
Solubility of Hydrofluorocarbons in Halobenzene Solvents:	https://www.doi.org/10.1016/j.fluid.2010.02.007
Isothermal Vapor-Liquid Equilibrium Data for Tetrafluoromethane + Ethane over a Temperature Range from (179.68 to 293.15) K:	https://www.doi.org/10.1021/je500525q
Vapor-Liquid Equilibrium Measurements for the Nitrogen + Tetrafluoromethane System over a Temperature Range of (134.27 to 204.85) K:	https://www.doi.org/10.1021/je050525c
NIST Webbook:	https://www.doi.org/10.1021/je9002064
VLE measurements and modelling for the binary systems of (CF4 + C6F14) and (CF4 + C8F18):	http://webbook.nist.gov/cgi/cbook.cgi?ID=C75730&Units=SI
Crippen Method:	https://www.doi.org/10.1016/j.fluid.2018.12.005
Joback Method:	http://pubs.acs.org/doi/abs/10.1021/ci990307l
Solubilities of several non-polar gases in mixtures water + 2,2,2-trifluoroethanol at 298.15 K and 101.33 kPa:	https://en.wikipedia.org/wiki/Joback_method
Vapor-Liquid Equilibrium Measurements for a Tetrafluoromethane + Propane System over a Temperature Range from (142.96 to 293.23) K:	https://www.doi.org/10.1016/j.fluid.2011.11.006
Crippen Method:	https://www.doi.org/10.1021/je300806e
	https://www.chemeo.com/doc/models/crippen_log10ws

Legend

affp:	Proton affinity
basg:	Gas basicity
chl:	Standard liquid enthalpy of combustion
cpg:	Ideal gas heat capacity
cpl:	Liquid phase heat capacity
gf:	Standard Gibbs free energy of formation
hf:	Enthalpy of formation at standard conditions
hfus:	Enthalpy of fusion at standard conditions
hfust:	Enthalpy of fusion at a given temperature

hsubt:	Enthalpy of sublimation at a given temperature
hvap:	Enthalpy of vaporization at standard conditions
hvapt:	Enthalpy of vaporization at a given temperature
ie:	Ionization energy
log10ws:	Log10 of Water solubility in mol/l
logp:	Octanol/Water partition coefficient
mcvol:	McGowan's characteristic volume
pc:	Critical Pressure
pvap:	Vapor pressure
rhoc:	Critical density
rinpol:	Non-polar retention indices
sfust:	Entropy of fusion at a given temperature
sl:	Liquid phase molar entropy at standard conditions
svapt:	Entropy of vaporization at a given temperature
tb:	Normal Boiling Point Temperature
tc:	Critical Temperature
tf:	Normal melting (fusion) point
vc:	Critical Volume