Formic acid

Other names:	AMINIC ACID
	Acide formique
	Acido formico
	Add-F
	Amasil
	Ameisensaeure
	BILORIN
	Collo-Bueglatt
	Collo-Didax
	FORMYLIC ACID
	Formira
	Formisoton
	HCOOH
	Hydrogen carboxylic acid
	Kwas metaniowy
	Kyselina mravenci
	Methanoic acid
	Mierenzuur
	Myrmicyl
	Rcra waste number U123
	UN 1779
Inchi:	InChI=1S/CH2O2/c2-1-3/h1H,(H,2,3)
InchiKey:	BDAGIHXWWSANSR-UHFFFAOYSA-N
Formula:	CH2O2
SMILES:	O=CO
Mol. weight [g/mol]:	46.03
CAS:	64-18-6

Physical Properties

Property code	Value	Unit	Source
af	0.4730		KDB
affp	742.00	kJ/mol	NIST Webbook
aigt	874.26	K	KDB
basg	710.30	kJ/mol	NIST Webbook
chl	-253.80 ± 0.30	kJ/mol	NIST Webbook
chl	-254.60 ± 0.30	kJ/mol	NIST Webbook

dm	1.50	debye	KDB
fll	18.00	% in Air	KDB
flu	57.00	% in Air	KDB
fpc	332.04	K	KDB
gf	-351.20	kJ/mol	KDB
gyrad	0.1880		KDB
hf	-378.90	kJ/mol	KDB
hf	-379.00	kJ/mol	NIST Webbook
hf	-378.50 ± 0.60	kJ/mol	NIST Webbook
hf	-378.60	kJ/mol	NIST Webbook
hf	-379.20 ± 0.60	kJ/mol	NIST Webbook
hf	-378.30	kJ/mol	NIST Webbook
hfl	-424.80 ± 0.30	kJ/mol	NIST Webbook
hfl	-425.50 ± 0.30	kJ/mol	NIST Webbook
hfl	-425.09	kJ/mol	NIST Webbook
hfus	4.72	kJ/mol	Joback Method
hvap	46.30	kJ/mol	NIST Webbook
hvap	19.90	kJ/mol	NIST Webbook
hvap	36.00	kJ/mol	NIST Webbook
hvap	46.30 ± 0.50	kJ/mol	NIST Webbook
hvap	46.30 ± 0.50	kJ/mol	NIST Webbook
ie	11.33	eV	NIST Webbook
ie	11.50	eV	NIST Webbook
ie	11.05 ± 0.01	eV	NIST Webbook
ie	10.70	eV	NIST Webbook
ie	11.51	eV	NIST Webbook
ie	11.34	eV	NIST Webbook
ie	11.05 ± 0.03	eV	NIST Webbook
ie	11.33	eV	NIST Webbook
ie	11.16 ± 0.03	eV	NIST Webbook
ie	11.35 ± 0.03	eV	NIST Webbook
ie	11.30	eV	NIST Webbook
ie	11.31 ± 0.00	eV	NIST Webbook
ie	11.33 ± 0.00	eV	NIST Webbook
ie	11.31	eV	NIST Webbook
ie	11.33 ± 0.01	eV	NIST Webbook
ie	11.33	eV	NIST Webbook
ie	11.16 ± 0.03	eV	NIST Webbook
log10ws	0.66		Crippen Method
logp	-0.299		Crippen Method
mcvol	32.390	ml/mol	McGowan Method
nfpaf	%!d(float64=2)		KDB
nfpah	%!d(float64=3)		KDB
pc	7390.00	kPa	KDB

pt	2.36 ± 0.01	kPa	NIST Webbook
rinpol	512.00		NIST Webbook
rinpol	495.00		NIST Webbook
rinpol	490.00		NIST Webbook
rinpol	495.00		NIST Webbook
rinpol	512.00		NIST Webbook
rinpol	543.00		NIST Webbook
rinpol	512.00		NIST Webbook
rinpol	490.00		NIST Webbook
ripol	1505.00		NIST Webbook
ripol	1499.00		NIST Webbook
ripol	1532.00		NIST Webbook
ripol	1533.00		NIST Webbook
ripol	1528.00		NIST Webbook
ripol	1510.00		NIST Webbook
ripol	1492.00		NIST Webbook
ripol	1528.00		NIST Webbook
ripol	1521.00		NIST Webbook
ripol	1485.00		NIST Webbook
ripol	1470.00		NIST Webbook
ripol	1470.00		NIST Webbook
ripol	1543.60		NIST Webbook
ripol	1470.00		NIST Webbook
ripol	1501.00		NIST Webbook
sg	248.70 ± 0.42	J/mol×K	NIST Webbook
sl	128.40	J/mol×K	NIST Webbook
sl	143.10	J/mol×K	NIST Webbook
sl	131.84	J/mol×K	NIST Webbook
tb	374.00	K	KDB
tb	373.85 ± 0.30	K	NIST Webbook
tb	373.75 ± 0.40	K	NIST Webbook
tb	373.63 ± 0.10	K	NIST Webbook
tb	380.85 ± 5.00	K	NIST Webbook
tb	373.70 ± 0.40	K	NIST Webbook
tb	373.95 ± 0.50	K	NIST Webbook
tb	373.85 ± 0.20	K	NIST Webbook
tb	373.90 ± 0.50	K	NIST Webbook
tb	373.90 ± 0.50	K	NIST Webbook
tb	373.90 ± 0.30	K	NIST Webbook
tb	373.40 ± 0.60	K	NIST Webbook
tb	374.05 ± 0.60	K	NIST Webbook
tb	373.90 ± 0.20	K	NIST Webbook
tb	373.35 ± 0.30	K	NIST Webbook
tb	374.55 ± 0.50	K	NIST Webbook

tb	373.85 ± 0.40	K	NIST Webbook
tb	376.15 ± 2.00	K	NIST Webbook
tb	373.80 ± 0.30	K	NIST Webbook
tb	374.15 ± 1.00	K	NIST Webbook
tb	373.75 ± 1.00	K	NIST Webbook
tb	374.15 ± 1.50	K	NIST Webbook
tb	374.15 ± 1.50	K	NIST Webbook
tb	373.80 ± 1.00	K	NIST Webbook
tb	373.75 ± 1.00	K	NIST Webbook
tb	373.95 ± 1.00	K	NIST Webbook
tb	372.00 ± 1.50	K	NIST Webbook
tb	373.65 ± 1.00	K	NIST Webbook
tb	378.45 ± 1.00	K	NIST Webbook
tb	378.45 ± 1.00	K	NIST Webbook
tb	373.60	K	Effect of Dissolved Salts on the Enthalpy of Mixing of the Methanol + Formic Acid System at 303.15 K
tb	374.40	K	Liquid-Liquid Equilibria for Ternary Systems of Water + Formic Acid + Dibasic Esters
tb	374.20	K	Ternary liquid-liquid phase equilibria of (water-carboxylic acid-1-undecanol) systems at 298.15 K
tb	374.05	K	Quaternary phase equilibrium of water-carboxylic acid mixture (formic-propionic acid or acetic-propionic acid)-solvent liquid systems at 298.15 K
tb	374.15	K	Determination and correlation of liquid liquid equilibria for the (water + carboxylic acid + dimethyl maleate) ternary systems at T = 298.2K
tb	373.80	K	NIST Webbook
tc	588.00	K	KDB
tc	588.00 ± 10.00	K	NIST Webbook
tc	580.00	K	NIST Webbook
tc	577.00 ± 30.00	K	NIST Webbook
tf	281.47 ± 0.10	K	NIST Webbook
tf	282.85	K	Differential scanning calorimetry determination of phase diagrams and water activities of aqueous carboxylic acid solutions
tf	281.40 ± 0.30	K	NIST Webbook
tf	281.70 ± 1.50	K	NIST Webbook

tf	282.00 ± 1.50	K	NIST Webbook
tf	281.55 ± 0.10	K	NIST Webbook
tf	280.85 ± 0.50	K	NIST Webbook
tf	281.40 ± 0.05	K	NIST Webbook
tf	281.40	K	KDB
tf	281.50 ± 0.30	K	NIST Webbook
tf	281.55 ± 0.20	K	NIST Webbook
tt	281.45 ± 0.10	K	NIST Webbook
tt	281.40 ± 0.06	K	NIST Webbook
vc	0.125	m3/kmol	KDB
zc	0.1889290		KDB
zra	0.18		KDB

Temperature Dependent Properties

Property code	Value	Unit	Temperature [K]	Source
cpg	61.87	J/mol×K	534.36	Joback Method
cpg	54.85	J/mol×K	420.20	Joback Method
cpg	52.92	J/mol×K	391.66	Joback Method
cpg	50.91	J/mol×K	363.12	Joback Method
cpg	56.71	J/mol×K	448.74	Joback Method
cpg	60.22	J/mol×K	505.82	Joback Method
cpg	58.49	J/mol×K	477.28	Joback Method
cpl	98.10	J/mol×K	298.15	NIST Webbook
cpl	100.00	J/mol×K	290.00	NIST Webbook
cpl	98.30	J/mol×K	291.50	NIST Webbook
cpl	95.40	J/mol×K	298.00	NIST Webbook
cpl	99.04	J/mol×K	298.15	NIST Webbook
dvisc	0.0008790	Pa×s	333.15	Densities and Viscosities of N,N-Dimethylformamide + Formic Acid, and + Acetic Acid in the Temperature Range from (303.15 to 353.15) K

dvisc	0.0012050	Pa×s	313.15	Densities and Viscosities of N,N-Dimethylformamide + Formic Acid, and + Acetic Acid in the Temperature Range from (303.15 to 353.15) K
dvisc	0.0014370	Pa×s	303.15	Densities and Viscosities of N,N-Dimethylformamide + Formic Acid, and + Acetic Acid in the Temperature Range from (303.15 to 353.15) K
dvisc	0.0006770	Pa×s	353.15	Densities and Viscosities of N,N-Dimethylformamide + Formic Acid, and + Acetic Acid in the Temperature Range from (303.15 to 353.15) K
dvisc	0.0007660	Pa×s	343.15	Densities and Viscosities of N,N-Dimethylformamide + Formic Acid, and + Acetic Acid in the Temperature Range from (303.15 to 353.15) K
dvisc	0.0010220	Pa×s	323.15	Densities and Viscosities of N,N-Dimethylformamide + Formic Acid, and + Acetic Acid in the Temperature Range from (303.15 to 353.15) K
hfust	12.68	kJ/mol	281.40	NIST Webbook
hfust	12.68	kJ/mol	281.40	NIST Webbook
hsubt	62.00 ± 1.00	kJ/mol	210.50	NIST Webbook
hsubt	60.10	kJ/mol	264.00	NIST Webbook
hsubt	60.50	kJ/mol	274.50	NIST Webbook
hsubt	60.70	kJ/mol	266.50	NIST Webbook
hvapt	21.92	kJ/mol	373.90	KDB
hvapt	20.40	kJ/mol	315.00	NIST Webbook
hvapt	20.90	kJ/mol	323.00	NIST Webbook
hvapt	36.80	kJ/mol	290.00	NIST Webbook

hvapt	47.70	kJ/mol	334.50	NIST Webbook
hvapt	20.30	kJ/mol	323.00	NIST Webbook
hvapt	35.20	kJ/mol	342.00	NIST Webbook
hvapt	22.69	kJ/mol	373.80	NIST Webbook
hvapt	21.10	kJ/mol	338.00	NIST Webbook
hvapt	29.60	kJ/mol	303.00	NIST Webbook
hvapt	35.20	kJ/mol	346.00	NIST Webbook
pvap	200.60	kPa	398.15	Isobaric and Isothermal Vapor Liquid Equilibria for the Binary System of Water + Formic Acid at 99.41 kPa, 388.15 K, and 398.15 K
pvap	153.70	kPa	388.15	Isobaric and Isothermal Vapor Liquid Equilibria for the Binary System of Water + Formic Acid at 99.41 kPa, 388.15 K, and 398.15 K
rfi	1.37200		293.10	Phase Equilibria of Binary Systems Comprising Formic Acid, N,N-Dimethylformamide, 1-Chloro-2-ethylhexane, and 2-Ethyl-1-hexanol
rfi	1.37100		293.20	Experimental and Correlational Study of Phase Equilibria in Aqueous Solutions of Formic and Butyric Acids with Isoamyl Acetate and Methyl Isoamyl Ketone at T = 298.15 K
rfi	1.37130		298.20	Tie-line data for water- formic acid-1-decanol ternary system at T = (298.2, 303.2, 313.2, 323.2) K
rfi	1.37110		293.15	Liquid liquid equilibria of ternary systems (water + carboxylic acid + cumene) at 298.15K

rfi	1.37140		293.20	Vapor Liquid Equilibrium of Gamma-Valerolactone and Formic Acid at p = 51 kPa
rfi	1.36990		298.20	Vapor Liquid Equilibrium of Gamma-Valerolactone and Formic Acid at p = 51 kPa
rfi	1.37459		298.15	Refractive Index, Surface Tension, and Density of Aqueous Mixtures of Carboxylic Acids at 298.15 K
rfi	1.37110		293.20	Liquid-liquid equilibrium data for systems containing of formic acid, water, and primary normal alcohols at T = 298.2 K
rhol	1220.04	kg/m3	298.20	(Liquid + liquid) equilibria of the (water + carboxylic acid + dibasic esters mixture (DBE-2)) ternary systems
rhol	1220.04	kg/m3	298.20	Liquid Phase Equilibria of Water + Formic Acid + Dimethyl Carbonate Ternary System at Several Temperatures
rhol	1219.50	kg/m3	298.15	Liquid Phase Equilibria of Aqueous Mixtures of Carboxylic Acids (C1-C4) with Ethylbenzene: Thermodynamic and Mathematical Modeling

rhol	1214.10	kg/m3	298.20	Modeling phase equilibria of ternary systems (water + formic acid + ester or alcohol) through UNIFAC-original, SERLAS, NRTL, NRTL-modified, and three-suffix Margules: Parameter estimation using genetic algorithm
rhol	1218.50	kg/m3	293.15	Phase equilibrium of (water + formic or acetic acid + ethyl heptanoate) ternary liquid systems at different temperatures
rhol	1226.00	kg/m3	288.00	KDB
sfust	45.05	J/mol×K	281.40	NIST Webbook
srf	0.04	N/m	293.20	KDB

Correlations

Information	Value
Property code	pvap
Equation	ln(Pvp) = A + B/(T + C)
Coeff. A	1.40203e+01
Coeff. B	-2.67757e+03
Coeff. C	-8.91130e+01
Temperature range (K), min.	281.55
Temperature range (K), max.	588.00

Information	Value
Property code	pvap
Equation	ln(Pvp) = A + B/T + C*ln(T) + D*T^2
Coeff. A	7.89044e+01
Coeff. B	-6.67745e+03
Coeff. C	-9.79394e+00
Coeff. D	1.14316e-05
Temperature range (K), min.	271.00
Temperature range (K), max.	580.00

Sources

Liquid-liquid equilibrium data for systems containing of formic acid, water, and ternary normal alcohols at T = 298.2 K:	https://www.doi.org/10.1016/j.fluid.2013.06.006
Determination and correlation of liquid-liquid equilibria for the (water + carboxylic acid + dimethyl maleate) ternary systems at 298.2K:	https://www.doi.org/10.1016/j.fluid.2008.04.014
Liquid Phase Equilibria of Aqueous Mixtures of Carboxylic Acids (C1-C4) with Ethylbenzene: Thermodynamic and Mathematical Modeling:	https://www.doi.org/10.1021/acs.jced.6b00112
Differential scanning calorimetry determination of Solid-Liquid equilibria phase diagrams for binary systems:	https://www.doi.org/10.1016/j.fluid.2018.12.035
Measurement and Modeling of Solid-Liquid Equilibria of L-Glutamic Acid in Pure Solvents and Aqueous Binary Mixtures:	https://www.doi.org/10.1021/acs.jced.8b01084
Liquid-liquid equilibria of ternary systems (water + carboxylic acid + cumene) at 298.15K:	https://www.doi.org/10.1021/acs.jced.6b00109
Modeling phase equilibria of ternary systems (water + formic acid + ester or alcohol) through UNIFAC original, SERLAS, NRTL, NRTL-modified, and three-suffix Margules: Parameter estimation using genetic algorithm:	https://www.doi.org/10.1016/j.fluid.2006.07.011
Isobaric and Isothermal Vapor Liquid Equilibria for the Binary System of Water + Formic Acid at 99.41 kPa, 298.15 K, and 323.15 K:	https://www.doi.org/10.1016/j.fluid.2015.01.012
Determination of the Solubility of Diphenhydramine in Different Solvents at Temperatures from (278.15 to 328.15) K:	https://www.doi.org/10.1021/je900903w
Dilute Aqueous Solutions with Formate Ions: A Conductometric Study:	https://www.doi.org/10.1016/j.fluid.2010.08.030
Liquid phase equilibria of (water + formic acid + diethyl carbonate or diethyl malonate or diethyl fumarate) ternary systems at 298.15K and atmospheric pressure:	https://www.doi.org/10.1021/acs.jced.8b01139
Liquid Viscosity and Interfacial Tension of Binary and Ternary Mixtures of Diethyl Carbonate + Methanol + Formic Acid at 303.15 K:	https://www.doi.org/10.1021/je800568m
Efficient Dissolved Salts on the Enhancement of Formic Acid in Several Solvents at Temperatures between 293.65 and 303.15 K:	https://www.doi.org/10.1016/j.fluid.2012.05.002
Liquid-Liquid Equilibria for Ternary Systems of Water + Formic Acid + Dibasic Esters:	https://www.doi.org/10.1021/je700206y
Understanding ion–ion and ion–solvent interactions in aqueous solutions of biologically active ionic liquids through partial molar properties and DFT calculations:	https://www.doi.org/10.1021/acs.jced.5b00170
(Liquid + liquid) equilibria of the (water + carboxylic acid + dibasic esters mixture (DBE-2)) ternary systems:	https://www.doi.org/10.1016/j.fluid.2017.05.005
Phase equilibrium of (water + formic or acetic acid + ethyl heptanoate) ternary liquid systems at different temperatures:	https://www.doi.org/10.1016/j.fluid.2011.01.020
Ternary liquid-liquid phase equilibria of (water-carboxylic acid-1-undecanol) systems at 298.15 K:	https://www.doi.org/10.1016/j.fluid.2014.03.002
Tie-line data for water- formic acid-1-decanol ternary system at T = (298.2, 303.2, 313.2, 323.2) K:	https://www.doi.org/10.1016/j.tca.2012.08.001
Thermodynamic Models for Determination of the Solubility of Pure Solutes and Aqueous Organic Solutions:	https://www.doi.org/10.1021/je500867u
Densities and Viscosities of Binary Mixtures of Formamide + Formic Acid, and + Acetic Acid in the Temperature Range from 293.15 to 353.15 K:	https://www.doi.org/10.1021/je700755t
Solubility of Dihydroxylammonium 5,5'-Bistetrazole-1,1'-diolate in Formic Acid, Water, and Their Binary Solvents from 278.15 K to 338.15 K at 101.1 kPa:	https://www.doi.org/10.1016/j.jct.2018.07.030
	https://www.doi.org/10.1016/j.fluid.2016.08.041
KDB Vapor Pressure Data:	https://www.cheric.org/research/kdb/hcprop/showprop.php?cmpid=929
Isobaric and Isothermal Vapor Liquid Equilibria for the Binary System of Water + Formic Acid at 99.41 kPa, 298.15 K, and 323.15 K:	https://www.doi.org/10.1021/acs.jced.6b00139
Thermodynamic Model for Solubility of Clopidogrel Hydrogen Sulfate in Formic Acid, N-Methylpyrrolidone, and Mononitro-Substituted Products of Dimethylformamide:	https://www.doi.org/10.1021/je500437m
Determination of the Solubility of Diphenhydramine in Different Solvents at Temperatures from (278.15 to 328.15) K:	http://pubs.acs.org/doi/abs/10.1021/ci990307l
Liquid Viscosity and Interfacial Tension of Binary and Ternary Mixtures of Diethyl Carbonate + Methanol + Formic Acid at 303.15 K:	https://www.doi.org/10.1021/je800568m
Study on the Solubilities of Nitration of m-Toluic Acid in Several Solvents at Temperatures between 297.65 and 361.15 K:	https://www.doi.org/10.1021/je201128n
Measurement and correlation of osmotic coefficient for aqueous solution of ionic liquid [Bmim]BF4 at T = (288.15, 298.15, and 308.15) K:	https://www.doi.org/10.1021/acs.jced.7b00431
Liquid-liquid equilibria for ternary systems of water + formic acid + 2-sec-butylphenol at 298.15 K:	https://www.doi.org/10.1016/j.fluid.2012.05.002
Mutual Solubilities for the Water 2-sec-Butylphenol System and Partition Coefficients for Furfural and Formic Acid in Water + 2-sec-Butylphenol Systems:	https://www.doi.org/10.1021/je700206y
Gamma Method:	https://www.doi.org/10.1021/acs.jced.5b00170
Liquid-liquid equilibria for ternary systems of (water + formic acid + ethyl heptanoate) at different temperatures:	https://www.doi.org/10.1016/j.fluid.2017.05.005
NIST Webbook:	https://www.chemeo.com/doc/models/crippen_log10ws
Measurement and Correlation of the Solubility of Sodium 2-Chloroacetate in Selected Pure Solvents and Aqueous Solutions:	https://www.doi.org/10.1016/j.fluid.2011.01.020
Determination of the Solubility of Nifuroxazide in Different Solvents at Temperatures (278.15 to 328.15) K:	https://www.doi.org/10.1016/j.fluid.2014.03.002
Solubility of Dihydroxylammonium 5,5'-Bistetrazole-1,1'-diolate in Formic Acid, Water, and Their Binary Solvents from 278.15 K to 338.15 K at 101.1 kPa:	https://www.doi.org/10.1021/je500422t
	https://www.doi.org/10.1016/j.fluid.2013.07.015
	http://link.springer.com/article/10.1007/BF02311772
	https://www.doi.org/10.1016/j.fluid.2012.06.020
	http://webbook.nist.gov/cgi/cbook.cgi?ID=C64186&Units=SI
	https://www.doi.org/10.1016/j.tca.2012.08.001
	https://www.doi.org/10.1021/acs.jced.5b00655
	https://www.doi.org/10.1021/je500867u
	https://www.doi.org/10.1021/je700755t
	https://www.doi.org/10.1016/j.jct.2018.07.030
	https://www.cheric.org/research/kdb/hcprop/showprop.php?cmpid=929

Solubility, liquid-liquid equilibrium and critical states for the quaternary system formic acid + ethanol + ethyl acetate + water at 298.15 K:	https://www.doi.org/10.1016/j.fluid.2018.12.024
Liquid-liquid equilibria for ternary systems of water + carboxylic acid + 1-octanol at 298.15 K: modeling phase equilibria using a solvation model:	https://www.doi.org/10.1016/j.fluid.2004.10.029
Salt Effect on the Enthalpy of Mixing of 1,4-Dioxane + Formic Acid at 303.15 K: Experimental Data and Correlation Approach:	https://www.doi.org/10.1021/je7007022
Liquid-liquid equilibrium data for water + formic acid + solvent (butyl acetate, ethyl acetate, and isoamyl alcohol) at T = 298.15 K:	https://www.doi.org/10.1016/j.fluid.2016.01.045
Differential scanning calorimetry determination of phase diagrams and water activities of aqueous carboxylic acid solutions:	https://www.doi.org/10.1016/j.tca.2018.03.002
Thermodynamic analysis for determination of solid - liquid equilibrium of dibenzothiophene in a binary solvent mixture:	https://www.doi.org/10.1016/j.fluid.2015.08.023
Phase Equilibria of Binary Systems Comprising Formic Acid and Diethyl Ether between 278.15 and 313.15 K:	https://www.doi.org/10.1021/je800123c
Solubilities of 2,6-Dimethylnaphthalene in Six Pure Solvents and Two Binary Solvent Systems:	https://www.doi.org/10.1021/acs.jced.8b01209
1-Chloro-2-ethylhexane and 2-Ethyl-1-hexanol:	https://www.cheric.org/files/research/kdb/mol/mol929.mol
The Yaws Handbook of Vapor Pressure:	https://www.sciencedirect.com/book/9780128029992/the-yaws-handbook-of-vapor-pressure
Solubilities of Dihydroxylammonium 5,5'-Bistetrazole-1,1'-diolate in Various Pure Solvents at Temperatures between 293.15 and 323.15 K:	https://www.doi.org/10.1021/acs.jced.6b00009
Liquid-Liquid Equilibria of Formic Acid and Furfural in a Biphasic Aqueous Organic System: Temperature and Solvent Influence:	https://www.doi.org/10.1021/acs.jced.8b00335
Refractive Index, Speed of Sound, Isentropic Compressibility, and Density of Aqueous Mixtures of Quaternary Ammonium Salts:	https://www.doi.org/10.1021/je060084c
Optimization of Solvent and Amine Extractant: Quaternary phase equilibrium of water-carboxylic acid mixture (formic-propionic acid or acetic-propionic acid) + solvent liquid systems at 298.15 K:	https://www.doi.org/10.1016/j.fluid.2011.09.014
Vapor-Liquid Equilibrium of Gamma-Valerolactone and Formic Acid between Isobaric and Correlational Study of Phase Equilibria in Aqueous Solutions of Formic and Butyric Acids with Isoamyl Acetate and Methyl Isoamyl Ketone at T = 298.15 K:	https://www.doi.org/10.1021/acs.jced.6b00867
	https://www.doi.org/10.1021/je401095k

Legend

af:	Acentric Factor
affp:	Proton affinity
aigt:	Autoignition Temperature
basg:	Gas basicity
chl:	Standard liquid enthalpy of combustion
cpg:	Ideal gas heat capacity
cpl:	Liquid phase heat capacity
dm:	Dipole Moment
dvisc:	Dynamic viscosity
fll:	Lower Flammability Limit
flu:	Upper Flammability Limit
fpc:	Flash Point (Closed Cup Method)
gf:	Standard Gibbs free energy of formation
gyrad:	Radius of Gyration
hf:	Enthalpy of formation at standard conditions
hfl:	Liquid phase 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
nfpaf:	NFPA Fire Rating
nfpah:	NFPA Health Rating
pc:	Critical Pressure
pt:	Triple Point Pressure
pvap:	Vapor pressure
rfi:	Refractive Index
rhol:	Liquid Density
rinpol:	Non-polar retention indices
ripol:	Polar retention indices
sfust:	Entropy of fusion at a given temperature
sg:	Molar entropy at standard conditions
sl:	Liquid phase molar entropy at standard conditions
srf:	Surface Tension
tb:	Normal Boiling Point Temperature
tc:	Critical Temperature
tf:	Normal melting (fusion) point
tt:	Triple Point Temperature
vc:	Critical Volume
zc:	Critical Compressibility
zra:	Rackett Parameter