

Malic Acid

Other names:	(.+-.)-Malic acid 2-Hydroxyethane-1,2-dicarboxylic acid Butanedioic acid, 2-hydroxy- Butanedioic acid, hydroxy- DEOXYTETRARIC ACID FDA 2018 HYDROXYBUTANEDIOIC ACID Hydroxyethane-1,2-dicarboxylic acid Hydroxysuccinic acid Kyselina hydroxybutandiova Kyselina jablecna Musashi-no-Ringosan NSC 25941 POMALUS ACID R,S(.+-.)-Malic acid Succinic acid, hydroxy- dl-Malic acid «alpha»-Hydroxysuccinic acid Â«alphaÂ»-Hydroxysuccinic acid
Inchi:	InChI=1S/C4H6O5/c5-2(4(8)9)1-3(6)7/h2,5H,1H2,(H,6,7)(H,8,9)
InchiKey:	BJEPYKJPYRNKOW-UHFFFAOYSA-N
Formula:	C4H6O5
SMILES:	O=C(O)CC(O)C(=O)O
Mol. weight [g/mol]:	134.09
CAS:	6915-15-7

Physical Properties

Property code	Value	Unit	Source
gf	-687.94	kJ/mol	Joback Method
hf	-813.02	kJ/mol	Joback Method
hfus	18.05	kJ/mol	Joback Method
hvap	87.64	kJ/mol	Joback Method
log10ws	0.93		Crippen Method
logp	-1.093		Crippen Method
mcvol	87.970	ml/mol	McGowan Method
pc	7037.97	kPa	Joback Method
tb	674.76	K	Joback Method

tc	849.14	K	Joback Method
tf	400.75 ± 0.60	K	NIST Webbook
tf	403.15	K	Thermodynamic models for determination of the solubility of DL-malic acid in methanol plus (acetonitrile, N,N-dimethylformamide, isopropyl alcohol) binary solvent mixtures
vc	0.323	m3/kmol	Joback Method

Temperature Dependent Properties

Property code	Value	Unit	Temperature [K]	Source
cpg	222.47	J/mol×K	674.76	Joback Method
cpg	227.04	J/mol×K	703.82	Joback Method
cpg	231.36	J/mol×K	732.89	Joback Method
cpg	235.42	J/mol×K	761.95	Joback Method
cpg	239.25	J/mol×K	791.02	Joback Method
cpg	242.84	J/mol×K	820.08	Joback Method
cpg	246.21	J/mol×K	849.14	Joback Method
dvisc	0.0048344	Paxs	402.16	Joback Method
dvisc	0.0009670	Paxs	447.59	Joback Method
dvisc	0.0002602	Paxs	493.03	Joback Method
dvisc	0.0000874	Paxs	538.46	Joback Method
dvisc	0.0000348	Paxs	583.89	Joback Method
dvisc	0.0000158	Paxs	629.33	Joback Method
dvisc	0.0000080	Paxs	674.76	Joback Method

Correlations

Information	Value
Property code	pvap
Equation	$\ln(P_{\text{vap}}) = A + B/T + C*\ln(T) + D*T^2$
Coeff. A	2.51357e+02
Coeff. B	-2.63327e+04
Coeff. C	-3.22403e+01
Coeff. D	9.21419e-06
Temperature range (K), min.	403.15

Sources

Crippen Method:

https://www.chemeo.com/doc/models/crippen_log10ws

Low transition temperature mixtures (LTTMs) as novel entrainers in KDP Vapor Pressure Data:

<https://www.doi.org/10.1016/j.fluid.2014.10.044>

<https://www.cheric.org/research/kdb/hcprop/showprop.php?cmpid=977>

Joback Method:

https://en.wikipedia.org/wiki/Joback_method

<https://www.doi.org/10.1016/j.jct.2015.02.002>

<https://www.cheric.org/research/kdb/hcprop/showprop.php?cmpid=977>

Thermodynamic models for determination of the solubility of KDP, malic acid in methanol plus (acetonitrile, N,N-dimethylformamide, isopropyl alcohol) binary solvent

Thermodynamic Properties of Lactic Acid and Maleic Acid-Based Natural Deep Eutectic Solvents: Experiment and correlation of osmotic coefficient for aqueous solution of Salinity of D-malic acid in water, ethanol and its mixture of ethanol + water, solubility of citric, malonic, and malic acids in different solvents from 303.2 to 323.15 K

Tension of Aqueous Solutions of Small-Chain Amino and Organic Acids of Different Organic Acids on Solubility and Metastable Zone Width McGowan Method:

<https://www.doi.org/10.1021/acs.jced.7b01037>

<http://pubs.acs.org/doi/abs/10.1021/ci990307l>

<https://www.doi.org/10.1016/j.fluid.2012.05.002>

<https://www.doi.org/10.1016/j.fluid.2014.06.017>

<https://www.doi.org/10.1016/j.fluid.2011.09.033>

<https://www.doi.org/10.1021/acs.jced.9b00026>

<https://www.doi.org/10.1021/je3006453>

<http://link.springer.com/article/10.1007/BF02311772>

<http://webbook.nist.gov/cgi/cbook.cgi?ID=C6915157&Units=SI>

<https://www.doi.org/10.1021/je050366x>

NIST Webbook:

Surface Tensions and Densities of Oxalic, Malonic, Succinic, Maleic, Malic, and cis-Pinonic Acids:

Legend

cpg:	Ideal gas heat capacity
dvisc:	Dynamic viscosity
gf:	Standard Gibbs free energy of formation
hf:	Enthalpy of formation at standard conditions
hfus:	Enthalpy of fusion at standard conditions
hvap:	Enthalpy of vaporization at standard conditions
log10ws:	Log10 of Water solubility in mol/l
logp:	Octanol/Water partition coefficient
mcvol:	McGowan's characteristic volume
pc:	Critical Pressure
pvap:	Vapor pressure
tb:	Normal Boiling Point Temperature
tc:	Critical Temperature
tf:	Normal melting (fusion) point
vc:	Critical Volume

Latest version available from:

<https://www.chemeo.com/cid/46-520-3/Malic-Acid.pdf>

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