D-Serine

Other names:	(S)-(+)-serine
	(S)-2-amino-3-hydroxypropanoic acid
	(S)-serine
	.alpha.-amino-.beta.-hydroxypropionic acid
	.beta.-hydroxyalanine
	L-serine
	Serine, D-
Inchi:	InChI=1S/C3H7NO3/c4-2(1-5)3(6)7/h2,5H,1,4H2,(H,6,7)/t2-/m0/s1
InchiKey:	MTCFGRXMJLQNBG-REOHCLBHSA-N
Formula:	C3H7NO3
SMILES:	NC(CO)C(=O)O
Mol. weight [g/mol]:	105.09
CAS:	312-84-5

Physical Properties

Property code	Value	Unit	Source
gf	-364.17	kJ/mol	Joback Method
hf	-493.78	kJ/mol	Joback Method
hfus	14.97	kJ/mol	Joback Method
hvap	72.63	kJ/mol	Joback Method
log10ws	1.01		Crippen Method
logp	-1.609		Crippen Method
mcvol	76.420	ml/mol	McGowan Method
pc	7014.41	kPa	Joback Method
tb	578.36	K	Joback Method
tc	760.22	K	Joback Method
tf	363.40	K	Joback Method
tt	498.15	K	The Research and Measurement about the Solubility of l-Serine in Eight Common Pure Solvents and Four Binary Mixed Solvents for T = (278.15-333.15) K
vc	0.271	m3/kmol	Joback Method

Temperature Dependent Properties

Property code	Value	Unit	Temperature [K]	Source
cpg	184.80	J/mol×K	578.36	Joback Method
cpg	190.08	J/mol×K	608.67	Joback Method
cpg	195.08	J/mol×K	638.98	Joback Method
cpg	199.83	J/mol×K	669.29	Joback Method
cpg	204.33	J/mol×K	699.60	Joback Method
cpg	208.59	J/mol×K	729.91	Joback Method
cpg	212.60	J/mol×K	760.22	Joback Method
hvapt	141.00	kJ/mol	454.00	Enthalpy of sublimation of hydroxyl-containing amino acids: Knudsen's effusion mass spectrometric study

Sources

Volumetric Properties of Amino Acids in Aqueous N-Methylformamide Solutions at T = 298.15 K:	https://www.doi.org/10.1021/je1003466
Activity coefficients of CaCl2 in (serine or proline + water) mixtures at T = 298.15 K:	https://www.doi.org/10.1016/j.jct.2010.01.002
Water Activity in Aqueous Amino Acid Solutions Containing Ammonium Sulfate at 298.2 K:	https://www.doi.org/10.1021/je401034k
McGowan Method:	http://link.springer.com/article/10.1007/BF02311772
NIST Webbook:	http://webbook.nist.gov/cgi/cbook.cgi?ID=C312845&Units=SI
Study of thermodynamic properties of L-serine in aqueous 1-carboxymethyl-3-methylimidazolium chloride solutions at 298.15 K:	https://www.doi.org/10.1016/j.fluid.2013.11.017
Volumetric Properties of Glycine, L-Alanine, and L-Serine in Formamide + Water Mixtures at 298.15 K:	https://www.doi.org/10.1021/je5003797
Molecular interactions of some amino acids in aqueous 1-butyl-3-methylimidazolium bromide solutions at different temperatures: A volumetric approach:	https://www.doi.org/10.1016/j.jct.2018.05.008
Solubility of L-serine, L-threonine and L-isoleucine in aqueous aliphatic alcohol solutions:	https://www.doi.org/10.1016/j.fluid.2008.05.008
Effects of clustering structure on volumetric properties of amino acids in (DMSO + water) mixtures:	https://www.doi.org/10.1016/j.jct.2012.01.015
Crippen Method:	https://www.chemeo.com/doc/models/crippen_log10ws
Densities and Speeds of Sound of l-Serine with Aqueous Solutions of Antibacterial Drugs at Different Temperatures:	https://www.doi.org/10.1021/je3006425
Volumetric property of glycine, L-serine, L-alanine and L-proline in aqueous solutions of 1-phenylpiperazinium tetrafluoroborate:	https://www.doi.org/10.1016/j.jct.2016.03.045
Temperature Dependences and Enthalpic Discrimination of Homochiral Pairwise Interactions of Six α-Amino Acid Enantiomers in Pure Water:	https://www.doi.org/10.1021/je500825a
Thermodynamics of the ternary systems: (water + glycine, L-alanine and L-serine + di-ammonium hydrogen citrate) from volumetric, compressibility, and (vapour + liquid) equilibria measurements:	https://www.doi.org/10.1016/j.jct.2010.08.021
Studies on the Diffusion Coefficients of Amino Acids in Aqueous Solutions:	https://www.doi.org/10.1021/je049582g
Vapor pressure osmometry determination of vapor-liquid equilibria behavior of aqueous imidazolium-based ionic liquid + amino acid systems:	https://www.doi.org/10.1016/j.fluid.2017.05.019
Enthalpies of transfer of amino acids from water to aqueous solutions of sodium nitrate and sodium perchlorate at T = 298.15K:	https://www.doi.org/10.1016/j.tca.2005.10.013
Mutual Coexistence Curve Measurement of Aqueous Biphasic Systems Composed of [bmim][BF4] and Glycine, L-Serine, and L-Proline, Respectively:	https://www.doi.org/10.1021/je0601053
Effect of L-serine and L-threonine on volumetric and acoustic behaviour of aqueous metformin hydrochloride solutions at T = (305.15, 310.15 and 315.15) K:	https://www.doi.org/10.1016/j.jct.2015.11.020

A thermochemical study of serine stereoisomers:	https://www.doi.org/10.1016/j.tca.2014.08.032
The effect of ammonium sulfate on the solubility of amino acids in water at (298.15 and 323.15) K:	https://www.doi.org/10.1016/j.jct.2008.09.019
The Research and Measurement about the Solubility of l-Serine in Eight Common Pure Solvents and Four Binary Mixed Solvents for T = (278.15-333.15) K:	https://www.doi.org/10.1021/acs.jced.9b00460
Enthalpic interactions between some amino acids and cyclohexanone in water at 298.15K:	https://www.doi.org/10.1016/j.tca.2006.07.009
Water Activity in Aqueous Amino Acid Solutions, with and without KCl, at 298.15 K:	https://www.doi.org/10.1021/je700466s
KCl effect on the solubility of five different amino acids in water:	https://www.doi.org/10.1016/j.fluid.2007.04.004
Enthalpies of Transfer of Amino Acids from Water to Aqueous Solutions of Alkali Metal Nitrates:	https://www.doi.org/10.1021/je050296u
Volumetric, acoustic and transport properties of ternary solutions of L-serine and L-arginine in aqueous solutions of thiamine hydrochloride at different temperatures:	https://www.doi.org/10.1016/j.jct.2019.03.039
Thermodynamics of proton dissociations from aqueous serine at temperatures from (278.15 to 398.15) K, molalities from (0.01 up to 1.0) mol Ae kg-1, and at the pressure 0.35 MPa:	https://www.doi.org/10.1016/j.jct.2005.07.019
Enthalpies of transfer of amino acids from water to aqueous solutions of formamide:	https://www.doi.org/10.1016/j.tca.2005.04.002
Enthalpies of dilution of glycine, L-alanine and L-serine in aqueous potassium chloride solutions:	https://www.doi.org/10.1016/j.tca.2004.05.021
Apparent molar heat capacities and apparent molar volumes of serine, serinium chloride, and sodium serinate:	
Enthalpies of Dilution of L-Alanine in Dimethylsulfoxide + Water and Dimethylformamide + Water Mixtures at 298.15 K:	https://www.doi.org/10.1021/je9005322
Joback Method:	https://en.wikipedia.org/wiki/Joback_method
Surface Tension of Aqueous Solutions of Small-Chain Amino and Organic Acids:	https://www.doi.org/10.1021/acs.jced.9b00026
Crippen Method:	http://pubs.acs.org/doi/abs/10.1021/ci990307l
Volumetric, viscometric, and refractive index behaviour of a-amino acids and their groups? contribution in aqueous D-glucose solution at different temperatures:	https://www.doi.org/10.1016/j.jct.2005.04.011
Salting-out effect in polypropylene glycol-amino acid aqueous solutions revealed by vapor pressure osmometry:	https://www.doi.org/10.1016/j.fluid.2016.05.025
Enthalpy of sublimation of hydroxyl-containing amino acids: Knudsen's effusion mass spectrometric study:	https://www.doi.org/10.1016/j.jct.2016.02.021
Volumetric properties for glycine and L-serine in aqueous solutions of 1-Ethyl-3-methylimidazolium hydrogen sulfate ([Emim][HSO4]) at T = (293.15-313.15) K and ambient pressure:	https://www.doi.org/10.1016/j.jct.2016.07.046
Study of the interactions of PAMAM-NH2 G4 dendrimer with selected natural amino acids in aqueous solutions:	https://www.doi.org/10.1016/j.jct.2013.10.022
Salting-out behaviour of 1-butyl-3-methylimidazolium bromide, [C4mim][Br], ionic liquid on aqueous L-serine solutions at T = 298.15 K:	https://www.doi.org/10.1016/j.jct.2014.11.014
Investigation of 1-(2-carboxyethyl)-3-methylimidazolium chloride[HOOCEMIM][Cl] ionic liquid effect on water activity and solubility of L-serine at T = 298.15K:	https://www.doi.org/10.1016/j.jct.2014.08.016
Electrolytic Effect on the Solubility and Solvation Thermodynamics of L-Serine and L-Isoleucine in Aqueous Media:	https://www.doi.org/10.1021/acs.jced.9b00363

Legend

cpg:	Ideal gas heat capacity
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
hvapt:	Enthalpy of vaporization at a given temperature
log10ws:	Log10 of Water solubility in mol/l
logp:	Octanol/Water partition coefficient
mcvol:	McGowan's characteristic volume
pc:	Critical Pressure
tb:	Normal Boiling Point Temperature
tc:	Critical Temperature
tf:	Normal melting (fusion) point
tt:	Triple Point Temperature
vc:	Critical Volume