

Urea

Other names:

(NH₂)₂CO
Alphadrate
Aquacare
Aquadrate
B-I-K
Basodexan
Benural 70
Bubber shet
Calmurid
Carbaderm
Carbamide
Carbamimidic acid
Carbonyl Diamine
Carbonyldiamide
Elaqua xx
Harnstoff
Hyanit
Isourea
Keratinamin
Mocovina
NCI-C02119
NSC 34375
Nutraplus
Onychomal
Pastaron
Prespersion, 75 urea
Pseudourea
Supercel 3000
UR
Ultra Mide
Urea-13C
Ureaphil
Ureophil
Urepearl
Urevert
Uroderm
Varioform II
carbamoylamine

Inchi:

InChI=1S/CH₄N₂O/c2-1(3)4/h(H4,2,3,4)

InchiKey:

XSQUKJJJFZCRTK-UHFFFAOYSA-N

Formula: CH₄N₂O
SMILES: NC(N)=O
Mol. weight [g/mol]: 60.06
CAS: 57-13-6

Physical Properties

Property code	Value	Unit	Source
affp	868.40 ± 2.50	kJ/mol	NIST Webbook
affp	873.50 ± 5.00	kJ/mol	NIST Webbook
affp	873.50 ± 5.00	kJ/mol	NIST Webbook
basg	846.10 ± 5.00	kJ/mol	NIST Webbook
basg	841.60 ± 5.00	kJ/mol	NIST Webbook
basg	838.70 ± 3.00	kJ/mol	NIST Webbook
ep	9.40	J/mol×K	NIST Webbook
ep	-1.90	J/mol×K	NIST Webbook
gf	-38.48	kJ/mol	Joback Method
hf	-235.50 ± 1.20	kJ/mol	NIST Webbook
hfs	-333.11 ± 0.69	kJ/mol	NIST Webbook
hfs	-320.20 ± 2.00	kJ/mol	NIST Webbook
hfs	-333.39 ± 0.17	kJ/mol	NIST Webbook
hfs	-333.30 ± 0.20	kJ/mol	NIST Webbook
hfs	-323.60	kJ/mol	NIST Webbook
hfus	10.34	kJ/mol	Joback Method
hsub	98.60	kJ/mol	NIST Webbook
hsub	95.50 ± 0.30	kJ/mol	NIST Webbook
hsub	87.65 ± 0.88	kJ/mol	NIST Webbook
hvap	45.85	kJ/mol	Joback Method
ie	9.80	eV	NIST Webbook
ie	10.15	eV	NIST Webbook
ie	9.70	eV	NIST Webbook
ie	10.28	eV	NIST Webbook
ie	10.27 ± 0.05	eV	NIST Webbook
ie	10.33	eV	NIST Webbook
log10ws	0.96		Aqueous Solubility Prediction Method
log10ws	0.96		Estimated Solubility Method
logp	-0.976		Crippen Method
mcvol	46.480	ml/mol	McGowan Method
pc	7735.33	kPa	Joback Method
ss	104.93	J/mol×K	NIST Webbook

ss	104.26	J/molxK	NIST Webbook
ss	105.40	J/molxK	NIST Webbook
ss	172.00	J/molxK	NIST Webbook
tb	421.21	K	Joback Method
tc	638.13	K	Joback Method
tf	406.15 ± 1.50	K	NIST Webbook
tf	405.15 ± 1.50	K	NIST Webbook
tf	405.80 ± 0.50	K	NIST Webbook
tf	405.40 ± 0.80	K	NIST Webbook
tf	406.20 ± 0.10	K	NIST Webbook
tf	406.00 ± 3.00	K	NIST Webbook
tf	410.00 ± 1.50	K	NIST Webbook
tf	407.00	K	Aqueous Solubility Prediction Method
tf	406.50 ± 0.50	K	NIST Webbook
tt	405.80 ± 0.20	K	NIST Webbook
tt	405.80 ± 0.10	K	NIST Webbook
tt	408.00 ± 0.00	K	NIST Webbook
tt	407.90 ± 0.20	K	NIST Webbook
vc	0.155	m3/kmol	Joback Method

Temperature Dependent Properties

Property code	Value	Unit	Temperature [K]	Source
cpg	99.73	J/molxK	529.67	Joback Method
cpg	109.86	J/molxK	638.13	Joback Method
cpg	106.68	J/molxK	601.98	Joback Method
cpg	103.30	J/molxK	565.82	Joback Method
cpg	95.96	J/molxK	493.52	Joback Method
cpg	87.80	J/molxK	421.21	Joback Method
cpg	91.98	J/molxK	457.36	Joback Method
cps	93.64	J/molxK	298.00	NIST Webbook
cps	93.14	J/molxK	298.15	NIST Webbook
cps	90.00	J/molxK	298.15	NIST Webbook
cps	115.50	J/molxK	298.00	NIST Webbook
cps	94.00	J/molxK	304.70	NIST Webbook
cps	93.08	J/molxK	298.15	NIST Webbook
cps	68.60	J/molxK	293.00	NIST Webbook
cps	92.79	J/molxK	298.15	NIST Webbook
hfust	13.60	kJ/mol	405.20	NIST Webbook
hfust	14.60	kJ/mol	406.70	NIST Webbook

hfust	13.90	kJ/mol	405.80	NIST Webbook
hfust	15.03	kJ/mol	407.90	NIST Webbook
hfust	14.79	kJ/mol	406.50	NIST Webbook
hfust	13.90	kJ/mol	405.80	NIST Webbook
hfust	14.50	kJ/mol	406.00	NIST Webbook
hfust	12.93	kJ/mol	408.10	NIST Webbook
hfust	14.60	kJ/mol	407.20	NIST Webbook
hfust	13.61	kJ/mol	405.80	NIST Webbook
hsubt	88.20	kJ/mol	357.00	NIST Webbook
hsubt	94.60 ± 2.20	kJ/mol	366.00	NIST Webbook
hsubt	95.10 ± 2.20	kJ/mol	366.00	NIST Webbook
hsubt	90.90	kJ/mol	381.00	NIST Webbook
hsubt	87.70	kJ/mol	356.50	NIST Webbook
hsubt	96.90	kJ/mol	350.00	NIST Webbook
hsubt	95.40	kJ/mol	361.00	NIST Webbook
hsubt	87.90 ± 2.10	kJ/mol	356.50	NIST Webbook
hsubt	94.60 ± 0.50	kJ/mol	350.00	NIST Webbook
hsubt	97.60 ± 1.00	kJ/mol	354.00	NIST Webbook
psub	6.40e-04	kPa	358.30	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea
psub	1.00e-03	kPa	363.40	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea

psub	1.51e-03	kPa	368.40	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea
psub	1.89e-03	kPa	371.20	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea
psub	0.02	kPa	402.00	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea
psub	0.02	kPa	399.00	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea

psub	0.01	kPa	393.20	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea
psub	6.27e-03	kPa	386.30	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea
psub	3.80e-03	kPa	379.50	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea
psub	2.96e-03	kPa	376.50	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea

psub	2.46e-03	kPa	374.30	Measurement and Prediction of Thermochemical Properties: Improved Increments for the Estimation of Enthalpies of Sublimation and Standard Enthalpies of Formation of Alkyl Derivatives of Urea
sfust	36.40	J/molxK	406.50	NIST Webbook
sfust	34.25	J/molxK	405.80	NIST Webbook
sfust	35.70	J/molxK	406.00	NIST Webbook
sfust	33.54	J/molxK	405.80	NIST Webbook

Correlations

Information	Value
Property code	pvap
Equation	ln(Pvp) = A + B/(T + C)
Coeff. A	2.20584e+01
Coeff. B	-1.05730e+04
Coeff. C	6.10000e-01
Temperature range (K), min.	340.65
Temperature range (K), max.	368.05

Sources

Solid-liquid equilibria of the CO(NH2)2-MgSO4-(NH4)2SO4-H2O system and the effect of additives on volumetric and viscosity properties of aqueous binary mixtures of the solutions of H2SiF6 + H2O and H2SiF6 + CO(NH2)2 + H2O from 273 K to 353 K:

<https://www.doi.org/10.1016/j.fluid.2017.05.002>

Solubility of GABA in a Choline Chloride-Urea Eutectic Mixtures from (303.15 Standard Volumetric Properties of Chiral N-Methyl-Substituted Glycolurils in Water between 273 and 318.15 K and the thermodynamic properties of aqueous solutions of four deep eutectic solvents: Effect of lithium chloride on the density and dynamic viscosity of choline chloride/urea deep eutectic solvent in the temperature range (303.15-358.15) K:

<https://www.doi.org/10.1016/j.jct.2011.12.020>

<https://www.doi.org/10.1021/je050245x>

http://pubs.acs.org/doi/suppl/10.1021/ci034243x/suppl_file/ci034243xsi20040112_053635.txt

Thermophysical Properties and Solubility of Different Sugar-Derived Mesogens in Deep Eutectic Solvents: Solubilities of GABA in a Choline Chloride-Urea Eutectic Mixtures from (303.15 Standard Volumetric Properties of Chiral N-Methyl-Substituted Glycolurils in Water between 273 and 318.15 K and the thermodynamic properties of aqueous solutions of four deep eutectic solvents: Effect of lithium chloride on the density and dynamic viscosity of choline chloride/urea deep eutectic solvent in the temperature range (303.15-358.15) K:

<https://www.doi.org/10.1021/acs.jced.7b00184>

<https://www.doi.org/10.1021/je401053y>

<https://www.doi.org/10.1021/je700638u>

<https://www.doi.org/10.1021/acs.jced.8b00105>

<https://www.doi.org/10.1016/j.jct.2019.01.018>

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

<https://www.doi.org/10.1016/j.jct.2018.10.003>

Activity Coefficients of RbF in Urea Water and Formamide Water Mixtures
 Separation of azeotropic mixtures: (ethanol and water) enhanced by deep eutectic solvents
 Acoustic investigation of choline chloride based ionic liquids analogues: Solubility of Rofecoxib in the Presence of Mannitol, Poly(vinylpyrrolidone) K30, Vitamin C and Fructose Behavior of Different Gas-Chloride in Aqueous and Poly(ionic liquid) Mixtures in Chloride/Urea System Studied under Moisture-Prevalent Phase on the Vapor-Liquid Equilibria of the Ethanol + Urea System and Volumetric Properties of (Choline chloride+urea) deep eutectic solvent and its mixtures with Choline Chloride/Urea and Poly(ionic liquid) Water System
 Water System
 Solutions of Urea: Reference Data for Interactions of Urea with Various Solids: amino acids with sarcosine in presence of urea
 Measurement and Prediction of Thermomechanical Properties: Improved Prediction of the Heat Capacity of Solvents and of Aqueous Solutions
 Measurement and modeling of urea solubility in supercritical CO₂ and CO₂/Ethanol mixtures
 Effect of temperature and ionic strength on volumetric and acoustic properties of solutions of Electrical Conductivity of Pure Anhydrous RbF and Its Mixtures with Water in the Temperature Range (293.15 to 330.15) K
 Evaluation of Methanesulfonate-Based Deep Eutectic Solvent for Ammonia Viscosity and Carbon Dioxide Solubilities of Guanidine Carbonate Ternary Phase Diagram for Systems of Succinic Acid + Urea + Water, Glutaric Acid + Urea + Water on Aqueous Solubility and Mass Transfer Coefficients
 Benzyl Benzoate in Water: Coefficients of Solutes at Infinite Dilution in (Dimethyl Sulfoxide + Water) and (Formamide, deep eutectic solvents and high pressure) and Volumetric and Expansibilities of Thiourea, Triethylamine and Bisoxetane
 Aqueous Solutions of Viscosity and Temperature Dependence of Apparent Molar Volumes and Compressibilities of H₂O, CO₂, CH₄, N₂, O₂, and Ar in Pure Water and Water + Urea Mixtures
 Aqueous Solubility Prediction Method: Solutions of Urea and Tetramethylurea in Formamide and Water: A Vapor-Liquid Equilibria Study of the Aqueous System and Containing Choline Chloride
 Prediction of Volumetric Properties of the Aqueous System of Urea, CH₃CO₂Na and CH₃CO₂Li from 11 to 333 K and the System NaH₂PO₄/CO(NH₂)₂ from 273 to 333 K
 Ultrasonic characterization of urea and its derivatives in water
 Transfer Coefficient Enhancement of Benzyl The Yaws Handbook of Vapor Pressure: Effect of Water on the Density, Viscosity, and CO₂ Solubility in Choline Chloride/Urea:

<https://www.doi.org/10.1021/acs.jced.5b00484>
<https://www.doi.org/10.1016/j.fluid.2017.03.010>
<https://www.doi.org/10.1016/j.fluid.2014.08.017>
<https://www.doi.org/10.1021/je049631p>
<https://www.doi.org/10.1021/je2000099>
<https://www.doi.org/10.1021/acs.jced.9b00474>
<https://www.doi.org/10.1021/je9007734>
<https://www.doi.org/10.1016/j.jct.2018.04.010>
<https://www.doi.org/10.1021/acs.jced.6b00569>
<https://www.doi.org/10.1021/je049971a>
<https://www.doi.org/10.1016/j.jct.2013.09.009>
<https://www.doi.org/10.1021/je050230z>
<https://www.doi.org/10.1016/j.fluid.2017.01.022>
<https://www.doi.org/10.1016/j.fluid.2005.09.004>
<https://www.doi.org/10.1016/j.jct.2015.07.002>
<https://www.doi.org/10.1021/acs.jced.9b00145>
<http://pubs.acs.org/doi/abs/10.1021/ci990307l>
<https://www.doi.org/10.1021/acs.jced.7b01004>
<https://www.doi.org/10.1021/acs.jced.6b00680>
<https://www.doi.org/10.1021/je500725e>
<https://www.doi.org/10.1021/je049756u>
<https://www.doi.org/10.1021/je030122h>
<https://www.doi.org/10.1016/j.fluid.2019.112249>
<https://www.doi.org/10.1021/je301203z>
<https://www.doi.org/10.1016/j.jct.2009.08.013>
<https://www.doi.org/10.1016/j.fluid.2018.06.018>
<https://www.doi.org/10.1021/je5001796>
<https://www.doi.org/10.1021/je300358u>
<https://www.doi.org/10.1016/j.jct.2014.07.012>
<https://www.doi.org/10.1021/acs.jced.8b01042>
<https://www.thermofisher.com/research/kdb/hcprop/showprop.php?cmpid=1456>
<https://www.doi.org/10.1021/je0340957>
<https://www.doi.org/10.1021/je300707j>
<https://www.doi.org/10.1021/je049582g>
<http://onschallenge.wikispaces.com/file/view/AqueousDataset002.xlsx/351826032/AqueousDataset002.xlsx>
<https://www.doi.org/10.1021/acs.jced.9b00794>
<https://www.doi.org/10.1021/acs.jced.9b00076>
<https://www.doi.org/10.1016/j.jct.2018.01.024>
<https://www.doi.org/10.1021/je3009478>
<https://www.doi.org/10.1016/j.jct.2012.11.007>
<https://www.doi.org/10.1021/je0342872>
<https://www.sciencedirect.com/book/9780128029992/the-yaws-handbook-of-vapor-pressure>
<https://www.doi.org/10.1021/je500320c>

Temperature and Concentration Dependence of Apparent Molar Volumes and Compressibilities of H₂O, CO₂, CH₄, N₂, O₂, and Ar in Pure Water and Water + Urea Mixtures
 Aqueous Solubility Prediction Method: Solutions of Urea and Tetramethylurea in Formamide and Water: A Vapor-Liquid Equilibria Study of the Aqueous System and Containing Choline Chloride
 Prediction of Volumetric Properties of the Aqueous System of Urea, CH₃CO₂Na and CH₃CO₂Li from 11 to 333 K and the System NaH₂PO₄/CO(NH₂)₂ from 273 to 333 K
 Ultrasonic characterization of urea and its derivatives in water
 Transfer Coefficient Enhancement of Benzyl The Yaws Handbook of Vapor Pressure: Effect of Water on the Density, Viscosity, and CO₂ Solubility in Choline Chloride/Urea:

Studies of the Effect of Urea on PEG-4000 Polymer-Water Interactions
 Determination and modeling of binary and ternary solid-liquid phase equilibrium for the systems formed by choline chloride and tetraethylamine hydrochloride and tetraethylamine glycol: interactions of urea with zwitterionic glycerol phosphates
 Solubility of Dilute SO₂ in Binary Mixtures of Urea and Urea Interaction Parameters for Dilute Solutions of Urea and Tetramethylurea in Ethylene Glycol between 288.15 K and 328.15 K
 Thermodynamic Phase Transitions for Polar Molecules from Alkanes to Deep Eutectic Solvents
 Solubility of Urea in Acetonitrile Water Mixtures and Liquid Liquid Phase Separation of Urea-Saturated Acetonitrile Water Mixtures: Molar heat capacities of choline chloride-based deep eutectic solvents and their binary mixtures with urea for choline chloride: Urea deep eutectic solvent and its aqueous mixtures at T = 298.15 K
 Study of mixed micellization of a non-ionic surfactant in a mixture of aqueous solutions of two protonic fertilizers at 298.15 K
 Measurement and Correlation of the Solubility of urea solutions: (1) Sodium chloride-urea equilibrium in the aqueous binary system NaH₂PO₄·5H₂O (NH₂)₂·H₂O at 298.15, 313.15, 328.15, 343.15, 358.15, 373.15, 388.15, 403.15, 418.15, 433.15, 448.15, 463.15, 478.15, 493.15, 508.15, 523.15, 538.15, 553.15, 568.15, 583.15, 598.15, 613.15, 628.15, 643.15, 658.15, 673.15, 688.15, 703.15, 718.15, 733.15, 748.15, 763.15, 778.15, 793.15, 808.15, 823.15, 838.15, 853.15, 868.15, 883.15, 898.15, 913.15, 928.15, 943.15, 958.15, 973.15, 988.15, 1003.15, 1018.15, 1033.15, 1048.15, 1063.15, 1078.15, 1093.15, 1108.15, 1123.15, 1138.15, 1153.15, 1168.15, 1183.15, 1198.15, 1213.15, 1228.15, 1243.15, 1258.15, 1273.15, 1288.15, 1303.15, 1318.15, 1333.15, 1348.15, 1363.15, 1378.15, 1393.15, 1408.15, 1423.15, 1438.15, 1453.15, 1468.15, 1483.15, 1498.15, 1513.15, 1528.15, 1543.15, 1558.15, 1573.15, 1588.15, 1603.15, 1618.15, 1633.15, 1648.15, 1663.15, 1678.15, 1693.15, 1708.15, 1723.15, 1738.15, 1753.15, 1768.15, 1783.15, 1798.15, 1813.15, 1828.15, 1843.15, 1858.15, 1873.15, 1888.15, 1903.15, 1918.15, 1933.15, 1948.15, 1963.15, 1978.15, 1993.15, 2008.15, 2023.15, 2038.15, 2053.15, 2068.15, 2083.15, 2098.15, 2113.15, 2128.15, 2143.15, 2158.15, 2173.15, 2188.15, 2203.15, 2218.15, 2233.15, 2248.15, 2263.15, 2278.15, 2293.15, 2308.15, 2323.15, 2338.15, 2353.15, 2368.15, 2383.15, 2398.15, 2413.15, 2428.15, 2443.15, 2458.15, 2473.15, 2488.15, 2503.15, 2518.15, 2533.15, 2548.15, 2563.15, 2578.15, 2593.15, 2608.15, 2623.15, 2638.15, 2653.15, 2668.15, 2683.15, 2698.15, 2713.15, 2728.15, 2743.15, 2758.15, 2773.15, 2788.15, 2803.15, 2818.15, 2833.15, 2848.15, 2863.15, 2878.15, 2893.15, 2908.15, 2923.15, 2938.15, 2953.15, 2968.15, 2983.15, 2998.15, 3013.15, 3028.15, 3043.15, 3058.15, 3073.15, 3088.15, 3103.15, 3118.15, 3133.15, 3148.15, 3163.15, 3178.15, 3193.15, 3208.15, 3223.15, 3238.15, 3253.15, 3268.15, 3283.15, 3298.15, 3313.15, 3328.15, 3343.15, 3358.15, 3373.15, 3388.15, 3403.15, 3418.15, 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hfus:	Enthalpy of fusion at standard conditions
hfust:	Enthalpy of fusion at a given temperature
hsub:	Enthalpy of sublimation at standard conditions
hsubt:	Enthalpy of sublimation at a given temperature
hvap:	Enthalpy of vaporization at standard conditions
ie:	Ionization energy
log10ws:	Log10 of Water solubility in mol/l
logp:	Octanol/Water partition coefficient
mcvol:	McGowan's characteristic volume
pc:	Critical Pressure
psub:	Sublimation pressure
pvap:	Vapor pressure
sfust:	Entropy of fusion at a given temperature
ss:	Solid phase molar entropy at standard conditions
tb:	Normal Boiling Point Temperature
tc:	Critical Temperature
tf:	Normal melting (fusion) point
tt:	Triple Point Temperature
vc:	Critical Volume

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