Morpholine, 4-methyl-

Other names:	1,4-oxazine, tetrahytdro-, N-methyl-
	1-Methylmorpholine
	4-Methyl-1-oxa-4-azacyclohexane
	4-Methylmorfolin
	4-Methylmorpholine
	Morpholine, N-methyl-
	N-Methylmorpholine
	NMM
	NSC 9382
	Texacat NMM
	UN 2535
	p-Methyl morpholine
Inchi:	InChI=1S/C5H11NO/c1-6-2-4-7-5-3-6/h2-5H2,1H3
InchiKey:	SJRJJKPEHAURKC-UHFFFAOYSA-N
Formula:	C5H11NO
SMILES:	CN1CCOCC1
Mol. weight [g/mol]:	101.15
CAS:	109-02-4

Physical Properties

Property code	Value	Unit	Source
hvap	39.80	kJ/mol	NIST Webbook
hvap	39.40 ± 0.10	kJ/mol	NIST Webbook
hvap	39.60 ± 0.30	kJ/mol	NIST Webbook
hvap	38.20 ± 1.10	kJ/mol	NIST Webbook
hvap	39.50	kJ/mol	NIST Webbook
log10ws	1.00		Aqueous Solubility Prediction Method
logp	-0.052		Crippen Method
mcvol	86.300	ml/mol	McGowan Method
rinpol	787.00		NIST Webbook
rinpol	787.00		NIST Webbook
rinpol	788.00		NIST Webbook
ripol	1080.00		NIST Webbook
tb	388.45	K	NIST Webbook
tf	207.25	K	NIST Webbook

Temperature Dependent Properties

Property code	Value	Unit	Temperature [K]	Source
dvisc	0.0008580	Pa×s	313.15	Densities and Viscosities of Aqueous Solutions of N-Methylmorpholine from (293.15 to 343.15) K
dvisc	0.0004980	Pa×s	343.15	Densities and Viscosities of Aqueous Solutions of N-Methylmorpholine from (293.15 to 343.15) K
dvisc	0.0006260	Pa×s	333.15	Densities and Viscosities of Aqueous Solutions of N-Methylmorpholine from (293.15 to 343.15) K
dvisc	0.0007540	Pa×s	323.15	Densities and Viscosities of Aqueous Solutions of N-Methylmorpholine from (293.15 to 343.15) K
dvisc	0.0008810	Pa×s	298.15	Densities, viscosities, and excess properties of (N-methylmorpholine + cyclohexane, + benzene, and + toluene) at T = (298.15, 303.15, 313.15, 323.15) K
dvisc	0.0008640	Pa×s	303.15	Densities, viscosities, and excess properties of (N-methylmorpholine + cyclohexane, + benzene, and + toluene) at T = (298.15, 303.15, 313.15, 323.15) K

dvisc	0.0008330	Pa×s	313.15	Densities, viscosities, and excess properties of (N-methylmorpholine + cyclohexane, + benzene, and + toluene) at T = (298.15, 303.15, 313.15, 323.15) K
dvisc	0.0008140	Pa×s	323.15	Densities, viscosities, and excess properties of (N-methylmorpholine + cyclohexane, + benzene, and + toluene) at T = (298.15, 303.15, 313.15, 323.15) K
dvisc	0.0010280	Pa×s	293.15	Densities and Viscosities of Aqueous Solutions of N-Methylmorpholine from (293.15 to 343.15) K
dvisc	0.0009590	Pa×s	303.15	Densities and Viscosities of Aqueous Solutions of N-Methylmorpholine from (293.15 to 343.15) K
hvapt	33.60	kJ/mol	343.00	NIST Webbook
hvapt	38.40	kJ/mol	343.00	NIST Webbook
hvapt	40.00	kJ/mol	333.00	NIST Webbook
hvapt	40.20 ± 0.30	kJ/mol	289.00	NIST Webbook
hvapt	38.90	kJ/mol	313.00	NIST Webbook
pvap	1.93	kPa	290.13	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols

pvap	19.06	kPa	338.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	23.13	kPa	343.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	27.88	kPa	348.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	6.90	kPa	273.18	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K
pvap	12.94	kPa	283.12	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K
pvap	12.93	kPa	283.12	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K

pvap	23.06	kPa	293.06	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K
pvap	39.34	kPa	303.04	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K
pvap	64.46	kPa	313.05	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K
pvap	101.73	kPa	323.08	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K
pvap	155.32	kPa	333.07	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K
pvap	230.31	kPa	343.08	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K

pvap	332.76	kPa	353.08	Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and N-benzylethanolamine between 273.18 and 364.97K
pvap	0.83	kPa	276.28	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	1.11	kPa	280.80	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	1.56	kPa	286.43	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	1.91	kPa	290.03	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols

pvap	33.27	kPa	353.08	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	1.93	kPa	290.15	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	1.94	kPa	290.20	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	2.02	kPa	290.90	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	2.05	kPa	291.20	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols

pvap	2.74	kPa	296.45	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	3.02	kPa	298.26	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	3.12	kPa	298.83	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	3.12	kPa	298.91	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols
pvap	3.69	kPa	302.04	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols

pvap	4.83	kPa	307.40	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols	
pvap	6.20	kPa	312.46	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols	
pvap	6.18	kPa	312.48	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols	
pvap	8.26	kPa	318.64	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols	
pvap	8.21	kPa	318.64	Vapor Pressure and Its Temperature Dependence of 28 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open Chain Secondary Alcohols	

pvap	0.69	kPa	273.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	0.95	kPa	278.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	15.60	kPa	333.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	1.75	kPa	288.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	2.32	kPa	293.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	3.05	kPa	298.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures

pvap	3.96	kPa	303.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	5.09	kPa	308.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	6.48	kPa	313.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	8.17	kPa	318.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	10.22	kPa	323.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
pvap	12.68	kPa	328.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures

pvap	1.30	kPa	283.18	Isothermal Vapor-Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Systems at Several Temperatures
rhol	914.15	kg/m3	298.15	Determination of Infinite Dilution Partial Molar Excess Enthalpies and Volumes for Some Ionic Liquid Precursors in Water and Methanol Using Tandem Flow Mixing Calorimetry and Vibrating-Tube Densimetry
rhol	914.06	kg/m3	298.15	Densities and Excess Molar Volumes of N-Methylmorpholine + 1-Alkanol Systems at 298.15 K
srf	0.03	N/m	298.15	Surface Thermodynamics of Aqueous Solutions of Morpholine and Methylmorpholine
srf	0.03	N/m	328.15	Surface Thermodynamics of Aqueous Solutions of Morpholine and Methylmorpholine
srf	0.03	N/m	318.15	Surface Thermodynamics of Aqueous Solutions of Morpholine and Methylmorpholine
srf	0.03	N/m	308.15	Surface Thermodynamics of Aqueous Solutions of Morpholine and Methylmorpholine

Pressure Dependent Properties

Property code	Value	Unit	Pressure [kPa]	Source
tbrp	388.70	K	100.00	NIST Webbook

Sources

McGowan Method:	http://link.springer.com/article/10.1007/BF02311772
Crippen Method:	http://pubs.acs.org/doi/abs/10.1021/ci990307l
Experimental vapor pressures of 1,2-bis(dimethylamino)ethane, 1-Methylmorpholine, 1,2-bis(2-aminoethoxy)ethane and Methoxyethylamine between 273.18 and 364.79 K:	https://www.doi.org/10.1016/j.fluid.2009.04.006
Surface Thermodynamics of Aqueous Solutions of Morpholine and Methoxyethylamine:	https://www.doi.org/10.1021/je0340250
Liquid Equilibria of (Monoethanolamine + Water) and (4-Methylmorpholine + Water) Binary Mixtures at Several Temperatures:	https://www.doi.org/10.1021/je800530u
Densities, viscosities, and excess properties of (N-methylmorpholine + cyclohexane, + benzene, and + toluene) at T = (298.15, 303.15, 313.15, 323.15) K:	https://www.doi.org/10.1016/j.jct.2007.11.002
Vapor Pressure and Its Temperature Dependence of 203 Organic Compounds: Cyclic Amines, Cyclic Ethers, and Cyclic and Open-Chain Secondary Alcohols:	https://www.doi.org/10.1021/acs.jced.6b00576
Densities and Excess Molar Volumes of N-Methylmorpholine + 1-Alkanol Systems at 298.15 K:	https://www.doi.org/10.1021/je7005055
Densities and Viscosities of Aqueous Solutions of N-Methylmorpholine from (293.15 to 343.15) K:	https://www.doi.org/10.1021/je800197t
NIST Webbook:	http://webbook.nist.gov/cgi/cbook.cgi?ID=C109024&Units=SI
Aqueous Solubility Prediction Method:	http://onschallenge.wikispaces.com/file/view/AqueousDataset002.xlsx/351826032/AqueousDa
Determination of Infinite Dilution Partial Molar Excess Enthalpies and Volumes for Some Ionic Liquid Precursors in Water and Methanol Using Tandem Flow Mixing Calorimetry and Vibrating Tube Densimetry:	https://www.doi.org/10.1021/je200093f

Legend

dvisc:	Dynamic viscosity
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
pvap:	Vapor pressure
rhol:	Liquid Density
rinpol:	Non-polar retention indices
ripol:	Polar retention indices
srf:	Surface Tension
tb:	Normal Boiling Point Temperature
tbrp:	Boiling point at reduced pressure
tf:	Normal melting (fusion) point

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