Nitrous oxide

Other names:	DINITROGEN MONOXIDE
	Dinitrogen oxide
	Factitious air
	Hyponitrous acid anhydride
	LAUGHING GAS
	N2O
	Nitral
	Nitrogen monoxide
	Nitrogen oxide
	Nitrogen oxide (N2O)
	UN 1070
	UN 2201
Inchi:	InChI=1S/N2O/c1-2-3
InchiKey:	GQPLMRYTRLFLPF-UHFFFAOYSA-N
Formula:	N2O
SMILES:	[N-]=[N+]=O
Mol. weight [g/mol]:	44.01
CAS:	10024-97-2

Physical Properties

Property code	Value	Unit	Source
af	0.1650		KDB
affp	575.20	kJ/mol	NIST Webbook
affp	549.80	kJ/mol	NIST Webbook
basg	548.70	kJ/mol	NIST Webbook
basg	523.30	kJ/mol	NIST Webbook
dm	0.20	debye	KDB
ea	0.27 ± 0.17	eV	NIST Webbook
ea	0.76 ± 0.10	eV	NIST Webbook
ea	0.22 ± 0.10	eV	NIST Webbook
ea	-0.15 ± 0.10	eV	NIST Webbook
gf	103.70	kJ/mol	KDB
hf	81.60	kJ/mol	KDB
ie	12.89	eV	NIST Webbook
ie	12.80 ± 0.05	eV	NIST Webbook
ie	12.88 ± 0.01	eV	NIST Webbook
ie	12.89 ± 0.00	eV	NIST Webbook

ie	12.89	eV	NIST Webbook
ie	12.00 ± 1.00	eV	NIST Webbook
ie	12.91 ± 0.03	eV	NIST Webbook
ie	12.89 ± 0.00	eV	NIST Webbook
ie	12.88 ± 0.01	eV	NIST Webbook
ie	12.89 ± 0.01	eV	NIST Webbook
ie	12.90	eV	NIST Webbook
ie	12.89 ± 0.01	eV	NIST Webbook
ie	12.89 ± 0.01	eV	NIST Webbook
ie	12.89	eV	NIST Webbook
ie	12.89 ± 0.01	eV	NIST Webbook
ie	12.89	eV	NIST Webbook
log10ws	1.67		Crippen Method
logp	-0.158		Crippen Method
mcvol	28.090	ml/mol	McGowan Method
pc	7255.00	kPa	KDB
pc	7270.00 ± 50.00	kPa	NIST Webbook
pc	7234.60 ± 50.66	kPa	NIST Webbook
pc	7238.00 ± 20.00	kPa	NIST Webbook
pt	87.89 ± 0.01	kPa	NIST Webbook
pt	87.91 ± 0.01	kPa	NIST Webbook
pt	87.85	kPa	KDB
rhoc	453.33 ± 4.40	kg/m3	NIST Webbook
rhoc	448.93	kg/m3	NIST Webbook
rhoc	453.33 ± 2.20	kg/m3	NIST Webbook
rinpol	182.00		NIST Webbook
rinpol	182.00		NIST Webbook
tb	184.67	K	KDB
tc	309.57	K	KDB
tc	309.56 ± 0.15	K	NIST Webbook
tc	309.65 ± 0.20	K	NIST Webbook
tc	309.49	K	NIST Webbook
tc	309.55 ± 0.50	K	NIST Webbook
tf	182.30	K	KDB
tt	182.32	K	KDB
tt	181.99	K	Solid Liquid Equilibria for the CO2 + R23 and N2O + R23 Systems
vc	0.097	m3/kmol	KDB
vc	0.096 ± 0.002	m3/kmol	NIST Webbook
zc	0.2734100		KDB
zra	0.28		KDB

Temperature Dependent Properties

Property code	Value	Unit	Temperature [K]	Source
hfust	6.50	kJ/mol	182.40	NIST Webbook
hsubt	23.60	kJ/mol	113.00	NIST Webbook
hsubt	24.60	kJ/mol	165.00	NIST Webbook
hsubt	25.10 ± 0.40	kJ/mol	74.00	NIST Webbook
hvapt	16.10	kJ/mol	209.00	NIST Webbook
hvapt	16.50	kJ/mol	184.70	NIST Webbook
pvap	2065.40	kPa	257.87	PVT Properties of Dinitrogen Monoxide
pvap	1092.90	kPa	237.49	PVT Properties of Dinitrogen Monoxide
pvap	1294.70	kPa	242.57	PVT Properties of Dinitrogen Monoxide
pvap	1521.90	kPa	247.65	PVT Properties of Dinitrogen Monoxide
pvap	1777.00	kPa	252.73	PVT Properties of Dinitrogen Monoxide
pvap	2061.80	kPa	257.80	PVT Properties of Dinitrogen Monoxide
pvap	915.40	kPa	232.43	PVT Properties of Dinitrogen Monoxide
pvap	2379.00	kPa	262.90	PVT Properties of Dinitrogen Monoxide
pvap	2381.80	kPa	262.95	PVT Properties of Dinitrogen Monoxide
pvap	2730.60	kPa	267.98	PVT Properties of Dinitrogen Monoxide
pvap	2734.00	kPa	268.03	PVT Properties of Dinitrogen Monoxide
pvap	3119.90	kPa	273.08	PVT Properties of Dinitrogen Monoxide
pvap	912.10	kPa	232.37	PVT Properties of Dinitrogen Monoxide
pvap	760.60	kPa	227.36	PVT Properties of Dinitrogen Monoxide

pvap	759.60	kPa	227.32	PVT Properties of Dinitrogen Monoxide
pvap	652.80	kPa	223.31	PVT Properties of Dinitrogen Monoxide
pvap	626.30	kPa	222.28	PVT Properties of Dinitrogen Monoxide
pvap	554.70	kPa	219.24	PVT Properties of Dinitrogen Monoxide
rhol	1226.00	kg/m3	184.00	KDB

Correlations

Information	Value
Property code	pvap
Equation	ln(Pvp) = A + B/(T + C)
Coeff. A	1.36769e+01
Coeff. B	-1.26781e+03
Coeff. C	-4.47100e+01
Temperature range (K), min.	182.30
Temperature range (K), max.	309.57

Sources

Density, Viscosity and N2O solubility of Aqueous 2- (methylamino)ethanol Solution	https://www.doi.org/10.1021/acs.jced.6b00504
Solubility of N2O in and Density and Viscosity of Aqueous Solutions of Piperazine, Ammonia, and Their Mixtures from (283.15 to 328.15) K	https://www.doi.org/10.1021/je300102d
Physical Solubility and Diffusivity of N2O and CO2 in Aqueous Sodium Glycinate Solutions:	https://www.doi.org/10.1021/je0503913
Density, Viscosity, and N2O Solubility of Aqueous Solutions of MEA, BmimBrH, and Their Mixtures from 283.15 to 333.15 K	https://www.doi.org/10.1021/acs.jced.8b00070
Solid–Liquid Equilibria for the CO2 + R152a and N2O + R152a Systems:	https://www.doi.org/10.1021/je700384e
An experimental and modeling study of physical N2O solubility in 2-(ethylamino)ethanol:	https://www.doi.org/10.1016/j.jct.2019.06.008
(Vapour + liquid) equilibria of {xCH3Cl + (1-x)HCl} at temperatures (159.01 and 182.33) K	https://www.doi.org/10.1016/j.jct.2004.05.009
Binary Diffusion Coefficient Data of Various Gas Systems Determined Using a Loschmidt Cell and Holographic Interferometry	https://www.doi.org/10.1007/s10765-015-1981-5
Solubility of carbon dioxide, nitrous oxide, ethane, and nitrogen in 1-butyl-1-methylpyrrolidinium and (trihexyltetradecyl)phosphonium bis(trifluoromethylsulfonyl)imide ionic liquids	https://www.doi.org/10.1016/j.jct.2012.11.010
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Isochoric PVTx measurements for the C2H6 + N2O binary system:	https://www.doi.org/10.1007/s10765-011-1150-4
Phase Behavior of N2O and CO2 in Room-Temperature Ionic Liquids [bmim][Tf2N], [bmim][BF4], [bmim][N(CN)2], [bmim][Ac], [eam][NO3], and [bmim][SCN]:	

Crippen Method:	http://pubs.acs.org/doi/abs/10.1021/ci990307l
Solid-Liquid Equilibria for the CO2 + R125 and N2O + R125 Systems: A New Apparatus:	https://www.doi.org/10.1021/je0603067
Solid-Liquid Equilibria for the CO2 + R23 and N2O + R23 Systems:	https://www.doi.org/10.1007/s10765-008-0511-0
McGowan Method:	http://link.springer.com/article/10.1007/BF02311772
Vapour pressure and excess Gibbs free energy of the ternary system {x1CH3F + x2HCl + x3N2O} at temperature of 182.33 K:	https://www.doi.org/10.1016/j.jct.2006.04.010
Isochoric PVTx measurements for CO2 + N2O binary system:	https://www.doi.org/10.1021/je049633+
Solubility of Nitrous Oxide in Aqueous Methyldiethanolamine Solutions:	https://www.doi.org/10.1021/acs.jced.7b00112
Experimental Study of a Hydrophobic Solvent for Natural Gas Sweetening Based on the Solubility and Selectivity for Light Hydrocarbons (CH4, C2H6) and Acid Gases (CO2 and H2S) at 298-353 K:	https://www.doi.org/10.1021/acs.jced.8b00735
Physicochemical Properties of Aqueous Solutions of 2-Amino-2-hydroxymethyl-1,3-propanediol:	https://www.doi.org/10.1021/je800460a
KDB:	https://www.cheric.org/files/research/kdb/mol/mol1931.mol
Physicochemical Properties of Aqueous Solutions of 2-(1-Piperazinyl)-ethylamine:	https://www.doi.org/10.1021/je9007926
Burnett Measurements and Virial Coefficients for the R32+N2O System:	https://www.doi.org/10.1007/s10765-006-0033-6
PVTx measurements for N2O+CH3F, N2O+CH2F2, and N2O+ CHF3 binary systems:	https://www.doi.org/10.1016/j.fluid.2004.11.021
Virial Coefficients from Burnett Measurements for the R23 + N2O System:	https://www.doi.org/10.1007/s10765-006-0082-x
solubility of carbon dioxide in aqueous solutions of 2-amino-2-hydroxymethyl-1,3-propanediol:	https://www.doi.org/10.1016/j.fluid.2008.04.003
Isochoric PVTx Measurements for the N2O + R125 Binary System:	https://www.doi.org/10.1021/je060140+
Solubility of N2O and CO2 in non-aqueous systems of monoethanolamine and glycol ethers: Measurements and model representation:	https://www.doi.org/10.1016/j.jct.2019.05.017
The Yaws Handbook of Vapor Pressure:	https://www.sciencedirect.com/book/9780128029992/the-yaws-handbook-of-vapor-pressure
Solubility of carbon dioxide, nitrous oxide and methane in ionic liquids at pressures close to atmospheric:	https://www.doi.org/10.1016/j.fluid.2014.03.015
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Measurements and correlations of solubility of N2O in and density, viscosity of partially CO2 loaded water-lean amino acid salts:	https://www.doi.org/10.1016/j.jct.2018.06.021
Crippen Method:	https://www.chemeo.com/doc/models/crippen_log10ws
NIST Webbook:	http://webbook.nist.gov/cgi/cbook.cgi?ID=C10024972&Units=SI
Physical Solubility and Diffusivity of N2O and CO2 into Aqueous Solutions of (2-Amino-2-methyl-1-propanol + Diethanolamine) and (N-Methyldiethanolamine + Diethanolamine):	https://www.doi.org/10.1021/je0301951
Diffusion Coefficients of N2O in Aqueous Piperazine Solutions Using the Taylor Dispersion Technique from (293 to 333) K and (0.3 to 1.4) mol *dm-3:	https://www.doi.org/10.1021/je700717w
Automated apparatus for gas solubility measurements:	https://www.doi.org/10.1016/j.jct.2007.05.013
Vapour pressure and excess Gibbs free energy of binary mixtures of hydrogen sulphide with ethane, propane, and n-butane at temperature of 182.33 K:	https://www.doi.org/10.1016/j.jct.2006.03.013
Solubility of N2O in Density and Viscosity of Aqueous Solutions of 1,4-Butanediamine, 2-(Diethylamino)-ethanol, and Their Mixtures from (298.15 to 333.15) K:	https://www.doi.org/10.1021/je301371p

Legend

af:	Acentric Factor
affp:	Proton affinity
basg:	Gas basicity
dm:	Dipole Moment
ea:	Electron affinity
gf:	Standard Gibbs free energy of formation
hf:	Enthalpy of formation at standard conditions
hfust:	Enthalpy of fusion at a given temperature
hsubt:	Enthalpy of sublimation at a given temperature
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
pc:	Critical Pressure
pt:	Triple Point Pressure
pvap:	Vapor pressure
rhoc:	Critical density
rhol:	Liquid Density
rinpol:	Non-polar retention indices
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