EASTMAN

Technical Data Sheet
N-Methyl-2-Pyrrolidone (NMP)

Chemical Synonym

1-Methyl-2-pyrrolidone; N-Methylpyrrolidone; N-Methylpyrrolidinone; NMP; 1-Methyl-2-pyrrolidone

Applications

- Electronics
- Paints & coatings
- Polymer & plastic
- Process solvents
- Solvents/stripping agents
- Wire wrappers

Product Description

N-Methyl-2-Pyrrolidone (NMP) is a high boiling, polar aprotic, low viscosity liquid. NMP has a good solvency for a wide range of organic and inorganic compounds and it is miscible with water at all temperatures and has a high chemical and thermal stability. It is used as a solvent for engineering polymers and coating resins. Additionally, the polar nature and the low surface tension of NMP makes it an excellent cleaning medium and paint stripping solvent.

NMP is a powerful solvent with a low volatility used for a wide range of chemicals and finds its application among others in:

Petrochemical processing:
NMP is used as extraction medium in several industrial processes because of its affinity for unsaturated hydrocarbons and aromatics, for example butadiene recovery, BTX extraction, lube oil purification, ...

As illustration for the strong selectivity of NMP towards acetylene, the table below shows the solubility of acetylene in various solvents.

Solvent	**K value** (1 atm ml gas/ml solvent, at 20°C)	**Boiling point**
NMP	43	204°C
DMF	36	153°C
Aceton	17.5	56.5°C
BLO	17	204°C
Cyclohexanone	14	155°C

Electronics:
NMP is used as photoresist stripper, for defluxing, degreasing and cleaning.

NMP is a solvent for the production of FCCL, polyamide/polyimide wire enamels, epoxy and polyurethane coatings, ...

Pharmaceuticals:
NMP can be used as solvent, extraction medium, …

Industrial and household cleaning:
NMP is used for paint stripping, in graffiti removers, oven cleaners, in automotive and industrial cleaner formulations, ...

Agrochemicals:
NMP can be used as solvent during synthesis or as a formulation agent.

Typical Properties

Property	Typical Value, Units
General	
Molecular Formula	C_5H_9NO
Molecular Weight	99.13 g/mol
Autoignition Temperature	245 °C
Boiling Point	204 °C
Density	
@ 25°C	1.03 g/cm^3
Dielectric Constant	
10 kHz @ 25°C	32.2
Dipole moment	
@ 20°C	12.26 D (debye)
Evaporation Rate[a]	360
Flash Point	
Closed Cup	91 °C
Free energy of formation	
@ 25°C	210.85 kJ/mol
Freezing Point	-24.2 °C
Hansen solubility parameters @ 25°C	
Dispersion	17.6 (MPa)$_{½}$
Hydrogen Bonding	7.0 (MPa)$_{½}$
Polar	12.0 (MPa)$_{½}$
Total	22.4 (MPa)$_{½}$
Heat of Combustion	3 023 kJ/mol
Heat of Vaporization	
@ 20°C	54.5 kJ/mol
Octanol-water partition coefficient, log Pow	
@ 25°C	-0.46
pH	
100 g/l @ 20°C	8.5-10
Refractive Index	1.4700
Specific Heat	
@ 20°C	0.175 kJ/mol.K
Surface Tension	
@ 25°C	41 mN/m
Thermal Conductivity	
@ 20°C	180 mW/m.K
@ 50°C	179 mW/m.K
@ 80°C	177 mW/m.K
Vapor Density	
(air = 1)	3.42

Vapor Pressure	
@ 20°C	0.324 hPa
@ 40°C	1.357 hPa
@ 80°C	13.473 hPa
Viscosity	
@ 25°C	1.661 mPa·s
@ 50°C	1.0 mPa·s
@ 80°C	0.9 mPa·s
Water solubility	Miscible

[a]*DIN 53170; ether=1*

Compatibility and Solubility

Solubility of other solvents in NMP
NMP is completely miscible with water, alcohols, ethers, ketones, aromatic and chlorinated hydrocarbons, other aprotic solvents and vegetable oils. In the table below some examples of solvents miscible with NMP are shown:

Glycols	Substituted pyrrolidones
Dimethylformamide	Nitrobenzene
Toluene	Ethanolamines
Benzene	Glycerol
Xylene	Chlorobenzene
Tetrahydrofuran	Ethylene/propylene carbonate

Compatibility of polymeric materials with NMP
NMP is commonly used as performance solvent for different types of plastics, resins, waxes and different types of paint formulations. In the table below some solubility data of different polymeric materials are presented.

Polymer	**Solubility**
Polyethylene	Insoluble
Polypropylene	Insoluble
Poly(ethylene/vinylacetate)	Insoluble
Polyamide	Insoluble
Polysulfone	Soluble
Polycarbonate	Insoluble
Polyacetal	Insoluble

Polyphenylene oxide	Insoluble
Polyethylene terephthalate (PET)	Insoluble
Polystyrene (PS)	Soluble
Poly(styrene/acrylonitrile)	Soluble
Poly(styrene/maleic anhydride)	Soluble
Polymethyl methacrylate	Soluble
Polyacrylonitrile	Soluble
Cellulose Acetate	Soluble
Polyesters	Soluble
Poly(methyl methacrylate) (PMMA)	Soluble
Poly(vinyl acetate)	Soluble
Poly(vinyl chloride) (PVC)	Soluble

Packaging

- Bulk
- PE drums (222 kg net)
- IBC containers (1035 kg net)

Comments

Properties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

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