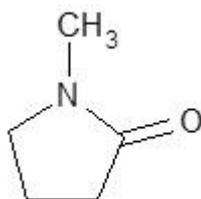


## Technical Data Sheet

# N-Methyl-2-Pyrrolidone (NMP)

### Product Information

Chemical Name	N-Methyl-2-Pyrrolidone
CAS #	872-50-4
Formula	C <sub>5</sub> H <sub>9</sub> NO
Molecular Weight	99.10
Synonyms	1-methyl-2-pyrrolidinone; NMP; M-pyrol; Methylpyrrolidone; 1-Methyl-5-Pyrrolidinone; N-Methylpyrrolidone; N-Methyl-2-Pyrrolidone;
Chemical Structure	



### Description

N-Methyl-2-pyrrolidone is a high boiling, polar aprotic, low viscosity, colorless to slightly yellow liquid, with a faint amine odor. NMP is miscible with water and conventional organic solvents like ethyl acetate, chloroform, benzene and lower alcohols or ketones. It is the cyclization product of 4-Methyl-Aminobutyric acid.

### Physical Properties

Autoignition Temperature	245° C
Boiling Point	204° C
Density @ 25° C	1.03 g/cm <sup>3</sup>
Dielectric Constant 10 kHz @ 25° C	32.2
Dipole moment @ 20° C	12.26 D (debye)
Flash Point Closed Cup	91° C
Freezing Point	-24.2° C
Heat of Combustion	3 023 kJ/mol
Heat of Vaporization @ 20° C	54.5 kJ/mol
pH 100 g/l @ 20° C	7.5-10
Refractive Index	1.4700
Specific heat @ 20° C	0.175 kJ/mol.K
Surface Tension @ 25° C	41 mN/m

Vapor Density (air = 1)	3.42
Vapor Pressure @ 20° C	0.324 hPa
Viscosity @ 25° C	1.661 mPa • s
Water solubility	Miscible

## Specification

Item	Industrial Grade	Electronic Grade
Assay, % min.	99.5	99.8
Water, % max.	0.03	0.02
Color, APHA max.	20	10
Butyrolactone, %max	0.1	0.1
Total Amines (ppm)(as Methylamine),max	35	35

\* Please refer to Certificate of Analysis for detailed specification

## Applications

**N-Methylpyrrolidone (NMP)** is the lactam of 4-methylaminobutyric acid and a very weak base. NMP is a chemically stable and powerful polar solvent. These characteristics are highly useful in a variety of chemical reactions where an inert medium is of concern. Despite the stability of NMP, it can also play an active role in certain reactions: hydrolysis, oxidation, condensation, conversion with chlorinating agents, polymerization and o-alkylation, and related reactions.

### Recovery of Pure Hydrocarbons in Petrochemical Processing

A well-established application for NMP is the large-scale recovery of hydrocarbons by extractive distillation. This technique utilizes the high solubility of hydrocarbons in NMP and the fact that differences in volatility are sometimes considerably increased in the presence of NMP. Compared to other commercial solvents and extraction media, NMP offers the following advantages: no azeotropes are formed with hydrocarbons; NMP is very resistant to heat and chemicals; and NMP has a favorable toxicological and environmental profile.

### Desulfurization of Gases

High concentrations of acidic compounds are often present in natural or synthesis gases. Examples are hydrogen sulfide, carbon oxysulfide, carbon dioxide and organic sulfur compounds. Rather than applying a chemical process, they are removed by physical scrubbing in several stages with a mixture of NMP, alcohol and water.

### Plastics

NMP is a widely used industrial solvent for natural and synthesis plastics, waxes, resins and various types of paints. It dissolves polymers, such as cellulose derivatives, polyamides, polyimides, polyesters, polystyrene, polyacrylonitrile, polyvinyl chloride, polyvinyl pyrrolidone, polyvinyl acetate, polyurethanes, polycarbonates, polyethersulfones, polysulfones, polyethers and many copolymers

### Surface Coatings

NMP is a non-corrosive high boiler with excellent solvent power and chemical resistance. Thus, NMP improves the properties of many surface coating systems. In particular, these effects are favorable for baked coatings that are cured at relatively high temperatures. NMP allows the production of highly filled paints and

finishes. Since it improves the rheological properties, paints with superior flow-out and covering power are obtained. Hence, the coatings are more homogeneous, non-porous and non-cratering, and they display greater resistance to chemicals and higher mechanical strength

### **Paint Stripping and Cleaning**

Due to its high solvating power for plastics, resins, oil and grease, NMP has been successfully employed as an ingredient in paint removers, cleaners and degreasers. NMP can be used alone or in blends for removal of oil, carbon deposits and other tarry polymeric residues from metal chambers, pistons and cylinders, as well as for wet cleaning of combustion engines.

### **Plant Protection / Agrochemicals**

NMP can be used as a solvent or co-solvent for the formulation of insecticides, fungicides, herbicides, seed treatment products and bioregulators where highly polar compounds are required. NMP is given preference over other highly polar solvents because it is exempt from the requirement of a tolerance when used as a solvent or co-solvent in pesticide formulations applied to growing crops, and it possesses a favorable toxicological and environmental profile.

### **Electronics**

The production of integrated circuits (ICs) calls for products of very high purity. The Electronic Grade NMP exceeds in all points the standard established by SEMI (Semiconductor Equipment and Materials Institute). This makes NMP a desired solvent for the electronic industry and producers of printed circuit boards. Blends of NMP with common solvents are utilized for the cleaning and degreasing of single-crystal silicon wafers for ICs.

### **Packaging**

200kg per plastic or iron drum.

16mt per 20ft container

### **Safety**

Care should be used when handling NMP. Skin contact should be avoided.

Contact can result in irritation; prolonged contact can result in redness and dermatitis. Butyl rubber or FEP Teflon gloves are recommended when handling NMP. A good skin cream should be used after washing the affected area. As with all solvents, the workplace should be well ventilated and safety goggles must be worn.

Always refer to the Material Safety Data Sheet (MSDS)

### **Storage & Handling**

NMP has an almost unlimited shelf life in sealed containers when properly stored in a protected storage area in original unopened containers or protected from moisture. It is neither explosive nor spontaneously flammable in air. However, it is combustible. When ignited, NMP will sustain a fire. All types of fire extinguishers are effective against NMP fires.

Always refer to the Material Safety Data Sheet (MSDS) for detailed information on handling and disposal.

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchant ability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall we be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if we has been advised of the possibility of such damages.*

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