

Intermediates



# Solvents

Diverse Applications — Unique Solutions

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# BASF –

## We create chemistry

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**At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. The approximately 112,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into five segments: Chemicals, Performance Products, Functional Materials & Solutions, Agricultural Solutions and Oil & Gas.**

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### **About BASF Intermediates**

The BASF Group's Intermediates division develops, produces and markets a comprehensive portfolio of about 700 intermediates around the world. Its most important product groups include amines, diols, polyalcohols, acids and specialties. Intermediates are for example used as starting materials for coatings, plastics, pharmaceuticals, textiles, detergents and crop protectants. Innovative intermediates from BASF help to improve both the properties of final products and the efficiency of production processes. The ISO 9001 certified Intermediates division operates plants at production sites in Europe, Asia and North America.  
<http://product-finder.basf.com>

# Solvents for Engineering Plastics

BASF has a broad portfolio of solvents for engineering plastics serving multifaceted application possibilities, many of which have become an indispensable part of modern living.

## Portfolio:

N-Methylpyrrolidone Standard Grade (NMP)

N-Methylpyrrolidone Life Science Grade (NMP LS)

Dimethylformamide (DMF)

Dioxolane



## Key Points:

- NMP has many uses, e.g., the process of spinning aramide fibers and the production of polyphenylene sulfide (PPS).
- NMP dissolves polymers such as cellulose derivatives, polyamides, polyimides, polyamide-imide, polyesters, polystyrene, polyacrylonitrile, polyvinyl chloride, polyvinyl pyrrolidone, polyvinyl acetate, polyurethanes, polycarbonates, polyethersulfones, polysulfones, polyethers and many copolymers.
- DMF is a solvent used with epoxy hardener systems.
- Dioxolane is used in applications involving polar polymers due to its ability to rapidly solubilize such materials as polyesters, epoxies and urethanes.





## Solvents for Water Treatment Membranes

BASF is a one-stop shop that can provide complete raw material solutions for your membrane manufacturing worldwide. This includes the base polymer, modifier and processing solvents.

### Portfolio:

- N-Methylpyrrolidone Standard Grade (NMP)
- N-Methylpyrrolidone Life Science Grade (NMP LS)
- Dimethylformamide (DMF)
- N,N-Dimethylacetamide (DMAc)
- Propylene carbonate (PC)
- 2-Pyrrolidone (2P)

### Key Points:

- NMP dissolves a wide variety of polymers and yields higher porosity membranes, while low amine content in the NMP yield a higher quality final product.
- DMF and DMAc dissolve a wide variety of polymers and are key solvents in the membrane manufacturing process.
- PC is often used as a water scavenger.
- 2P is a low toxicity solvent used for a wide variety of polymers. It is also a key solvent in the membrane manufacturing process.



# Solvents for Electronics and Batteries



Throughout the value chain, BASF offers products for the latest in energy-storage technology. We offer several solvents for cleaning and degreasing.

## Portfolio:

N-Methylpyrrolidone Electronic Grade (NMP EG)

Tetrahydrofuran (THF)

Ethylene carbonate (EC)

Propylene carbonate (PC)

N-(2-Hydroxyethyl)-2-pyrrolidone (HEP)

Dioxolane

Proglyme

## Key Points:

- NMP or formulations containing NMP are used for photoresist and residue removal during the production of integrated circuits or printed circuit boards.
- NMP can be used as a solvent in the production of electrode (anode and/or cathode) coatings for lithium ion batteries.
- Due to its good solvent power, THF is a useful reaction medium for the production of organometallic compounds.
- Blends of EC and PC with other carbonates or organic solvents provide high solvency of  $\text{LiPF}_6$ , viscosity reduction and protection against electrode decay.
- HEP is used for its solvency applications, most often in combination with other components such as N-methylpyrrolidone.
- Dioxolane is used in the production of lithium triflate and lithium iodide based electrolyte solutions for primary (single use) lithium batteries and as a solvent for removing photomasking compounds in the production of printed circuit boards. Very low water and ultra high purity grades of dioxolane are used in water sensitive applications for electronics cleaning and electrolyte formulations.
- Proglyme can be used as a cleaning solvent for printed circuit boards.





## Solvents for Surface Coatings

BASF offers a broad portfolio of solvents for pigments, adhesives, resins and additives used in the coatings industry.

### Portfolio:

N-Methylpyrrolidone Standard Grade (NMP)

Proglyme

Dioxolane

2-Pyrrolidone

N-(2-Hydroxyethyl)-2-pyrrolidone (HEP)

N-Octyl-2-pyrrolidone (NOP)

### Key Points:

- NMP is a non-corrosive high boiler with excellent solvent power, chemical and thermal resistance. NMP allows the production of highly filled paints and finishes.
- Coatings using NMP in the production process are more homogeneous, non-porous and non-cratering, and display greater chemical resistance and higher mechanical strength.
- NMP can be used in the production of ink systems, specialty and waterborne paints or finishes, plastic coatings and coalescing agents.
- Proglyme is one of the solvents of choice for the production of water-based polyurethane isocyanate dispersions.
- Due to its high solvency for polar polymers, Dioxolane is successfully employed for the preparation of polyester film coatings. Its small size allows it to rapidly penetrate the polymer, resulting in rapid application rates for the preparation and application of dispersions for various coating processes. Its low boiling point helps achieve high throughput or fast drying.
- 2-Pyrrolidone can be used as a water-soluble organic solvent/co-solvent in inkjet ink formulations and as a setting agent for acrylic emulsions and acrylic/styrene copolymers used in floor polishes.
- HEP and NOP are low foaming wetting agents that present low dynamic surface tensions and low VOC to provide high performance in coatings.



# Solvents for Cleaning and Paint Stripping

BASF supplies solvents for the industrial, institutional and household cleaning markets.

## Portfolio:

N-Methylpyrrolidone Standard Grade (NMP)

N-Ethyl-2-Pyrrolidone (NEP)

Ethylene carbonate (EC)

Propylene carbonate (PC)

N-Octyl-2-pyrrolidone (NOP)

Dioxolane

Proglyme

## Key Points:

- Due to its high solvent power for plastics, resins, oil and grease, NMP and NEP have been successfully employed as an ingredient in paint removers, cleaners and degreasers.
- EC and PC can be used as a solvent either alone or in blends in a range of applications, including cleaning of electronic printed circuit boards and paint strippers. They are excellent solvents due to their high solvency power, compatibility with both polar and apolar substances, limited flammability and benign EHS profile.
- NOP is an excellent solvent to promote rapid wetting penetration and high surface activity for cleaning applications. NOP can be used as a co-solvent with other surface active molecules to enhance their function properties in stripping applications.
- Proglyme and Dioxolane are used in paint stripping formulations, either individually, as blends, or with small quantities of protic solvents added. Such mixtures also allow formulators to move away from methylene chloride.





# Solvents for the Agriculture Industry



BASF's intermediates make essential contributions to our daily lives. The agricultural industry uses our chemicals to produce crop protectants and animal feed preservatives.

## Portfolio:

- N-Methylpyrrolidone Standard Grade (NMP)
- Tetrahydrofuran (THF)
- Dimethylformamide (DMF)
- N,N-Dimethylacetamide (DMAc)
- N-Octyl-2-pyrrolidone (NOP)
- Proglyme
- Propylene Carbonate (PC)

## Key Points:

- NMP and THF are solvents/co-solvents for insecticides, fungicides, herbicides and bioregulators.
- NMP can also be used as a reaction medium in the synthesis of active components.
- DMF and DMAc are solvents used in the manufacturing of active ingredients for agrochemicals.
- NOP is a molecule characterized by a combination of hydrophilic and hydrophobic properties combined with very low water solubility – the product being soluble in various organic apolar systems. These characteristics make NOP an excellent solvent for crystalline pesticides eliminating future crystallization when added in water.
- Proglyme is well-suited to prepare and stabilize formulations for crop protection.
- PC is a polar aprotic solvent with low odor, low toxicity, low vapor pressure and low VOC profile. It is readily biodegradable and is used as a powerful (co-)solvent in agrochemical formulations like insecticides, fungicides and herbicides.



# Solvents for Chemical Synthesis



BASF's portfolio of chemical intermediates comprises top quality building blocks, reagents, solvents and protecting groups for chemical synthesis and the pharmaceutical industry.

## Portfolio:

N-Methylpyrrolidone Standard Grade (NMP)

N-Methylpyrrolidone Life Science Grade (NMP LS)

N-Ethyl-2-Pyrrolidone (NEP)

Tetrahydrofuran (THF)

Dimethylformamide (DMF)

N,N-Dimethylacetamide (DMAc)

Dioxolane

Proglyme

## Key Points:

- NMP and NEP are used for peptide synthesis.
- NMP Life Science Grade is the solvent of choice for the synthesis of peptides and APIs.
- THF is used in a number of chemical reactions for the preparation of APIs and intermediates.
- DMF and DMAc are solvents used in the manufacturing of active ingredients for pharmaceuticals.
- Dioxolane is low-boiling, fully water miscible solvent with excellent stability in neutral or basic environments and can be used, for example, in the synthesis of fluoroaromatic compounds.
- Proglyme is a powerful, aprotic solvent with high thermal stability and is used, for example, in esterification reactions where it also facilitates water removal.



# Solvents Selection Guide



BASF Solvents	Freezing Point, °C	Boiling Point, °C	Flash Point, °C	Ignition Temperature, °C	Additives for Fuel & Lubricants	Agriculture	Artificial Leather
Amides & Pyrrolidones							
Dimethylformamide (DMF)	-61	152 - 153	58	410		■	■
N-Ethyl-2-Pyrrolidone (NEP)	<-75	212	91	245			
N-Methylpyrrolidone	-23	204	91	245			
Electronic Grade (NMP EG)							
Life Science Grade (NMP LS)							
Standard Grade (NMP)					■	■	
N,N-Dimethylacetamide (DMAc)	-20	165 - 166	64	345		■	
N-Octyl-2-pyrrolidone (NOP)	-26	306 - 307	142	225		■	
N-(2-Hydroxyethyl)-2-pyrrolidone (HEP)	20	309	174	275			
2-Pyrrolidone (2P, 2P 95%)	25	242	<200				
Ethers & Acetals							
Dioxolane	-95	76	-5	245			
Proglyme	-75	175	65	156		■	
Tetrahydrofuran (THF)	-108	66 - 67	-22	215		■	
Carbonates							
Ethylene Carbonate S (EC)	36	246	150	465	■		■
Propylene Carbonate S (PC)	-49	240 - 243	123	455		■	



Battery	Cleaning	Coatings	Cosmetics	Electronics	Engineering Plastics	Foundry Resins	Lube Oil, Extraction, Gas Scrubber Absorption Aids	Paint, Printing Inks, Photographic Chemicals	Paint Stripping	Solvents for Chemical Synthesis	Plasticizers	Polyurethanes	Resin Bound Foundry Cores	Super Absorbent Polymers	Surfactants	Water Treatment Membranes	Wood Protection
■	■	■		■		■	■		■	■		■	■				
	■	■			■	■	■	■	■	■		■				■	
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