Technical Data Sheet
Dimethylformamide (DMF)

Applications

- Agricultural chemical processing
- Fibers
- Htf - pharmaceutical processing
- Oil or gas processing
- Polymer processing
- Process solvents
- Refining
- Textile

Product Description

Dimethylformamide (DMF) is a clear, colorless, hygroscopic liquid with a slight amine odor. The solvent properties of DMF are particularly attractive because of the high dielectric constant, the aprotic nature of the solvent, its wide liquid range and low volatility. It is frequently used for chemical reactions and other applications, which require a high solvency power. The product is known as a universal solvent.

The high solubility of polyacrylonitrile in DMF, together with the good miscibility of DMF in water makes DMF the preferred solvent for the production of acrylic fibers. Also the spinning of polyurethane based elastomers is performed from DMF based solutions.

Another significant application is the use of DMF as a solvent for polyurethane-based coatings on leather and artificial leather fabrics.

Polymers like polyvinylchloride, vinylchloride- vinylacetate copolymers and some polyamides are also readily dissolved in DMF. DMF is also used in epoxy based formulations.

The pharmaceutical industry uses DMF as a reaction and crystallization solvent because of its exceptional solvency parameters.

In the petrochemical industry DMF is used for the purification of acetylene from ethylene and butadiene from C4 streams. Also for the separation of aromatics, which can be easily dissolved by DMF from aliphatic hydrocarbons. Those aliphatics are used in lube oils.

Due to the high solubility of SO_2 in DMF, exhaust combustion streams from high sulfur containing fuels can be purified with CO_2 being recovered.

Inorganic and organic based residual fluxes are highly soluble in DMF; therefore this solvent is used as a cleaner, for instance to clean hot-dip tinned parts. DMF is also used as industrial paint stripper.

This high solubility of inorganic substances also leads to the application of DMF in the production of high voltage capacitors.

DMF is also used as carrier for inks and dyes in various printing and fiber-dying applications.

DMF is widely used as a solvent, reagent and catalyst in the synthetic organic chemistry.

Typical Properties

Property	Typical Value, Units

General	
Molecular Formula	C_3H_7NO
Molecular Weight	73.09 g/mol
Appearance	Colorless liquid
Autoignition Temperature	445 °C
Boiling Point	152-153 °C
Critical Pressure	44 200 hPa
Critical Temperature	374 °C
Critical Volume	3.65 m^3/kg
Density	
@ 20°C	0.949 g/cm^3
@ 50°C	0.921 g/cm^3
Dielectric Constant	
10 kHz @ 25°C	36.7
Dipole moment	
@ 20°C	3.81 D (debye)
Dissociation constant, pKa	
@ 20°C	-0.3
Flash Point	
Closed Cup	57.5 °C
Free energy of formation	
@ 25°C	239 kJ/mol
Freezing Point	-61 °C
Hansen solubility parameters @ 25°C	
Dispersion	17.4 $(MPa)_{½}$
Hydrogen Bonding	11.3 $(MPa)_{½}$
Polar	13.7 $(MPa)_{½}$
Total	24.8 $(MPa)_{½}$
Heat Capacity	
Gas (127°C, 101.3 kPa)	1.61 kJ/kg·K
Liquid (25°C)	2.03 kJ/kg·K
Heat of Vaporization	
@ 140°C	38.3 kJ/mol
@ 25°C	47.6 kJ/mol
Octanol-water partition coefficient, log Pow	-0.85
Refractive Index	
@ 25°C	1.4278
Surface Tension	
@ 25°C	36.42 mN/m
Vapor Density	
(air = 1)	2.52
Vapor Pressure	
@ 20°C	3.77 hPa
@ 25°C	4.8 hPa
@ 60°C	34.6 hPa
Viscosity	
@ 25°C	0.802 mPa·s
Water solubility	200 g/L

Principal chemical properties

Formation of complexes
Dimethylformamide complexes with a number of substances including the following: SO_3, P_2O_5, $POCl_3$, HCI, BF_3,

metal salts: $CoCl_2$, $NiCl_2$, $FeCl_3$, $SnCl_4$.

Stability
Decomposition reactions, which may be violent with metallic sodium, some halogenated hydrocarbons, inorganic nitrates (particularly magnesium nitrate), triethylaluminum, bromine and potassium permanganate.

Decomposition into dimethylamine and formaldehyde may occur as a result of UV irradiation.

Hydrolysis
Slight tendency towards hydrolysis in aqueous solution and at elevated temperature. The rate of hydrolysis increases in the presence of acids or alkalis (formation of formic acid and dimethylamine).

Packaging

- Bulk
- PE drums (200 kg net)
- Iron drums (195 kg net) (on request)
- IBC containers (945 kg net)

Storage

Dimethylformamide has practically no corrosive effect on ordinary metals with the exception of copper and its alloys.

Dimethylformamide may be stored in stainless steel or aluminum tanks.

Seals should preferably be made of polytetrafluoro-ethylene (PTFE), polyethylene, or high-density polypropylene.

Dimethylformamide is hygroscopic and it is advisable to store it under nitrogen. Additional technical information may be obtained on request.

As dimethylformamide is very easily absorbed through the skin, it is advisable for personnel to wear masks and polyethylene gloves. Independent breathing apparatus should be worn inside tanks that have contained dimethylformamide.

People susceptible to skin disease or liver and stomach disorders should not be exposed to dimethylformamide.

In the event of accidental spillage of a small amount of the substance, it may be diluted with water and removed without any danger to purification plants.

If the amount spilt is large, the product should be recovered by pumping and then destroyed by incineration or by absorption in a suitable substance for subsequent removal in compliance with current legislation.

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