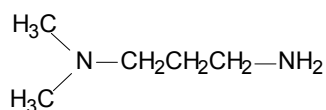


Technical Bulletin

DIMETHYLAMINOPROPYLAMINE (DMAPA)

N,N-Dimethyl-1, 3-Propanediamine

DIMETHYLAMINOPROPYLAMINE (DMAPA) is a clear, essentially colorless liquid with a typical amine odor. It is completely soluble in water, benzene, heptane, and other organic solvents.



SALES SPECIFICATIONS

<u>Property</u>	<u>Specifications</u>	<u>Test Method*</u>
Appearance	Clear and substantially free of foreign matter	ST-30.1
Color, Pt-Co	25 max.	ST-30.12
DMAPA, wt. %	99 min.	ST-5.5
Water, wt. %	0.2 max.	ST-31.53, 6

*Methods of Test are available from Huntsman Corporation upon request.

ADDITIONAL INFORMATION

Regulatory Information

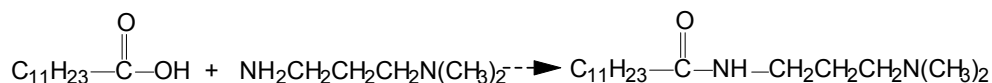
Please review respective MSDS for regulatory information.

Typical Properties

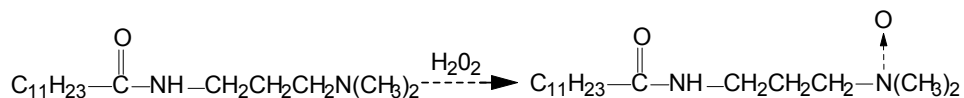
Boiling point, °C (°F)	135 (275)
Equivalent weight	51
Flash point, TCC, °C (°F)	29 (84)
Molecular weight	102.18
Odor	Ammonia-like
pH	12
Refractive index, n_D^{20}	1.4350
Specific gravity, 20/20°C	0.82
Vapor Pressure, mmHg, 20°C (68°F)	5
Viscosity, cSt, 20°C (68°F)	1
Water solubility (%)	> 10

APPLICATIONS

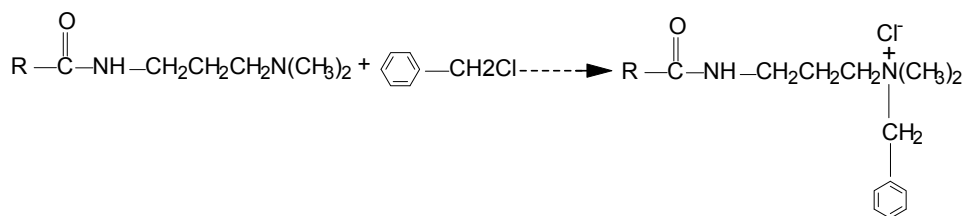
Dimethylaminopropylamine contains one primary and one tertiary amine group, which makes it of interest in many applications. For instance, when DMAPA is heated with a fatty acid, an amide containing a tertiary amine group is formed.



Such amides can be treated with hydrogen peroxide to give amine oxides which show excellent detergent and foam boosting properties.



The amide can also be treated with alkyl or aralkyl halides, such as benzyl chloride, to give quaternary ammonium compounds which have been used to prepare smooth and soft textile fibers that are water-resistant and stable to light.



Quaternary ammonium compounds are effective as hair-cleaning and washing aids. Such quaternized amines are water soluble, odorless, and relatively nontoxic to humans. They are useful as antiseptics, wetting agents, textile dyeing and finishing aids, and emulsifiers.

Betaines prepared from DMAPA are used in shampoos and bath preparations to reduce static electricity and improve the body, gloss, and manageability of wet hair, and improve the feel of the skin after a bath.

An amphoteric surfactant prepared from DMAPA is used to prepare a shampoo which causes little irritation of the eyes.

Properties of gasoline are reported to be improved by the addition of DMAPA or compounds based upon DMAPA. The addition of DMAPA to nonleaded gasoline gave satisfactory bactericidal activity. The reaction product of DMAPA with polyisobutenyl chloride is reported to counteract engine fouling, thereby reducing hydrocarbon exhaust gas emissions. The reaction of DMAPA with polyisobutenyl chloride and α , β -dibromopropionitrile gives a product which reportedly is an effective carburetor cleaner. Carburetor detergents have been prepared by reacting DMAPA with alkylphenol and an aldehyde or with thiolglycolic acid and chlorinated polyisobutene.

Dimethylaminopropylamine has been used for preparing good corrosion inhibitors (amine phosphates) for aviation gasoline. Heating DMAPA and urea yields a product which is useful as an octane requirement reducer.

Ash-free lubricant additives were prepared by reacting DMAPA with an ethylene, propylene, or 1,4 hexadiene copolymer. A lubricating oil having dispersancy properties and good viscosity index contains, along with other components, a DMAPA-modified hydroperoxidized ethylenepropylene copolymer. A detergent for a lubricating oil has been prepared from DMAPA reacted with maleic anhydride and an ethylene-propylene copolymer. A lubricating oil additive effective in improving dispersancy, wear, and corrosion properties has been prepared from DMAPA and an alkyl phenol, formaldehyde, and sulfur.

Water dispersible coating compositions useful for preparing electrophoretic coating compositions using the substrate as the cathode are prepared from DMAPA, polybutadiene, and maleic anhydride. These coatings can also be prepared from DMAPA, an epoxy resin, acetic acid, and an unsaturated monoisocyanate. A polybutadiene derivative and an epoxy resin derivative are combined to prepare a coating composition which give hardened coatings with good corrosion resistance.

Polyester films and fibers treated with DMAPA have a much lesser tendency to develop static electricity and their receptivity to acid wool dyes is greatly improved. An amide made from stearic acid and the amine is used as a viscosity decreasing additive in aqueous softening agents useful for textile finishing or dyeing.

A quaternary ammonium compound made from DMAPA is useful as a nonyellowing fabric softener which can be used in the rinse cycle, in combination with detergent formulations in the wash cycle, or as a liquid concentrate to be applied to fabrics. A fluorescent whitener for acrylic fibers was prepared from 4,5-dichloronaphthalic anhydride, DMAPA, and 2-ethoxyethanol. Reaction products of DMAPA and C₁₁₋₁₄ epoxyalkanes were used to prepare detergent compositions suitable for laundering textiles in cold water.

Finishing poly(ethylene terephthalate) fibers with a composition containing DMAPA and a siloxane followed by heat treatment gave staple fibers with increased resilience.

Quaternary salts prepared from polymethacrylate, DMAPA, and allyl chlorides imparted good antistatic properties to nylon, polyester, and other synthetic fabrics.

DMAPA has been added to polymeric systems to alter the dye-reception properties thereof.

Basic phthalocyanine dyes have been prepared from DMAPA. Such dyes are reported to be useful for dyeing plastics, synthetic varnishes, fibers of cellulose, nylon, and polyacrylonitrile. They are also used in printing inks.

Dimethylaminopropylamine has been used effectively for curing epoxy resins.

Derivatives of dimethylaminopropylamine have been examined in pharmaceutical applications. Diquaternary salts of DMAPA derivatives have been suggested for regulating blood pressure. Sulfonamides possessing antiseptic properties have been prepared from DMAPA and aryl sulfonyl chlorides. The condensation of DMAPA with a substituted thiazole yielded a drug which showed antimalarial activity.

The reaction product of DMAPA and α,α' -dichloro-p-xylene was effective in preventing the ozone deterioration of rubber.

An ion exchange resin with high exchange capacity was prepared by treating a cross-linked alkyl acrylate polymer with DMAPA.

A cationic sizing agent for paper was prepared by reacting maleic anhydride- α -olefin copolymers with DMAPA.

Water-soluble polyelectrolytes useful as flocculants in papermaking are prepared from DMAPA and polyvinyl chloride, a styrene-vinyl chloride copolymer, and C₂₀₋₃₀ chlorinated paraffins, and from DMAPA, water, and acrylonitrile.

A product useful in flocculating and settling an aqueous suspension of Georgia kaolin clay is prepared from a styrene-maleic anhydride copolymer, DMAPA, and methyl chloride. One suitable as a precipitant for waste treatment was prepared from DMAPA and an alkenyl- or alkylsuccinic anhydride.

Polystyrene is stabilized to outdoor weathering by the incorporation of DMAPA.

TOXICITY AND SAFETY

Dimethylaminopropylamine as the undiluted product is severely irritating to the eyes, skin, and mucous membranes of exposed individuals. Adequate eye and skin protection must be provided; chemical goggles with full face shield, protective clothing, and impervious gloves must be worn during handling of dimethylaminopropylamine. In case of contact, flush eyes immediately with water for at least 15 minutes, then get medical attention.

The product was shown to be "corrosive" to the skin in Department of Transportation (DOT) tests with laboratory animals. The rabbit dermal irritation score is estimated to be 6.6-8.0/8.0, and the dermal LD₅₀ (rabbit) is 1.02 ml/kg. Dimethylaminopropylamine must be washed off promptly in instances of skin exposure. Remove contaminated clothing and launder before reuse. Breathing of vapors of this product should be avoided. Evidence suggests that dimethylaminopropylamine 4 causes symptoms of acute respiratory distress or a decrease in pulmonary function at airborne concentrations above 0.2 ppm (Brubaker, R. E., et al., *J. Occup. Med.* 21 (10) 688-690, 1979). Blurring of vision is another symptom of excess exposure, but such symptoms rapidly disappear when exposures are discontinued. The vapor pressure of this product is quite low, and symptoms usually only appear under conditions of improper workplace ventilation. When rats were exposed to near-saturated vapor concentrations of dimethylaminopropylamine in a confined space, all died after less than eight hours of exposure.

Dimethylaminopropylamine is moderately toxic by ingestion (rat oral LD₅₀ = 1.02 ml/kg). If this product is swallowed, *do not* induce vomiting. Give large quantities of water and at least one fluid ounce of vinegar in an equal amount of water and consult a physician.

In the Ames *Salmonella* test and BALB/3T3 Cell Transformation assay, tests which evaluate potential mutagenicity and carcinogenicity, dimethylaminopropylamine was found to be inactive. Thus, no potential mutagenic hazard is anticipated.

For additional information on the toxicity and safe handling of this product, consult the Material Safety Data Sheet (Safety Data Sheet in Europe) prior to use of this product.

HANDLING AND STORAGE

Carbon steel is a satisfactory material for storing and handling dimethylaminopropylamine. Copper, zinc, lead, or alloys containing any of these materials should not be used, since they will be attacked by the product.

The freezing point of DMAPA is below -60°F, and the viscosity is low. Therefore, heating the storage tank will not be necessary.

Dimethylaminopropylamine will discolor when exposed to air. It is also hygroscopic and will pick up moisture. If either of these two characteristics is not acceptable in the intended use of the product, it will be necessary to pad the storage tank. We recommend a nitrogen which is low in both carbon dioxide and water content.

Carbon steel is acceptable for transfer lines. Lines should be blown or drained clean after each use. Otherwise, the product will discolor when it is left in the lines for an extended period. In cases where it is impossible to drain lines, or where the dimethylaminopropylamine is handled warm, stainless steel will be required. Since the product will leach conventional pipe dopes from threaded connections, the lines should be welded or flanged. Satisfactory gasketing materials are Garlock 7021, U. S. Rubber 899, John Crane 333, Johns-Manville 70, or equivalent.

Carbon steel, centrifugal pumps are satisfactory. Either pump packing or a mechanical seal may be used. Braided TEFLON is a satisfactory packing material. Seals may be John Crane Type 9, Durametallic Type RO-TT, or equivalent, with either stellite-carbon or tungsten faces and TEFLON® V-rings.

Dimethylaminopropylamine is a flammable material; therefore, care should be taken in handling and storage. It should be stored away from heat and open flame. It is also a corrosive material; therefore, care should be taken to avoid contact with the product.

AVAILABILITY

Dimethylaminopropylamine is available for immediate shipment in tank cars, tank wagons, and 55-gallon drums. Samples are available by contacting our sample department at 1-800-662-0924.

Huntsman Corporation Business Offices

10003 Woodloch Forest Dr.
The Woodlands, TX 77380
(281) 719-6000

Huntsman Advanced Technology Center

Technical Service
8600 Gosling Rd.
The Woodlands, TX 77381
(281) 719-7780

Samples 1-800-662-0924

www.huntsman.com

Copyright © 2007, 2012 Huntsman Corporation or an affiliate thereof. All rights reserved.
TEFLON® is a registered trademark of DuPont.

Huntsman Corporation warrants only that its products meet the specifications stated herein. Typical properties, where stated, are to be considered as representative of current production and should not be treated as specifications. While all the information presented in this document is believed to be reliable and to represent the best available data on these products, HUNTSMAN MAKES NO WARRANTY OR GUARANTEE OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT OF ANY THIRD PARTY, OR WARRANTIES AS TO QUALITY OR CORRESPONDENCE WITH PRIOR DESCRIPTION OR SAMPLE, AND ANY USER OF PRODUCTS DESCRIBED HEREIN SHOULD CONDUCT A SUFFICIENT INVESTIGATION TO ESTABLISH THE SUITABILITY OF ANY PRODUCT FOR ITS INTENDED USE AND ASSUMES ALL RISK AND LIABILITY WHATSOEVER RESULTING FROM THE USE OF SUCH PRODUCT, WHETHER USED SINGLY OR IN COMBINATION WITH OTHER SUBSTANCES. Product(s) described in this publication may be hazardous and/or toxic and require special precautions in handling. For all product(s) described herein, the user should obtain from Huntsman detailed information on hazards and/or toxicity, together with proper shipping, handling, and storage procedures, and should comply with all applicable safety and environmental standards. The behavior, hazards and/or toxicity of the product(s) referred to in this publication in manufacturing processes and their suitability in any given end-use environment are dependent upon various conditions such as chemical compatibility, temperature, and other variables, which may not be known to Huntsman. It is the sole responsibility of the user of such product(s) to evaluate the manufacturing circumstances and the final product(s) under actual end-use requirements and to adequately advise and warn future purchasers and users thereof.