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Technical Bulletin

METHOXYPROPYLAMINE (MOPA)

METHOXYPROPYLAMINE (3-methoxypropyl-amine) is a clear, colorless liquid with an ammoniacal odor. It undergoes reactions typical of primary amines and is completely soluble in water and common organic solvents.

$$CH_3—O—CH_2—CH_2—CH_2—NH_2$$

APPLICATIONS

Amine soaps prepared from methoxypropylamine and fatty acids are useful for making dispersions and emulsions of certain synthetic and natural resins and waxes which are useful in floor finishes, textile finishes, water-based paints and in similar areas of application.

Methoxypropylamine is useful for preparing water-insensitive waxes. It volatilizes with water and leaves behind an insoluble wax film. Further, methoxypropylamine in dilute solutions does not have an objectionable odor. The material has been compared with morpholine in such applications and may, in fact, function as a substitute for morpholine in some instances. Methoxypropylamine should also find use in insecticide emulsions, dye solvents, textile assistants, and in general, applications in which mild bases of moderate volatility are desired. It has been used in the production of dyes to modify polybutadiene-based isocyanates and in the manufacture of polyamide resins. The treatment of aluminum and aluminum alloy surfaces with dilute solutions of methoxypropylamine is reported to improve the adherence of various coatings which may be subsequently applied.

The reaction of methoxypropylamine with bis(2-carbamoylphenyl) disulfides is reported to give products useful in controlling mildew fungi in latex and alkyd paints. Similar products are obtained by reacting methoxypropylamine with quinones, carbamates, benzothiazole and other substrates. Compounds effective against silicosis have been reported from the reaction of methoxypropylamine with styrene-maleic anhydride copolymer and a diamine.

A phenol-free paint remover has been prepared from methoxypropylamine and sodium hydroxide. Plant growth regulators were prepared from methoxypropylamine.

A fluorescent brightener for cellulosic textiles was prepared from methoxypropylamine. It is reported to have improved low-temperature effectiveness and did not discolor washing powders.

Water soluble polyelectrolytes for use as flocculating agents have been prepared by reacting methoxypropylamine with acrylonitrile polymers.

Methoxypropylamine can be used to inhibit corrosion in steam condensate systems. The addition of the amine in the parts per million level is effective in reducing corrosion caused by the presence of carbon dioxide in the water.

Methoxypropylamine has been proposed as an additive to prevent corrosion of oil refining equipment. The presence of acidic materials in the incoming crude causes corrosion at the points of initial water condensation.

SALES SPECIFICATIONS

Property	Specifications	Test Method*
Appearance	Clear and substantially free of foreign matter	ST-30.1
Color, Pt-Co	25 max.	ST-30.12
3-Methoxypropylamine, wt. %	99 min.	ST-5.5

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

ADDITIONAL INFORMATION

Regulatory Information

DOT/TDG Classification	Amines, liquid, corrosive, flammable, n.o.s. (3-Methoxypropylamine)
HMIS Code	3-3-0
WHMIS Classification	B2, D2B, E
CAS Number	5332-73-0

Chemical Control Laws

Australia, AICS	Listed
Canada, DSL	Listed
Europe, EINECS/ELINCS	Listed
Japan, METI	Listed
United States, TSCA	Listed

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Typical Physical Properties

Boiling point, °C (°F)	116 (240)	pH	11
Flash point, TCC, °C (°F)	27 (81)	Refractive index, n_D^{20}	1.4180
Freezing point, °C (°F)	- 76 (-104)	Specific Gravity	0.87
Ionization constant, K_b, 25°C	1.3×10^{-4}	Surface tension, dynes/cm^2, 25°C	27.64
Ionization constant, pK_b	3.9	Vapor pressure, mm Hg, 20°C (68°F)	6
Molecular weight	89.14	Viscosity, cSt, 37.8°C (100°F)	0.8
		Water solubility	> 10

TOXICITY AND SAFETY

Methoxypropylamine should be considered hazardous, having the potential to cause eye burns, skin irritation and allergic skin reactions.

The oral LD_{50} (rats) for methoxypropylamine is 0.69 g/kg and it is, therefore, classified as moderately toxic if swallowed. Skin penetration by undiluted product is indicated by the dermal LD_{50} (>3.0 g/kg, rabbits) which shows that a slight degree of toxicity is associated with skin contact. Irritation studies with rabbits have shown methoxypropylamine to be extremely irritating to the eyes, 103.7/110.0 (Draize score) and severely irritating to the skin, 8.0/8.0 (Draize score). A Department of Transportation (D.O.T.) corrosion test with rabbits showed the product to be corrosive to the skin. This product has produced evidence of delayed contact hypersensitivity reactions (dermal sensitization) in studies using guinea pigs.

In an acute inhalation study with rats, a saturated vapor of methoxypropylamine did not produce any deaths during a 7-hour exposure.

Methoxypropylamine has been unreactive (negative) in short-term genotoxicity assays. Methoxypropylamine should be handled in well-ventilated areas and chemical type goggles with face shield, impervious suits, gloves and rubber boots should be worn. If eye contact occurs, flush thoroughly with water for at least 15 minutes. If skin contact occurs, wash exposed areas with soap and water, remove contaminated clothing and wash clothing before reuse. If swallowed, *do not* induce vomiting, but give large quantities of water. Give at least one ounce of vinegar in an equal amount of water.

Since methoxypropylamine has a low vapor pressure, inhalation under usual or ordinary circumstances should not present a problem. However, repeated exposure to high concentrations of vapor could cause respiratory irritation and/or hazy vision from a film over the cornea of the eye. Both conditions disappear with discontinuance of exposure and no residual injury is known. Due care should be exercised to avoid breathing of vapors, skin contact and exposure to open flame. Areas in which vapors or mists may be emitted should be well-ventilated, and spills in confined areas should be cleaned up promptly.

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

Storage tanks constructed to a recognized code, using carbon steel as a material of construction, generally are satisfactory. However, prolonged storage in carbon steel may cause the color of the product to increase. In those cases where color needs to be preserved, stainless steel or aluminum should be used.

Copper, zinc, lead, or alloys containing any of these materials should not be used since they will be attacked by the amine. In addition, complex salts will be formed which will result in product discoloration.

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

A good gas blanketing system for a conventional tank requires two regulators — one on the gas to the tank and one on the vent to the atmosphere. Because of the flammable nature of methoxypropylamine, it is recommended that a flame arrestor be installed on any vent discharge. The inlet regulator should be set for approximately two or three ounces of pressure, while the outlet regulator should be set for about four or five ounces and certainly not more pressure than that for which the tank was designed. The inlet and outlet regulators should be sized very carefully to allow for maximum pumping into and out of the tank; otherwise, the tank structure may rupture or collapse. Inspect vent valves for build-up of solid amine carbonates which result from reaction of atmospheric carbon dioxide and amine fumes vented from the storage tank.

Carbon steel is acceptable for transfer lines. They should be blown or drained clean after each use. Otherwise, the product will discolor when it is left in the lines. Transfer lines should be joined by welds or flanges. Screwed joints are subject to failure because the amine will leach conventional pipe dopes. Satisfactory gasketing materials are Garlock 7021, U.S. Rubber 899, John Crane 333, and Johns-Manville 70 or equivalent. For flexible connections, stainless steel hose is preferred to rubber, since rubber will eventually deteriorate in amine service.

Centrifugal pumps constructed of carbon steel 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. If rotary pumps are used, they should be equipped with externally lubricated bearings.

Although it is not recommended that tanks and transfer lines be cleaned, it is sometimes necessary as the result of contamination or accumulation of foreign material in the system. For such cleaning, a water wash is generally satisfactory. Tank cleaning is accomplished by thoroughly sluicing the interior of the tank with a water jet and following this with cloth or chamois drying. Once clean and dry, the tank should be sealed and purged with dry inert gas to avoid undue condensation and rust formation.

New systems frequently introduce line scale, rust and the like, which will be a source of contamination and possible plugging. These solids can be effectively removed with either a “y” strainer, using a 150-200 mesh stainless steel screen or with a commercial type cloth filter. A good woven cotton canvas, 12 ounces or heavier, is suitable as a cloth filter medium. Wool and synthetic fibers have not been found to be satisfactory.

Methoxypropylamine has a low viscosity and a freezing point of -104°F; therefore, it will not freeze or become viscous during normal handling.

Since methoxypropylamine has a low flash point (80°F, TCC), adequate precautions should be observed to reduce fire hazards. It should be used only in a well-ventilated area and precautions should be taken to avoid exposure to sparks and open flames. Ground wires should be welded to the storage tank to reduce the chances of static electricity build-up. Where possible, equipment should also be electrically bonded. Either float or manometer type gauges are recommended for tank metering. Gauge glasses are not recommended for this service as they are subject to accidental breakage, resulting in a serious fire hazard.

Proper fire-fighting equipment should be available wherever ethoxypropylamine is handled. Carbon dioxide, dry chemical or “alcohol” foam, is effective in controlling fires.

Fumes from the burning of methoxypropylamine may include carbon monoxide, carbon dioxide and ammonia. Therefore personnel fighting fires involving this product should be equipped with self-contained breathing apparatus and protective clothing.

In case of spills eliminate all sources of ignition. Spills should be removed by absorbing with dry absorbent materials or by washing with water.

The same storage and handling information discussed above applies to drum material.

Methoxypropylamine may be removed from drums by either pumping or draining. While material is being removed from the drum, a dry inert gas blanket or purge should be maintained or, optionally, the 3/4 inch bung can be fitted with a suitable dryer tube. Adequate ventilation and suitable protective devices should be employed.

AVAILABILITY

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

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