Product Safety Assessment

*DOW™* Monoethanolamine


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### Names

- CAS No. 141-43-5
- *DOW™* monoethanolamine
- DOW MEA GT Grades
- MEA
- Aminoethanol
- 2-Aminoethanol
- 1-Amino-2-hydroxyethane
- 2-Amino-1-ethanol
- Beta-aminoethanol
- Beta-aminoethyl alcohol
- Beta-ethanolamine
- Colamine
- Ethanolamine
- Ethanol, 2-amino-
- Glycinol
- 2-Hydroxyethanamine
- Olamine

### Product Overview

* DOW™* monoethanolamine is a clear, colorless, viscous liquid. It is one of a class of organic compounds called ethanolamines. Ethanolamines combine the properties of amines and alcohols. DOW monoethanolamine is available in a variety of grades, including low freeze grade (LF, 85%) and iron and chloride free (ICF, 100%), as well as Gas Treating (GT) grades. See [Product Description](#).

* DOW monoethanolamine (MEA) is primarily used in detergents, personal-care products, textile finishing, and wood treating. Other applications include use as oil-field chemicals, metal-working fluids, and catalysts that promote stability during the manufacture of flexible and rigid urethane foams. See [Product Uses](#).

* DOW monoethanolamine is not sold for consumer use. However, it is used in the production of products that consumers may use. The most probable exposure route is skin contact with products that contain small amounts of this material. Occupational exposure may occur by inhalation of fumes from various processes. See [Exposure Potential](#).

* Monoethanolamine can cause burns to the eyes and skin. It is harmful and corrosive if swallowed. It is also harmful if inhaled or absorbed through the skin. It can cause lung damage if aspirated, and repeated exposure may cause liver and kidney damage. See [Health Information](#).

* DOW monoethanolamine is water soluble and biodegrades rapidly. It should not bioaccumulate or persist in the environment. However, large releases to wastewater-treatment facilities can result in poor treatment and toxic shock to biologically active species. See [Environmental Information](#).
• DOW™ monoethanolamine exhibits good temperature stability, but can react exothermically (producing heat) with many other materials, including strong oxidizing agents, strong acids, strong bases, aluminum, aldehydes, ketones, acrylates, organic anhydrides, organic halides, formates, lactones, oxalates, and copper and zinc metals and alloys. It can also form an unstable crystalline complex called tris(ethanolamino)-iron when in contact with iron or steel, which can ignite when heated to 54–71°C (130–160°F) in the presence of air. See Physical Hazard Information.

Manufacture of Product

• Capacity – Worldwide capacity for ethanolamines was 2.374 million metric tonnes (5.23 billion pounds) in 2011. Dow is the largest global supplier of ethanolamines. Dow has production facilities in Seadrift, Texas; and Hahnville, Louisiana.

• Process – DOW™ monoethanolamine is produced commercially by reacting one ethylene oxide molecule with each ammonia molecule, as shown below.

\[
\text{NH}_3 + \text{CH}_2=\text{CH}_2 \rightarrow \text{NH}_2\text{-CH}_2\text{-CH}_2\text{-OH}
\]

Product Description

DOW™ monoethanolamine (MEA) is a clear, thick, colorless liquid with an ammonia-like smell. It is completely soluble in water. Monoethanolamine has a freezing point of 10.5°C (51°F), so it can become a solid at ambient temperatures.Monoethanolamine is one of a class of organic compounds called ethanolamines, which combine the properties of amines and alcohols and can undergo reactions common to both groups. They can react with acids to form salts or soaps and can also form esters (sometimes used as artificial flavorings and fragrances).

To avoid freezing concerns, Dow also offers grades that are mixtures with water to depress the freezing point. DOW monoethanolamine is available in an LF grade (low freeze, 85%), and an ICF grade (free of iron and chloride, 100%). DOW monoethanolamine is also available in GT grades specially formulated for gas treating applications.

Monoethanolamine is a primary amine – it has one chemical group and two hydrogen atoms attached to the nitrogen atom. This affects its reactivity with other materials. See Nitrosamine Formation and Physical Hazard Information.

Product Uses

Typical uses for monoethanolamine are shown in the chart. DOW™ monoethanolamine is used in the following applications:

• Cement – to enhance strength, reduce drying time and protect against the affects of freezing and thawing

• Gas treating – for a variety of natural gas, petrochemical, and oil treatments

• Metalworking fluids – to neutralize acid components in lubricants, prevent corrosion and rusting, and for proprietary corrosion inhibitors and biocides

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• **Personal-care products** – to make ethanolamine-based soaps for use in hand lotions, cosmetic creams, cleansing creams, shaving creams, and shampoos; also for dry-cleaning solvents and heavy-duty liquid laundry detergents

• **Pharmaceuticals** – as raw materials in the production of certain pharmaceuticals

• **Printing inks** – to control pH in the formulation of packaging and printing inks

• **Textiles and textile additives** – as aids to clean and scour textiles, facilitate wetting, and improve lather and ease of soap removal

• **Wood treating** – for wood-preservative alternatives

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**Exposure Potential**

Based on the uses for DOW™ monoethanolamine (MEA), the public could be exposed through:

• **Workplace exposure** – Exposure could occur in a monoethanolamine manufacturing facility or a facility that makes products using monoethanolamine as a raw material. DOW monoethanolamine is produced in a closed system to minimize emissions. Potential exposure may occur during process sampling, filter changes, and material loading. Exposure could also occur when working with gas treatments, metalworking fluids, printing inks, or other products that contain this material. Each manufacturing facility should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit unnecessary exposure. For more information on health hazards, see Health Information.

• **Consumer exposure to products containing DOW monoethanolamine** – Dow does not sell monoethanolamine for consumer use. However, it is used in the production of other products that consumers may use. The most probable route of exposure is skin contact with metal-working fluids or other products that may contain small amounts of this material. Always review product labels and follow all instructions and guidelines for proper use to help prevent any unnecessary exposure. See Health Information.

• **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. Use dry absorbents (sand, clay) to soak up the spill and then wet down the area with water. Do not use cellulose or sawdust as absorbents. Dispose of contaminated absorbent in water-saturated containers in accordance with governmental requirements. Wear proper protective equipment. Monoethanolamine is water soluble and degrades readily. If released to the environment, it will partition to water and degrade rapidly. Small releases will be removed by wastewater-treatment facilities. See Environmental, Health, and Physical Hazard Information.

• **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be contained, captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Isolate the area and keep unnecessary and unprotected people from entering the area. Use appropriate safety equipment. Large releases to wastewater-treatment facilities can result in poor treatment and toxic shock to biologically active species. Monoethanolamine may also react with acidic compounds in the sewer stream and produce undesirable odors. See Environmental, Health, and Physical Hazard Information.

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In case of fire – Deny any unnecessary entry into the area and consider the use of unmanned hose holders. Use water spray or fog, carbon-dioxide or dry-chemical extinguishers, or foam to fight the fire. Alcohol-resistant foams are preferred. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Toxic gases may be evolved during a fire. Avoid water runoff to waterways and sewers. When relevant in scale or risk, the community should be notified of the hazards associated with the specific release event. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

Health Information

Based on the uses of monoethanolamine, the most likely route of exposure is skin contact, with some potential for exposure by inhalation of vapor and mists.

Eye and skin – Monoethanolamine can cause eye and skin burns. Prolonged or widespread skin contact may result in the absorption of potentially harmful amounts. Is classified as corrosive to the skin according to DOT guidelines. Repeated overexposure may cause damage to the kidneys and liver. Monoethanolamine does not cause allergic sensitization in standard animal tests, and human patch testing has not shown monoethanolamine to be a significant sensitizer.

Inhalation – Breathing monoethanolamine vapors can be irritating to the respiratory tract. In animal testing, repeated inhalation of severely irritating levels of monoethanolamine vapors have been reported to result in possible effects upon the nervous and reproductive systems.

Ingestion – Swallowing monoethanolamine can cause severe irritation or chemical burns of the mouth, throat, esophagus, and stomach.

Other – High oral or dermal doses of monoethanolamine did not affect the fetus of pregnant animals even though maternal toxicity was observed. These studies were conducted using methodology agreed upon by the Organization for Economic Co-operation and Development (OECD). In contrast, less rigorous studies have reported monoethanolamine to be toxic to the fetus of mice and to result in growth retardation. Monoethanolamine does not cause mutations in DNA or disrupt genetic material.

Nitrosamine Formation – Because monoethanolamine is a primary amine, it does not react with nitrosoating agents (like nitrites, which are common and naturally occurring chemicals) to produce nitrosamines. Nitrosamines, chemicals that are likely to be carcinogens, will not be formed by monoethanolamine.

For more information, see the relevant Safety Data Sheet.

Environmental Information

DOW™ monoethanolamine is expected to partition (preferentially locate) in water when released to the environment. Because of its water solubility and reactivity with other compounds, monoethanolamine biodegrades rapidly and is not likely to bioaccumulate in the aquatic food chain. Studies on a wide variety of freshwater fish show that monoethanolamine has very low toxicity to fish.

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Large releases of monoethanolamine can affect the pH of nearby water and wastewater-treatment facilities, resulting in possible toxic shock to biologically active species and poor treatment in wastewater-treatment facilities. Monoethanolamine may also react with acidic compounds in the sewer to produce undesirable odors.

For more information, see the relevant Safety Data Sheet.

**Physical Hazard Information**

DOW™ monoethanolamine is the most strongly basic material in the ethanolamine family, and it has the highest vapor pressure. It can react exothermically (to produce heat) with many other chemicals.

- Incompatible materials include strong oxidizing agents, strong acids, strong bases, aldehydes, ketones, acrylates, organic anhydrides, organic halides, formates, lactones, and oxalates. Although monoethanolamine is not known to form nitrosamines, contact between ethanolamines and nitrosating agents (e.g., sodium nitrite) should be avoided. Contact between some amines and nitrosating agents can form nitrosamines, which are suspected cancer-causing materials.
- Because ethanolamines react with so many other chemicals, ethanolamine storage tanks should be segregated from incompatible materials in separate dike enclosures.
- Monoethanolamine can form an unstable crystalline complex called tris(ethanolamino)-iron when in contact with iron or steel. This compound can ignite when heated to 54–71°C (130–160°F) in the presence of air. Stainless steel is recommended for any hot surfaces in contact with monoethanolamine.
- Galvanized steel, copper, and copper-based alloys (e.g., brass or bronze), and aluminum should not be used in contact with any ethanolamine contact.

DOW monoethanolamine exhibits good temperature stability. However, at temperatures above 250°C (480°F), it can undergo a self-sustaining exothermic reaction, causing rapid decomposition. Contaminants such as caustic, alkali metals, or mineral acids can reduce the onset temperature of decomposition.

Like many combustible liquids, monoethanolamine can begin to self-heat when in contact with high-surface-area media, such as spill absorbents and metal-wire mesh. In some cases, this may lead to spontaneous combustion, and either smoldering or a flame may be observed. Materials contaminated with monoethanolamine should always be washed or thoroughly wetted with water and then disposed of in closed, water-saturated containers, consistent with governmental requirements.

For more information, see the relevant Safety Data Sheet.

**Regulatory Information**

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of DOW™ monoethanolamine. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Technical Data Sheet, or Contact Us.

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Additional Information

- Safety Data Sheet: http://www.dow.com/webapps/msds/msdssearch.aspx
- Contact Us: http://www.dow.com/amines/contact/index.htm
- International Uniform Chemical Information Database (IUCLID) Data Set MEA, ID: 141-43-5, May 18, 2005

For more business information about DOW™ monoethanolamine, visit the Dow Amines web site at http://www.dow.com/amines/.

References

3. Monoethanolamine Technical Data Sheet, The Dow Chemical Company, Form No. 111-01410-1204
5. Monoethanolamine Safety Data Sheet, The Dow Chemical Company, No.1591
13. Ethanolamines Storage and Handling, The Dow Chemical Company, Form No. 111-01374-0103

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