Product Safety Assessment

DOW™ N-Methyldiethanolamine

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Names
- CAS No. 105-59-9
- DOW™ N-methyldiethanolamine
- 2,2′-methyliminodiethanol
- DOW MDEA GT Grades
- MDEA
- Alkyl alkanolamine

Product Overview
- DOW™ N-methyldiethanolamine (MDEA) is an alkyl alkanolamine. It is a colorless to yellow liquid tertiary amine compound with an ammonia-like odor. It combines the characteristics of amines and alcohols to undergo reactions typical of both.1,2 See Product Description.
- DOW N-methyldiethanolamine is used as an intermediate in the synthesis of numerous products, including coatings, textile lubricants, polishes, detergents, pesticides, personal-care products, and pharmaceuticals.1 See Product Uses.
- DOW N-methyldiethanolamine should be used and stored in closed systems. Workplace exposure could occur at a manufacturing site or facilities using N-methyldiethanolamine to manufacture other products. Consumer exposure to DOW N-methyldiethanolamine is unlikely because it is sold only for industrial use.3 See Exposure Potential.
- Contact with N-methyldiethanolamine can result in severe eye and skin burns. Inhalation may cause upper respiratory tract irritation and can be fatal. If swallowed, N-methyldiethanolamine causes burns of the mouth and throat. N-Methyldiethanolamine may be harmful if absorbed through the skin.2 See Health Information.
- DOW N-methyldiethanolamine is readily biodegradable, and its bioconcentration potential is low. Releases to the environment would not persist and would degrade rapidly. The potential for mobility in soil is very high. N-Methyldiethanolamine is slightly toxic to aquatic organisms on an acute basis. See Environmental Information.
- DOW N-methyldiethanolamine is stable under recommended storage conditions. Avoid contact with nitrites, strong acids, and strong oxidizers. N-Methyldiethanolamine can react with various halogenated organics, resulting in temperature and/or pressure increases. It is corrosive when wet. Heating above 60°C (140°F) in the presence of aluminum can result in corrosion and generation of flammable hydrogen gas.2 See Physical Hazard Information.
Manufacture of Product

- **Capacity** – Dow is the leading producer of ethylene oxide and alkylalkanolamines, with production facilities in Seadrift, TX; Taft, Louisiana; and Plaquemine, Louisiana.
- **Process** – DOW™ N-methyldiethanolamine is produced by the reaction between ethylene oxide and methylamine as shown below.

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\begin{align*}
2 \text{H}_3\text{C}\text{-CH}_3 + \text{H}_3\text{C}-\text{N}\text{H} &\rightarrow \text{H}_3\text{C-N}\text{CH}_2\text{CH}_2\text{OH} \\
&\text{Ethylene Oxide} &\text{Methylamine} &\text{N-Methyldiethanolamine}
\end{align*}
\]

Product Description

DOW™ N-methyldiethanolamine (MDEA) is a colorless to yellow liquid tertiary amine compound with an ammonia-like odor. It is completely soluble in water. N-Methyldiethanolamine combines the chemical characteristics of both amines and alcohols so that it is capable of undergoing reactions typical of both alcohols and amines: forming quaternary amine salts, soaps, and esters.

Dow sells a variety of grades of MDEA, including:
- DOW MDEA commercial grade
- DOW MDEA aqueous solutions
- DOW MDEA GT grades that are specially formulated for gas treatment

Product Uses

DOW™ N-methyldiethanolamine is used as an intermediate in the synthesis of numerous products. Its unique chemistry has resulted in its use in diverse areas, including coatings, textile lubricants, polishes, detergents, pesticides, personal-care products, pharmaceuticals, urethane catalysts, and water-treatment chemicals. DOW N-methyldiethanolamine is also used in gas treatment.

Exposure Potential

Based on the uses for DOW™ N-methyldiethanolamine, the public could be exposed through:
- **Workplace exposure** – Exposure can occur either in a N-methyldiethanolamine manufacturing facility or in the various industrial or manufacturing facilities that use this material. DOW N-methyldiethanolamine is produced, distributed, stored, and consumed in closed systems. Those working with N-methyldiethanolamine in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. 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. See Health Information.
- **Consumer exposure to products containing DOW N-methyldiethanolamine** – DOW N-methyldiethanolamine is not sold for direct consumer use. This product is for industrial use only. See Health Information.
- **Environmental releases** – In the event of a spill, only trained and properly protected personnel should be involved in clean-up operations. The focus is on containing the spill to prevent contamination of soil and surface or ground water. Absorb small spills with noncombustible materials such as sand, clay, and vermiculite. Collect in suitable and properly
labeled containers. This material degrades rapidly and would not persist in the environment. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, evacuate personnel upwind and keep personnel out of low areas. Eliminate all sources of ignition in the vicinity of spill or released vapor to avoid fire or explosion. Ground and bond all containers and handling equipment. Ventilate the area. Contain the spilled material if possible. Pump recovered material into suitable and properly labeled containers. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Use water fog or fine spray, dry-chemical or carbon-dioxide fire extinguishers, or foam. Alcohol-resistant foams are preferred. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Burning liquids may be extinguished by diluting with water, but use of a direct water stream may spread the fire. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Avoid contact with N-methyldiethanolamine during firefighting operations. If contact is likely, firefighters should wear chemical-resistant clothing. During a fire, smoke may contain the original material in addition to combustion products that may be toxic and/or irritating, such as nitrogen oxides, carbon monoxide, and carbon dioxide. Prevent material from entering soil, ditches, sewers, waterways, and/or groundwater. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

### Health Information

**Eye contact** – Contact may cause severe irritation with chemical burns and corneal injury, which may result in permanent impairment of vision, even blindness.

**Skin contact** – Prolonged contact may cause moderate irritation with local redness. Repeated contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage. Contact may cause a more severe response if the skin is abraded (scratched or cut) or covered (under clothing, gloves). However, prolonged skin contact is unlikely to result in absorption of harmful amounts.

**Inhalation** – At room temperature, exposure to vapor is minimal due to its low volatility. However, if the material is heated, or an aerosol or mist is produced, concentrations may be attained that are sufficient to cause respiratory irritation.

**Ingestion** – This material has a low toxicity if swallowed. However, swallowing may result in burns of the mouth and throat, nausea or vomiting, abdominal discomfort, or diarrhea, as well as gastrointestinal irritation or ulceration. Aspiration into the lungs may occur during ingestion or vomiting, causing tissue damage or lung injury.

**Other** – In animal studies, exposure to N-methyldiethanolamine did not cause birth defects or other effects in the fetus, even at doses that caused toxic effects in the mother. *In vitro* and animal genetic toxicity studies have been negative. Do not use sodium nitrite or other nitrosating agents in formulations containing this product. Suspected cancer-causing nitrosamines could be formed.

For more information, see the relevant Safety Data Sheet.
Environmental Information

DOW™ N-methyldiethanolamine is readily biodegradable, and its bioconcentration potential (tendency to accumulate in the food chain) is low. The potential for mobility in soil is very high. As a result, it would be expected to partition toward water and would not be expected to persist in the environment. N-Methyldiethanolamine is slightly toxic to aquatic organisms on an acute basis.

For more information, see the relevant Safety Data Sheet.

Physical Hazard Information

Store DOW™ N-methyldiethanolamine in a dry place. It is corrosive when wet. Do not store this material in copper, copper alloys, or galvanized containers. Heating above 60°C (140°F) in the presence of aluminum can result in corrosion and generation of flammable hydrogen gas.

DOW N-methyldiethanolamine is stable under normal storage and use conditions, but elevated temperatures can cause it to decompose. Decomposition products depend upon temperature, air supply, and the presence of other materials. Avoid contact with nitriles, strong acids, and strong oxidizers. Avoid unintended contact with halogenated hydrocarbons. N-methyldiethanolamine can react with halogenated organics, resulting in temperature and/or pressure increases.

Spills of N-methyldiethanolamine on hot fibrous insulations may reduce the autoignition temperature, increasing the potential for spontaneous combustion.

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™ N-methyldiethanolamine. These regulations may vary by city, state, country, or geographic region. Information is available from the relevant Safety Data Sheet, Technical Data Sheet, or Contact Us.

Additional Information

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/amines/contact/index.htm)
- **Alkyl Alkanolamines**, The Dow Chemical Company, Form No. 111-01376 (http://www.dow.com/amines/lit/index.htm)
- **Ethanolamines Storage and Handling**, The Dow Chemical Company, Form No. 111-01374 (http://www.dow.com/amines/lit/ethano-lit.htm)

For more business information about DOW™ N-methyldiethanolamine, visit the Dow Amines web site at www.dow.com/amines.
References

1. Dow™ N-Methyldiethanolamine (MDEA) Technical Data Sheet, The Dow Chemical Company, Form No. 111-01407-1104 AMS
2. N-Methyldiethanolamine (MDEA) Material Safety Data Sheet, The Dow Chemical Company
3. Alkyl Alkanolamines, The Dow Chemical Company, Form No. 111-01376-303 AMS
4. Ethanolamines, The Dow Chemical Company, Form No. 111-01375-0103 AMS
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