Product Safety Assessment

*Methacrylic Acid*


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**Names**

- CAS No. 79-41-4
- Methylacrylic acid
- Glacial methacrylic acid
- GMAA
- MAA
- 2-Propenoic acid, 2-methyl
- 2-Propenoic acid, α-methyl
- EC No. 201-204-4
- Methacrylic acid
- α-Methacrylic acid
- α-Methyl acrylic acid
- 2-Methacrylic acid
- 2-Methylpropenoic acid

**Product Overview**

- Methacrylic acid is a clear, colorless liquid at room temperature with a pungent, irritating odor. It is completely soluble in water and soluble in most organic solvents.\(^1\) For further details, see Product Description.
- Most DOW™ methacrylic acid is used as an intermediate in the production of methacrylic acid esters, which are used to produce a variety of plastic products.\(^2\) For further details, see Product Uses.
- Exposure to methacrylic acid can occur either in a manufacturing facility or in the various industrial or manufacturing facilities that use this material. It is produced, distributed, stored, and consumed in closed systems. Consumer exposure is unlikely.\(^2\) For further details, see Exposure Potential.
- Eye contact with methacrylic acid may cause severe irritation and permanent eye injury. Skin contact can cause severe irritation and tissue damage. Although the oral toxicity of methacrylic acid is considered low, swallowing is likely to result in irritation and/or chemical burns to the mouth and throat. Inhalation may cause irritation or lesions of the nose, throat, and lungs, but is not acutely toxic. In animal testing, prolonged or repeated overexposure resulted in irritation to the nasal tract epithelium and damage to olfactory epithelium as well as potential adverse effects on the liver and kidneys.\(^1,2\) For further details, see Health Information.
- Methacrylic acid has a low potential for bioconcentration (tendency to accumulate in the food chain) and its potential for mobility in soil is high. If released to the environment, more than 95% will partition into water. Methacrylic acid will not persist in the environment. It is readily biodegradable and will be removed by common wastewater-treatment processes. This
Material is considered moderately toxic to aquatic organisms.\textsuperscript{1,2} For further details, see Environmental Information.

- Methacrylic acid is a reactive chemical that must be stored and handled with care. It is stable under recommended storage conditions. Inhibitor is added to this product to prevent uncontrolled polymerization. For the inhibitor to be effective the oxygen concentration in the vapor space must be at least 5%. Avoid contact with acids, bases, oxidizing agents, reducing agents, UV light (sunlight), free-radical initiators, organic peroxides, and mild steel. Avoid excessive heat.\textsuperscript{1,3} For further details, see Physical Hazard Information.

Manufacture of Product\textsuperscript{2,4}

- **Capacity** – The Dow Chemical Company produces methacrylic acid in facilities at Deer Park, Texas, USA.
- **Process** – Methacrylic acid is produced via the acetone cyanohydrin route involving hydrolysis of methacrylamide sulfate.

Product Description\textsuperscript{1}

Methacrylic acid is a clear, colorless liquid at room temperature with a pungent, irritating odor. It is completely soluble in water and soluble in most organic solvents. It is typically greater than 98% pure, with various methacrylic ester compounds as the major impurities. DOW methacrylic acid also contains low levels of an inhibitor to prevent polymerization during shipment and storage.

Product Uses\textsuperscript{2}

Methacrylic acid and its esters are versatile chemicals with widespread use. Most methacrylic acid is used as an intermediate in the production of methacrylic acid esters, especially ethyl and higher methacrylates. These in turn are used as co-monomers to produce a variety of plastic products.

Other uses include:
- As a comonomer that adds functional properties to latex paint, adhesive, and textile formulations
- In reactive adhesives in which methacrylic acid monomer reacts to cure the adhesive
- In solid coatings and specialty polymers

Exposure Potential\textsuperscript{1,2,3}

DOW\textsuperscript{TM} methacrylic acid is used in the production of industrial and consumer products. Based on the uses for this material, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in a methacrylic acid manufacturing facility or in the various industrial or manufacturing facilities that use this material. The most likely route of exposure is by direct contact or inhalation. It is produced, distributed, stored, and consumed in closed systems. Those working with methacrylic acid 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 exposure. See Health Information.
Consumer exposure to products containing DOW methacrylic acid – Dow does not sell methacrylic acid for direct consumer use, but it is used to make products used by consumers. Residual levels of methacrylic acid in consumer products would be very low and significant contact is unlikely. Always read the product information before use and follow the label/use instructions. Acrylic and methacrylic polymers are used safely in a wide variety of personal-care and hygiene products. Dow does not sell methacrylic acid for artificial fingernail (acrylic nail) applications, dental adhesives, dental restoration, dental prosthetics, surgical implants, or for any application that would result in implantation or prolonged contact within the human body. See Health Information.

Environmental releases – If released into the environment, methacrylic acid would migrate through soil and partition into water, where it would biodegrade readily. It would not persist in the environment and would biodegrade in typical wastewater-treatment processes. In the event of a spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. Respiratory protection is necessary for cleaning up spills and leaks. For small spills, methacrylic acid should be absorbed with materials such as sand or earth. This material is considered moderately toxic to aquatic organisms on an acute basis. 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 with sand or earth, collected, and reprocessed or disposed of according to applicable governmental requirements. Wear approved self-contained breathing apparatus (SCBA) and appropriate protective clothing. This material is combustible. Eliminate all sources of ignition. Use explosion-proof safety and handling equipment during product recovery; ground and bond all containers and handling equipment. Transfer liquids and solid diking material to separate suitable containers for recovery or disposal. Contaminated monomer may be unstable. Add inhibitor to prevent polymerization. Absorbent can act as a contaminant or remove inhibitor from liquid monomer. Avoid freestanding monomer with absorbent and add inhibitor to stabilize against polymerization. See Environmental, Health, and Physical Hazard Information.

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 foam is preferred. Use of a direct water stream may spread the fire. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Heat can cause polymerization with the release of more heat. Immediately withdraw all personnel from the area in case of rising sounds from venting safety device or discolorations of the container. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

Health Information¹,²

Eye contact – Contact with liquid, vapor, or mist may cause severe irritation and permanent eye injury.

Skin contact – Contact can cause severe irritation and tissue damage. There is no evidence that contact with methacrylic acid results in skin sensitization (allergic reaction upon repeated contact).

Ingestion – The oral toxicity is considered low. This material may be harmful if swallowed. Swallowing is also likely to result in irritation and/or chemical burns to the mouth and throat.

Inhalation – Inhalation of vapor or mist may cause irritation or lesions of the nose, throat, and lungs, but is not acutely toxic.

¹³⁶
Repeated exposure – In animal tests, prolonged or repeated overexposure resulted in irritation to the nasal tract epithelium and damage to olfactory epithelium as well as potential adverse effects on the liver and kidneys.

Other – Mutagenicity tests have been negative, and based on results from similar compounds there is no concern that this material causes cancer. Likewise, based on test results for methacrylic acid and similar compounds there is no concern for developmental or reproductive toxicity.

For more information, see the relevant Safety Data Sheet.

Environmental Information

Because of its low molecular weight and high water solubility, methacrylic acid has a low potential for bioconcentration (tendency to accumulate in the food chain) and its potential for mobility in soil is high. If released to the environment, more than 95% will eventually partition into water. A small amount may stay airborne. Methacrylic acid will not persist in the environment. It is readily biodegradable, which suggests it will be completely removed from water and soil, and will be removed by common wastewater-treatment processes.

This material is considered moderately toxic to aquatic organisms on an acute basis.

For more information, see the relevant Safety Data Sheet.

Physical Hazard Information

Methacrylic acid is a reactive chemical that must be stored and handled with care. It is stable under recommended storage conditions. This product contains an inhibitor to stabilize it against polymerization during shipment and storage. The effectiveness of this inhibitor is dependent on the presence of dissolved oxygen. To maintain sufficient dissolved oxygen in the liquid, the monomer must be stored with an oxygen concentration of 5% or more in the vapor space. Do not store this material in an oxygen-free environment. Hazardous polymerization could occur not only by depletion of inhibitor or lack of sufficient oxygen, but by overheating, thawing frozen material improperly, or the presence of chemical contaminants. An uncontrolled polymerization (chemical reaction) may produce a rapid release of energy with the potential of an explosion of closed containers. Store this material out of direct sunlight.

Avoid contact with acids, bases, oxidizing agents, reducing agents, UV light (sunlight), free-radical initiators, organic peroxides, and mild steel. Avoid excessive heat.

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™ methacrylic acid. 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.
Additional Information

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (www.dow.com/assistance/thoughts.htm)
- Methacrylates Producers Association, Inc. web site (www.mpausa.org/index.html)

For more business information about DOW™ methacrylic acid, visit the Methacrylate Monomers web site at http://www.dow.com/monomers/.

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References

1 Glacial Methacrylic Acid Material Safety Data Sheet, The Dow Chemical Company.
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