METHACRYLATE PRODUCERS ASSOCIATION, INC.

GLOBAL PRODUCT SAFETY SUMMARY
METHACRYLIC ACID

(Last Updated: 9/27/19)
Disclaimer

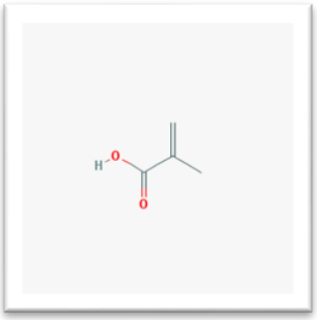
SUBSTANCE NAME

Methacrylic Acid

GENERAL STATEMENT

Undiluted or glacial methacrylic acid (MAA) is produced for use by industry as an intermediate for the manufacture of methacrylic acid esters, methacryl amides, methacrylamide, methacryl amides and acryloyl chloride; and as a building block to make a wide range of polymer-based products that we see and use every day including paints, varnishes, surface coatings, ion exchange resins, flocculants, soil improvers, as an interlevant during glass manufacture, and in auxiliary products for the leather and textile industry, , to name but a few. Liquid MAA monomer is also used in self-etch primer/adhesives in medical, dental and cosmetic applications. MAA is of moderate concern to human health and the environment due to its corrosive properties. It is classified as hazardous (irritating to corrosive upon contact (skin, eyes and respiratory system) depending upon the concentration; harmful when inhaled or ingested, toxic (by skin contact) and harmful to aquatic life) but has been handled safely by industry and professionals for over 60 years. MAA-based polymers are inert in the environment and can be recycled, but more typically, are used for energy recovery.

CHEMICAL IDENTITY

Name:	Methacrylic Acid
Synonym:	2-Methacrylic Acid
CAS name:	2-Propenoic acid, 2-methyl-
CAS number(s):	79-41-4
IUPAC name:	2-Methylprop-2-enoic acid
Molecular formula:	$C_4H_6O_2$ 

USES AND APPLICATIONS

MAA is produced for use by industry as monomer for the production of polymers and as a reactant for the synthesis of other methacrylate esters. MAA is manufactured in industrial settings in closed systems and used by industry for manufacture of polymers in closed and semi-closed systems. Downstream use of MAA is almost exclusively in the form of polymer although there are medical, dental, cosmetic, and potentially consumer uses as self-etch primer and adhesives.

PHYSICAL/CHEMICAL PROPERTIES

The following table includes information which refers to testing performed with the concentrated (liquid) monomer substance. It is not intended to be comprehensive or to replace information found in the Safety Data Sheet (SDS). A SDS may be obtained from one of the manufacturers.

Property	Value
Physical state	Liquid
Color	Colorless
Odor	Pungent
Density	1.0141 g/cm^3 at 20°C
Melting/Freezing point	15.4-15.5 °C
Boiling Point	162 °C at 1013 hPa
Flammability	Combustible Liquid
Explosive properties	Not explosive
Self-ignition temperature	400 °C
Vapor Pressure	0.97 hPa at 20 °C
Molecular Weight	86.08
Water solubility	9800 mg/L at 20 °C
Flash point	67 °C at 1013 hPa
Octanol-water partition coefficient (Log Kow)	0.93 at 22 °C

HUMAN HEALTH SAFETY ASSESSMENT

Information for the general population and consumers handling products made with methacrylic acid.

Consumer
The majority of MAA is converted to polymers before being used in consumer products. Therefore, exposure to MAA in these products is unlikely. Non-professional, consumer use of self-etch primer or adhesives containing concentrated methacrylic acid is possible, but this is not recommended since the material is corrosive and consumers may not use personal protective equipment, even if recommended. See table below for more information.

Worker
Workers may come into contact with MAA during manufacture and during production of polymer products. Medical, dental, and cosmetic professionals may come into contact with MAA during use of primers or adhesives containing liquid MAA. Direct contact with MAA could produce skin or eye corrosion or irritation depending upon the concentration of MAA. Repeated contact with less concentrated solutions could lead to skin irritation (dermatitis). Inhalation of high levels of vapors may irritate the respiratory system.

The following table includes information for someone handling the concentrated (liquid) monomer substance. The data, while verifiable, are not intended to be comprehensive nor replace the information found in the SDS.

Effect Assessment	Result
Acute Toxicity	MAA causes severe adverse local effects at the site of application, depending on the concentration and frequency or time of exposure. Undiluted MAA may have moderate to high toxicity after acute oral, dermal and inhalation exposure
Irritation	Causes irritation/corrosion to the skin, eyes and respiratory system.
Sensitisation	Not sensitizing by skin contact. Click here for a technical summary By weight of evidence, does not cause asthma.
Mutagenicity	Not mutagenic. Click here for a technical summary. No evidence of carcinogenicity. Click here for a technical summary.
Toxicity after repeated exposure	MAA causes damage to mucous membranes of the nose and respiratory tract when inhaled. Other effects in the body are non-specific.
Toxicity for reproduction	Does not harm reproduction or cause birth defects at levels that are not toxic to the mothers. Click here for a technical summary.

ENVIRONMENTAL SAFETY ASSESSMENT

Based on available data, MAA is of moderate toxicity to aquatic organisms. MAA is fully and rapidly biodegradable. While MAA is not intentionally released during manufacturing processes and use, any MAA released to air or trace amounts present in waste water streams would rapidly disappear by chemical and biological degradation. MAA does not possess significant ozone depletion potential.

The following tables include information for testing performed with the concentrated (liquid) monomer substance. Additional information may be obtained from the SDS supplied by the manufacturer.

Effect Assessment	Result
Aquatic Toxicity	Moderately toxic to aquatic organisms on an acute basis.

Fate and behaviour	Result
Biodegradation	Readily biodegradable
Bioaccumulation potential	Not bioaccumulative
PBT / vPvB conclusion*	Does not meet criteria for PBT or vPvB classification.
Environmental impact	Unlikely to persist in, or have significant impact on the environment. Click here for a technical summary.

* Persistent/Bioaccumulative/Toxic (PBT) very Persistent-very Bioaccumulative (vPvB)

EXPOSURE

Consumer

Consumer exposure to MAA is generally limited to products containing polymers made with MAA. These polymers contain extremely low levels of residual monomer. Consumer exposure to liquid monomer is therefore unlikely. Use of self-etch primer/adhesives in medical and dental applications might involve direct skin and/or nail contact with the liquid monomer. Direct skin and/or nail contact in cosmetic (artificial nails) uses is unavoidable, and such use is not recommended.

Worker

MAA is produced in essentially closed systems; therefore, significant worker exposure during manufacture is unlikely. Workers may come into contact with MAA during polymer production or during the production and professional use of MAA-based primers and adhesives.

RISK MANAGEMENT RECOMMENDATIONS

Consumer

For consumer use of products containing MAA-based polymers, risk management measures relating to the very low MAA residues in those polymers are not indicated. Any applications involving direct skin and/or nail contact with the liquid monomer that is not under the direct supervision of a medical or dental professional are not recommended (for further reference, see MPA's policy regarding the use of MAA in artificial nails).

Worker

As for any substance, workers should follow the recommended safety measures as provided by the manufacturer in the Safety Data Sheet. Considering the skin, eye irritating/corrosion as well as respiratory tract irritation properties of MAA, risk management measures typically will include avoiding skin contact or the wearing of suitable protective gloves and protective eyewear, and avoiding inhalation of high concentrations of vapor by use of one or more of the following: engineering controls, good general ventilation or personal protective (respiratory) equipment, depending upon the particular use conditions.. Use of self-etch primer or adhesives in professional medical and dental applications are regulated by the FDA, and all applicable safety regulations and protective measures should be followed.

REGULATORY INFORMATION / CLASSIFICATION AND LABELLING

This substance is subject to a number of federal and international statutes and regulations. Selected U.S. regulatory information is available on the MPA website. Other federal, state and local regulations may apply.

This substance has been registered under EU chemical control law known as REACH (Registration, Evaluation, Authorisation and Restriction of Chemical substances), and is listed on various chemical inventories. It has been reviewed under the OECD SIDS (Screening Information Data Set) program.

While the toxicological data are not specific to a particular region, the regulatory frameworks differ between countries and regions. The Global Harmonized System (GHS) attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use. Under the GHS, substances are classified according to their physical, health, and environmental hazards.

Note: The hazard statements and symbols presented here refer to the hazard properties of the concentrated substance and are meant to provide a brief overview of the labelling for the substance. It is not intended to be comprehensive or to replace information found in the SDS.

Classifications:

- Flammable liquid: Category 4
- Acute Toxicity: Category 3 (respiratory system)
- Acute Toxicity: Category 4
- Skin Corrosive: Category 1A*
- STOT single exposure: Category 3
- Aquatic acute: Category 3

* Specific concentration limits:
Skin irritation: Category 1 (>=3.0%-<10.0%); Category 2a (>=1.0%-<3.0%)
Skin irritation: Category 2 (>=1.0%-<10.0%); Category 1a (>=10.0%)

Labelling
Signal word: Danger
Hazard pictogram:
GHS06: acute toxicity

GHS05: corrosion

Hazard statements:
H227: Combustible liquid
H302: Harmful if swallowed
H311: Toxic in contact with skin.
H314: Causes severe skin burns and eye damage.
H332: Harmful if inhaled.
H335: May cause respiratory irritation.
H402: Harmful to aquatic life

ADDITIONAL INFORMATION

Information on registered substance (ECHA)
https://echa.europa.eu/registration-dossier/-/registered-dossier/15411/2/1

EU Risk Assessment
https://echa.europa.eu/documents/10162/f0b94b4b-a87b-442b-b647-8ff56895c92c

OECD High Production Volume (HPV) SIDS
https://hpvchemicals.oecd.org/ui/SIDS_Details.aspx?id=5495e306-d9ff-4847-9847-35f746088671

CONTACT

For further information on this substance or product safety summaries in general, please contact MPA. Click on the logos below to go to the company's website.

Glossary

Acute toxicity - harmful effects after a single exposure
Bioaccumulation - accumulation of substance in an organism
Biodegradation- chemical breakdown of substances by a physiological environment
Carcinogenicity - effects causing cancer
Concentrated - Non-formulated undiluted substance
ECHA – European Chemicals Agency
EU - European Union
GHS - Global Harmonized System
Hazard - situation bearing a threat to health and environment
HPV - High Production Volume
IUPAC – International Union of Pure & Applied Chemistry
Log Kow - Log Octanol-Water Partitioning Coefficient
Mutagenicity - effects that change genes
PBT/ vPvB - Persistent, Bioaccumulative and Toxic/very Persistent and very Bioaccumulative
OECD-Organisation for Economic co-operation and Development
REACH - Registration, Evaluation, Authorisation and Restriction of Chemical substances
SDS - Safety Data Sheet
Sensitizing - causes allergies
SIDS - Screening Information Data set
STOT – Specific Target Organ Toxicity

Disclaimer

This document is not intended to be comprehensive. It is provided solely as background information and should not substitute for an up-to-date Safety Data Sheet or research should specific regulatory or other legal questions arise. It is not intended to be a statement of legal requirements when using or handling acrylates. Although the information is believed to be accurate as of the last update, new information may become available and regulations frequently change, and no warranty, expressed or implied, is made concerning the contents. In addition, many states and localities adopt their own regulations, which are not covered by this summary or on the MPA website. In all events, the user should consult applicable laws and regulations, as well as their supplier's Safety Data Sheet, for current information and requirements. **NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY, OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE CONCERNING THE INFORMATION PROVIDED HEREIN.**