

METHACRYLATE PRODUCERS ASSOCIATION, INC.

GLOBAL PRODUCT SAFETY SUMMARY: BUTYL AND I-BUTYL METHACRYLATE

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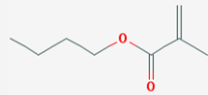
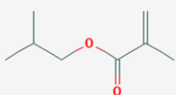
SUBSTANCE NAME

n-Butyl Methacrylate, iso-Butyl Methacrylate

GENERAL STATEMENT

n-Butyl methacrylate (n-BMA) and iso-butyl methacrylate (i-BMA) are produced for use as building blocks to make a wide range of polymer-based products that we see and use every day from paints and coatings, toners and inks, oil additives to dental and medical products to name but a few. Because of the similarity of the two isomers in structure and properties, a single summary has been provided for both chemicals. n-BMA and i-BMA in their current uses are chemicals of low concern to human health and the environment. Both are classified as hazardous (flammable, irritant to skin and respiratory system and sensitizing and toxic (n-BMA)/harmful (i-BMA) to aquatic life). However, these substances have been handled safely by industry and professionals for over 60 years. n-BMA and i-BMA-based polymers are inert in the environment and can be recycled, but more typically, are used for energy recovery.

CHEMICAL IDENTITY

Name:	n-Butyl methacrylate (or butyl methacrylate)	iso-Butyl methacrylate
Synonym:	Methacrylic acid, n-butyl ester	Methacrylic acid, i-butyl ester
CAS name:	2-Propenoic acid, 2-methyl-, butyl ester	2-Propenoic acid, 2-methyl-, 2-methylpropyl ester
CAS number:	97-88-1	97-86-9
IUPAC name:	butyl 2-methylprop-2-enoate	2-methylpropyl 2-methylprop-2-enoate
Molecular formula:	$C_8H_{14}O_2$ 	$C_8H_{14}O_2$ 

USES AND APPLICATIONS

n-BMA and i-BMA are produced for use by industry as monomer for the production of polymers. Both are manufactured in industrial settings in closed systems and used by industry for manufacture of polymers in closed and semi-closed systems. Downstream use of n-BMA and i-BMA is almost exclusively in the form of polymer, although some products used by professionals and hobbyists may contain liquid monomer.

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	n-BMA Value	i-BMA Value
Physical state	Liquid	Liquid
Color	Colorless	Colorless
Odor	Pungent	Pungent
Density	0.89 g/cm ³ at 20°C	0.88 g/cm ³ at 25°C
Melting point	-50 °C at 1013 hPa	-35 °C at 1013 hPa
Boiling point	163 °C at 1013 hPa	155 °C at 1025 hPa
Flammability	Flammable	Flammable
Explosive properties	Not explosive	Not explosive
Self-ignition temperature	294 °C	385 °C
Vapor Pressure	2.12 hPa at 20 °C	2.11 hPa at 20 °C
Molecular Weight	142.2	142.2
Water solubility	360 mg/L at 25 °C	470 mg/L at 20°C
Flash point	48.5 °C at 1013 hPa	42.5 °C at 1013 hPa
Octanol-water partition coefficient (Log Kow)	3 at 25 °C	2.95 at 20°C

HUMAN HEALTH SAFETY ASSESSMENT

Information for the general population and consumers handling products made with n-butyl and i-butyl methacrylate.

Consumer

The majority of BMA is converted to polymers before being used in consumer products. Since these polymers typically contain extremely low levels of residual monomer, exposure to liquid BMA is unlikely. Some professional/DIY and hobbyist products may contain liquid n-BMA or i-BMA monomer. Direct skin contact with liquid monomer could produce skin irritation, and repeated contact could lead to skin sensitization (allergy or dermatitis). Inhalation of high levels of vapors may irritate the respiratory system.

Worker

BMAs are produced in essentially closed systems so that significant worker exposure during monomer manufacture is unlikely. Workers may come into contact with n-BMA or i-BMA during polymer production and professional use of products containing liquid monomer. The health effects following skin contact or inhalation of the vapors would be the same as for the consumer.

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	Low toxicity after acute oral, dermal and inhalation exposure.
Irritation	Causes irritation to the skin and respiratory system. Not irritating to the eyes.
Sensitisation	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	By prolonged inhalation n-BMA or i-BMA may cause damage to the part of the nose responsible for detection of smell. 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, n-BMA and i-BMA are of low to moderate toxicity to aquatic organisms. Both are fully and rapidly biodegradable. While they are not intentionally released during manufacturing processes and use, any BMA isomer released to air or trace amounts present in wastewater streams would rapidly disappear by chemical and biological degradation. The BMA isomers do 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	Toxic (n-BMA)/harmful (i-BMA) to aquatic life.

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 n-BMA and i-BMA is generally limited to products containing polymers made with n-BMA and i-BMA. These polymers contain extremely low levels of residual monomer. Exposure of consumers to liquid monomer is therefore unlikely, unless they use one of the few professional, DIY or hobbyist products that contain significant levels of liquid monomer. In that case, exposure can occur if consumers have direct skin and/or nail contact with the liquid monomer. In addition, inhalation of vapors may be unintentional or unavoidable when using such products.

Worker

n-BMA and i-BMA are produced in essentially closed systems; therefore, significant worker exposure during manufacture is unlikely. Workers may come into contact with n-BMA or i-BMA during polymer production and professional use of products containing liquid monomer.

RISK MANAGEMENT RECOMMENDATIONS

Consumer

For consumer use of products containing n- or i-BMA-based polymers, risk management measures relating to the very low BMA residues in those polymers are not indicated. Use of professional, DIY and hobbyist products that contain liquid n-BMA or i-BMA monomer will require the user to follow the guidance provided by the product manufacturer on the packaging or product label. This will depend upon the product composition, but may include recommendations to avoid skin contact (to prevent skin irritating/sensitizing properties) and to provide good general ventilation (to prevent irritation of the respiratory system by high concentrations of the vapors) when handling the uncured (liquid, unpolymerized) product. To avoid clogging of drains and unintentional exposures, uncured (liquid, unpolymerized) product should not be poured down the drains or disposed of in domestic waste. 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 methacrylates 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 irritating and sensitizing properties of BMAs, this typically will include avoiding skin contact or the wearing of suitable protective gloves 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.

REGULATORY INFORMATION / CLASSIFICATION AND LABELLING

These substances are 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.

These substances have been registered under the EU chemical control law known as REACH (Registration, Evaluation, Authorisation and Restriction of Chemical substances), and are listed on various chemical inventories. They have 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.

Classification: n-Butyl- and iso-butyl methacrylate are classified as follows:

- Flammable liquid: Category 3
- STOT single exposure: Category 3 (respiratory system)
- Skin corrosion/irritation: Category 2
- Skin Sensitization: Category 1B

For environmental, aquatic effects the following classification applies:

- n-butyl methacrylate: Aquatic acute: Category 2 (Not used in some countries including USA and EU)
- iso-butyl methacrylate: Aquatic acute: Category 3 (Not used in some countries including USA and EU)

Labelling

Signal word: Danger

Hazard pictogram:

GHS02:



GHS07: exclamation mark



Hazard statements (for both, n-butyl and iso-butyl methacrylate):

H226: Flammable liquid and vapour.

H315: Causes skin irritation.

H317: May cause an allergic skin reaction.

H335: May cause respiratory irritation.

n-BMA - H401: Toxic to aquatic life (Not used in some countries including USA and EU)

i-BMA - H402: Harmful to aquatic life (Not used in some countries including USA and EU)

ADDITIONAL INFORMATION

Information on registered substance (ECHA):

- **n-Butyl Methacrylate:**
<https://echa.europa.eu/registration-dossier/-/registered-dossier/15151>
- **iso-Butyl Methacrylate:**
<https://echa.europa.eu/registration-dossier/-/registered-dossier/14969>

OECD High Production Volume (HPV) SIDS

- **n-Butyl Methacrylate:**
https://hpvchemicals.oecd.org/ui/SIDS_Details.aspx?id=98b6bb52-f74f-46d6-a226-6306bc51d20b
- **iso-Butyl Methacrylate:**
https://hpvchemicals.oecd.org/ui/SIDS_Details.aspx?id=197cccaa-569c-4a3d-b49f-2c0b1135fd37

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.**