Product Safety Summary
Methyl Acrylate

This Product Safety Summary is intended to provide a general overview of the chemical substance. The information on the Summary is basic information and is not intended to provide emergency response information, medical information or treatment information. The summary should not be used to provide in-depth safety and health information. In-depth safety and health information can be found on the Material Safety Data Sheet (MSDS) for the chemical substance.

Chemical Identity

Abbreviation:	MAM
CAS Number:	96-33-3
Formula:	CH_2=CHCOOCH$_3$
Common Names:	Methyl 2-Propenoate Acrylic Acid, Methyl Ester

Product Overview

- Methyl acrylate is a highly reactive material and will readily polymerize if not properly controlled by inhibitors.
- Methyl acrylate is an important chemical building block in a wide variety of acrylic polymers and resins. These polymers and resins are used in coatings, paints, adhesives, plastics, textiles and many other applications.
- Like any reactive chemicals, methyl acrylate products can create hazards if handled carelessly. All persons associated with the transportation, storage or handling of methyl acrylate must understand the hazards. This includes training in the recommended normal and emergency handling procedures.
- The primary hazards with methyl acrylate are from contact of the skin or inhalation of its vapors. Airborne limits have been established for methyl acrylate vapor concentrations in the work environment. The American Conference of Governmental Industrial Hygienists (ACGIH) has a threshold limit value (TLV) of 2 ppm for an eight hour time-weighted average basis with a skin notation. Occupational Health and Safety Administration (OSHA) has a permissible exposure limit (PEL) of 10 ppm for an eight hour time-weighted average, with skin notation. In animal studies, the irritation caused by repeated exposure to methyl acrylate vapor has resulted in nasal lesions. Methyl acrylate has been shown to cause allergic skin reactions in sensitized individuals. Animal exposure studies have not indicated that Methyl acrylate poses a cancer hazard.
- For further safety and health information, the current Material Safety Data Sheet (MSDS) should be used for this substance.

Physical/Chemical Properties

- Methyl acrylate is a clear, colorless liquid that has an acrid odor.
- The specific gravity of Methyl acrylate is 0.95 and is lighter than water. Methyl acrylate is slightly soluble in water and is freely soluble in most organic solvents.
- The Boiling point of Methyl acrylate is 80°C and the Freezing point is less than -76°C. The Flash point of Methyl acrylate is -3°C, by Tag Closed Cup method.

- Methyl acrylate will react with itself and a wide variety of chemicals. These reactions can generate heat and the reactions can become progressively more vigorous and can be violent. Methyl acrylate can be completely stable when properly inhibited and stored.

Health Information

Acute Hazards

Methyl acrylate is a potentially hazardous material. A thorough knowledge of potential dangers, with strict adherence to recommended safety practices, is essential before methyl acrylate products are handled, stored or used. Workers must be properly instructed and supervised in the handling of methyl acrylate. The primary hazards with methyl acrylate are the inhalation of its vapors. Limits have been established for allowable vapor concentrations in the work environment. ACGIH has a threshold limit value (TLV) of 2 ppm for an eight hour time-weighted average basis, with a skin notation. OSHA has a permissible exposure limit (PEL) of 10 ppm for an eight hour time-weighted average, with skin notation.

Effects on Respiratory System:
Exposure to methyl acrylate mists or vapors at levels above the recommended exposure limits may cause irritation to the respiratory tract. High exposure could result in pulmonary edema. Inhalation of mists or aerosols could result in irritation, drowsiness and headache.

Effects on Eyes:
Methyl acrylate is considered to be an eye irritant and may cause redness and swelling. Contact directly with the eye can result in severe corneal burns and may result in irreversible injury.

Effects on Skin:
Skin contact with methyl acrylate may result in irritation and a mild discoloration. Repeated or prolonged contact may cause redness, swelling, blistering or burns. Methyl acrylate has been shown to cause allergic skin reactions in sensitized individuals.

Effects on Ingestion:
The effects of ingestion include the irritation and burning of the mouth, throat, esophagus and stomach. Methyl acrylate is considered to be moderately toxic by ingestion and may cause nausea, vomiting and abdominal pain. Drink 4 to 8 ounces of water and DONOT induce vomiting.

Chronic Hazards

Methyl acrylate produces toxic effects mainly at the site of contact: nasal lesions if inhaled, skin lesions upon dermal contact, and gastrointestinal effects if Methyl acrylate solutions are swallowed. Overall, long-term studies and the studies for genetic and reproductive effects, indicate that methyl acrylate does not pose a genotoxic or carcinogenic threat, or cause reproductive or developmental effects. The current ACGIH TLV of 2 ppm protects against potential adverse health effects.

Environmental Information

Because of its reactivity, methyl acrylate is generally not persistent in the environment. It disperses via a combination of mechanisms, including biodegradation, oxidation, and volatilization.

In biochemical oxygen demand (BOD) studies, methyl acrylate showed limited biodegradability. Methyl acrylate is also amenable to anaerobic treatment, degrading to about 60% of theoretical methane in acclimated cultures.

Methyl acrylate is low to moderately toxic to aquatic life, but not persistent in aquatic environments, due to rapid oxidation. Large releases can deplete dissolved oxygen.

Methyl acrylates mobility in soil is classified as medium to very high. Compounds with medium mobility may accumulate to some degree in sediments, but undergo significant biodegradation and volatilization, while those of high mobility would pass through soil quickly and not accumulate in sediments.

A variety of federal, state and local regulations govern the release of any material to the land, air or surface waters. Any release or discharge of methyl acrylate must be evaluated in reference to these regulations to determine appropriate response actions and reporting requirements. Methyl acrylate is one of the chemicals for which releases to all environmental media must be annually reported.

A regulation called Resource Conservation and Recovery Act (RCRA) must be followed if a volume of methyl acrylate or material contaminated with methyl acrylate is to be disposed of or discarded. Based on RCRA criteria, methyl acrylate or materials contaminated with methyl acrylate will likely be considered a “Hazardous Waste” upon disposal and will need to follow certain storage, handling and disposal restrictions as outlined in RCRA. Strict adherence to these restrictions as well as proper characterization and labeling of the material is the responsibility of the generator and handler of the waste material.

Emphasis should be placed on the prevention of releases through careful design of equipment and sound operating procedures. If methyl acrylate is lost from containment through a leak or spill, care should be taken to use the proper personal protective equipment, decontamination procedures and other safety considerations. It is important to remember that spills of methyl acrylate and materials contaminated by methyl acrylate must be handled as RCRA hazardous wastes.

Any release of methyl acrylate greater than the “reportable quantity” designated by the EPA in CERCLA or SARA should be reported immediately on discovery to the National Response Center and State Emergency Response Agency (see current MSDS for reportable quantity and pertinent phone numbers).

In the event of accidental spillage of methyl acrylate to surface waters or to a municipal water system, contact the local and state pollution control agencies immediately.

Additional Hazard Information

Methyl acrylate is stable when stored and handled under recommended conditions. Commercially available methyl acrylate is stabilized (inhibited) with hydroquinone monomethyl ether (MEHQ), which prolongs the shelf life. However, this shelf life is reduced exponentially with increasing temperature, so exposure to high temperatures must be avoided.

The polymerization of methyl acrylate can be very violent, evolving considerable heat and pressure and ejecting hot vapor and polymer, which may auto ignite. An explosion hazard exists due to extremely rapid pressure build up. Several case histories are known in which vessels of methyl acrylate exploded due to violent (“runaway”) polymerization when proper procedures were not followed.

The presence of dissolved oxygen is necessary for MEHQ to function effectively. Thus, methyl

acrylate should never be handled or stored under an oxygen-free atmosphere. A gas mixture containing 5 to 21 vol. % of oxygen at one atmosphere should always be maintained above the monomer to ensure inhibitor effectiveness. In a closed system, this atmosphere must be periodically replenished since dissolved oxygen is gradually consumed in the inhibition process.

According to the National Fire Protection Association (NFPA), methyl acrylate is classed as a flammable liquid by NFPA and is given flammability ratings of 3. Methyl acrylate is also classified as a "FLAMMABLE LIQUID" by DOT and requires a "FLAMMABLE" placard on vehicles.

The following warnings should be followed when working with methyl acrylate:

- UNDER NO CIRCUMSTANCES SHOULD STEAM BE USED TO HEAT OR THAW METHYL ACRYLATE.
- NEVER USE AN "INERT" (OXYGEN-FREE) ATMOSPHERE and ALWAYS INSURE THAT THE ATMOSPHERE ABOVE THE ACRYLATE CONTAINS AT LEAST 5 PERCENT OXYGEN BY VOLUME.
- POLYMERIZATION IN VENT SYSTEMS CAN LEAD TO DANGEROUS PLUGGING AND THE FAILURE OF PRESSURE OR VACUUM RELIEF SYSTEMS.
- EVEN TRACE CONTAMINATION WITH AN INITIATOR CAN LEAD TO A DANGEROUS POLYMERIZATION.
- ALL ACRYLATE STORAGE VESSELS (INCLUDING CHARGE OR WEIGH TANKS) SHOULD HAVE A HIGH TEMPERATURE ALARM.
- ALL ACRYLATE PUMPS THAT COULD POTENTIALLY OVERHEAT IF DEADHEADED (BLOCKED IN) SHOULD BE PROTECTED FROM OVERHEATING.
- ODORS MUST BE MINIMIZED BY HAVING WELL MAINTAINED CONTROL DEVICES IN PLACE AND BY FOLLOWING GOOD OPERATING PROCEDURES.

Exposure Potential

Consumer products potentially could contain trace levels of methyl acrylate as a result of the polymerization process, however consumers are not generally exposed to these compounds in finished products. Although potential for exposure does exist during methyl acrylate manufacture, transportation and use, enclosed systems limit the exposure to worker populations and nearby communities. Exposure to the general public may occur in accidental situations. Methyl acrylate is not intended for the general use by the general public.

Methyl acrylate vapor has an acrid odor that allows for early detection of any potential release. Methyl acrylate odor usually will be detected before it reaches the level of the current standard. While smelling methyl acrylate may be unpleasant, the presence of methyl acrylate in not necessarily indicative that levels are above the current standard. Methyl acrylate should only be handled by knowledgeable, well-trained personnel who thoroughly understand the hazards associated with the transportation, storage and use of the chemical.

Workplace exposure should be limited by the use of engineering controls. Methyl acrylate vapors must be monitored and controlled below applicable regulatory limits. Methyl acrylate should be processed within a closed system. Worker exposure can potentially happen from leaks in piping system, during repair or replacement of the piping system or during removal of a sample for quality control purposes.

Regulations involving hazardous chemicals are continually evolving and thus exposure guidelines are reviewed regularly and modified whenever new information dictates a change. It is important that all companies handling methyl acrylate are aware of the current legislative requirements.

The guidelines established by OSHA, ACGIH, NIOSH and others, represent current thinking and are believed to be conservative and protective of occupational workers. There is not guarantee of absolute safety.

Risk Management

The potential hazards associated with methyl acrylate can be avoided if workers are adequately instructed in supervised on the proper procedures of handling Methyl acrylate.

Personal protective equipment (PPE) should be selected based on the potential for exposure to particular chemical(s), and the unique properties of that chemical. In general, PPE is not an adequate substitute for appropriate workplace controls (such as ventilation), or other safe work practices. There may be situations when the only practical means of preventing employee exposure is through the effective use of PPE. When PPE is provided to employees, they must be trained in how, where, when, and why the equipment should be used. The facility must also have provisions for decontaminating and replacing such equipment as necessary.

Eye protection in the form of chemical splash goggles should be worn to prevent methyl acrylate from accidentally splashing in an employee's eye. Goggles should be non-vented, and designed specifically to protect against chemical splash. If an employee wears corrective lenses, chemical goggles should be worn over the lenses. Contact lenses are not recommended for use in areas where there is a potential for exposure to methyl acrylate. Vapors can collect behind contact lenses and may cause severe damage to the eye and/or cause the contact lenses to adhere to the eyes.

Skin protection may be found in many forms. Hand protection such as chemical resistant gloves, protective arm sleeves, aprons, full body coveralls, boots, and head coverings are among the types available. Skin protection must be made of a material impervious to methyl acrylate. Butyl rubber of 0.4 to 0.6 mm thickness is a good example. Nitrile could be acceptable for short-duration tasks. Personal protective equipment should be selected on the basis of potential exposure, e.g., gloves may be required for sample collection while full body clothing including gloves, boot covers, head covering may be necessary for spill clean-up. Skin protection for the purpose of preventing chemical exposure may be worn in conjunction with other types of PPE. For example, steel toe safety shoes may be required to prevent a person's foot from being crushed, but an additional boot cover may be required to prevent methyl acrylate permeation into the safety shoe. Skin protection PPE is available in a variety of sizes, and should be available in a size that fits the employee wearing it. Improperly sized PPE may compromise its effectiveness and create additional safety hazards. When skin protection PPE is used, there must be a means of cleaning or disposal/replacement of the PPE.

Respiratory protection is available in two basic varieties, air purifying, and air supplied. In general, air purifying respirators provide less protection than air supplied respirators. Both types, however, have their particular advantages and limitations. The appropriate type of respirator must be selected to provide the appropriate level of protection for the anticipated degree of exposure to airborne methyl acrylate (vapor or mist). Detailed guidance for the selection of respiratory protection can be found in The American National Standards Institute Document Z88.2. Respiratory protective equipment should be approved by NIOSH. It must be carefully maintained, inspected, and cleaned. All employees required to wear respiratory protection must be medically cleared to do so (this ensures their physical capability to wear a respirator) and trained to use and care for the equipment. OSHA requirements for respiratory protection can be found in 29 CFR 1910.134.

Properly designed emergency showers and eyewash fountains should be placed in convenient locations wherever methyl acrylate is used. All employees should know the location and operation of this equipment. All equipment must be frequently inspected to make sure they are in proper working condition.

Federal/Science Findings

U.S. Environmental Protection Agency – Integrated Risk Information System (IRIS)
http://www.epa.gov/ncea/iris/subst/0441.htm

U.S Department of Labor – Occupational Safety and Health Administration (OSHA)
http://www.osha.gov/dts/chemicalsampling/data/CH_251300.html

American Conference of Governmental Industrial Hygienists (ACGIH)
http://www.acgih.org

Contact Information

http://www.basf.com

MSDS

http://worldaccount.basf.com/wa/PublicMSDS~en_US/Search

References

"Acrylate Esters", A Summary of Safety and Handling, ICSHAM, 3rd Edition.
"Basic Acrylic Esters: Background Information", Basic Acrylic Monomer Manufacturers, Inc. (BAMM) website, 2000.