

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Aluminum alkyls (trimethylaluminum) (MSDS No. P-6282-B)	Trade Names: Praxair [®] TMA
Chemical Name: Trimethylaluminum	Synonyms: Aluminumtrimethyl, trimethylalane
Chemical Family: Aluminum alkyls	Product Grades: None assigned.
Telephone:	Company Name: Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113
Emergencies: 1-800-645-4633* CHEMTREC: 1-800-424-9300* Routine: 1-800-PRAXAIR	

*Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

2. Hazards Identification

EMERGENCY OVERVIEW

**DANGER! Pyrophoric, flammable liquid and vapor.
Ignites on contact with air.
Harmful if inhaled or swallowed.
May cause eye, skin, and respiratory tract burns.
Reacts violently with water or atmospheric moisture.
Decomposes into irritating dust that may cause liver and kidney damage.
Self-contained breathing apparatus and protective clothing
must be worn by rescue workers.
Under ambient conditions, this is a colorless liquid.**

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:

Effects of a Single (Acute) Overexposure

Inhalation. Reaction with moist tissues causes burns. Residual dusts may cause irritation of the mouth nose, and throat.

Skin Contact. May cause irritation or burns.

Swallowing. Reaction of liquid with moisture may cause severe burns of the mouth, esophagus, and stomach lining. Residual dusts have been implicated in kidney and liver damage in laboratory animals.

Eye Contact. Contact with the liquid may cause severe eye burns. Dusts and vapor may irritate the eyes.

Effects of Repeated (Chronic) Overexposure. Repeated or prolonged exposure of the skin may cause cracking and drying.

Other Effects of Overexposure. None known.

Medical Conditions Aggravated by Overexposure. Irritating effects of dusts and mists may aggravate an existing respiratory condition. Prolonged exposure of the skin may aggravate an existing dermatitis.

CARCINOGENICITY: Trimethylaluminum is not listed by NTP, OSHA, or IARC.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Trimethylaluminum	75-24-1	>99%*

*The symbol > means "greater than."

4. First Aid Measures

INHALATION: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: Immediately flush exposed areas with large quantities of water. In case of massive exposure, remove contaminated clothing while showering with water. Do not remove any clothing that is stuck to the skin. Call a physician.

SWALLOWING: If victim is conscious, wash out mouth with water. Call a physician.

EYE CONTACT: Immediately flush eyes thoroughly with plenty of water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Liquid and vapor ignite spontaneously in air.

SUITABLE EXTINGUISHING MEDIA: Use dry powder, soda ash, or lime. Never use water, foam, or halogenated compounds.

PRODUCTS OF COMBUSTION: Aluminum dusts, oxides, and alkyls; CO; CO₂

PROTECTION OF FIREFIGHTERS: DANGER! Pyrophoric, flammable liquid and vapor. Ignites spontaneously in air. Burning material may release toxic and corrosive fumes. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus and protective clothing. Use appropriate media to control fire. Shut off flow if you can do so without risk. Move containers away from fire area if without risk. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

Specific Physical and Chemical Hazards. No part of container should be subjected to a temperature higher than 125°F (52°C). Back flow into container may cause reaction. In a controlled fire, unreacted trimethylaluminum may reignite on contact with air or water.

Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Pyrophoric, flammable liquid and vapor.

Personal Precautions. Ignites spontaneously on contact with air. Forms explosive mixtures with air. Immediately evacuate all personnel from danger area. Self-contained breathing apparatus and protective clothing must be worn by rescue workers. Reacts violently with water. Avoid contact with water or moisture. Back flow into container may cause reaction. Shut off flow if without risk. Ventilate area or move container to a well-ventilated area. Prevent waste from contaminating surrounding environment.

Environmental Precautions. Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: *Flammable liquid and vapor ignite spontaneously in air.* Do not breathe vapor. Use only with adequate ventilation or respiratory protection. Do not get liquid or vapor in eyes, on skin, or on clothing. Keep away from air, water or moisture, oxidizing agents, and other flammables. Use only spark-proof tools and explosion-proof equipment. Keep away from heat, sparks, and open flame. **Do not eat, drink, or smoke in areas where this material is stored or used.** After working with this material, wash face and hands thoroughly with soap and water before eating drinking, smoking, applying cosmetics, or using the toilet. Have safety showers and eyewash fountains immediately available. Protect containers from damage. For other precautions in using trimethylaluminum, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE: Store in a cool, dry place away from direct sunlight. Keep storage containers tightly closed. This material must be handled and stored under a blanket of nitrogen and used only in a closed system. Store away from oxygen, chlorine, and other oxidizers. Firmly secure containers upright to keep them from falling or being knocked over. Keep valves tightly closed. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. Store only where temperature will not exceed 125°F (52°C). Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods.

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, see NFPA 30, *Flammable and Combustible Liquids Code*, published by the National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101; 1-800-344-3555; www.nfpa.org. For further information on storage, handling, and use, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2008)
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Trimethylaluminum	Not Established.	Not Established.
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*(c) – ceiling. Ceiling values are not Time-Weighted-Average (TWA).

**N.E.–Not Established.

IDLH = Not available.

ENGINEERING CONTROLS:

Local Exhaust. Inadequate; see SPECIAL

Mechanical (General). Inadequate; see SPECIAL

Special. Use only in a closed system. This material is air- and moisture-sensitive. It should be maintained under a dry, inert atmosphere and used in an enclosed device such as a glove box.

Other. See SPECIAL.

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear work gloves when handling containers; fire resistant gloves where contact with product may occur.

Eye/Face Protection. Wear safety glasses when handling containers; safety goggles or a full face shield where contact with product may occur. Select eye protection in accordance with OSHA 29 CFR 1910.133. Do not wear contact lenses. Protective clothing such as fire resistant garments where needed. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

Respiratory Protection. A respiratory protection program that meet OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable) requirements must be followed whenever workplace conditions warrant respirator use. Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus.

9. Physical and Chemical Properties

APPEARANCE:	Colorless liquid
ODOR:	Unknown
ODOR THRESHOLD:	Not available.
PHYSICAL STATE:	Liquid at normal temperature and pressure
pH:	Not applicable.
MELTING POINT at 1 atm:	59°F (15°C)
BOILING POINT at 1 atm:	257°F (125°C)
FLASH POINT (test method):	Not available.
EVAPORATION RATE (Butyl Acetate = 1):	Not available.
FLAMMABILITY:	Flammable
FLAMMABLE LIMITS IN AIR , % by volume:	LOWER: Not available. UPPER: Not available.
VAPOR PRESSURE at 140°F (60°C):	1.34 psia (9.24 kPa abs, 69.3 mm Hg)

VAPOR DENSITY at 70°F (21.1°C) and 1 atm:	Not available.
SPECIFIC GRAVITY (H ₂ O = 1) at 68°/39.2°F (20°/4°C):	0.752
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	Not available.
SOLUBILITY IN WATER 68°F (20°C):	Reacts violently
PARTITION COEFFICIENT: n-octanol/water:	Not available.
AUTOIGNITION TEMPERATURE:	Not available.
DECOMPOSITION TEMPERATURE:	Not available.
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	72.09 g/mol
MOLECULAR FORMULA:	Al(CH ₃) ₃

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable

NOTE: Trimethylaluminum is stable as shipped and when stored, handled, and used under the conditions specified in this MSDS, sections 7, 10, and 16. Trimethylaluminum must not be exposed to air, water, or moisture

CONDITIONS TO AVOID: High temperatures, sparks, and flames.

INCOMPATIBLE MATERIALS: Air, water, moisture, oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Aluminum oxide dust, CO, CO₂

POSSIBILITY OF HAZARDOUS REACTIONS: May Occur Will Not Occur

Decomposition may produce aluminum oxide dust, CO, and CO₂.

11. Toxicological Information

ACUTE DOSE EFFECTS: None known.

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: Trimethylaluminum does not contain any Class I or Class II ozone-depleting chemicals.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Aluminum alkyls

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
4.2	I	UN3051	None

SHIPPING LABEL(s): SPONTANEOUSLY COMBUSTIBLE, DANGEROUS WHEN WET

PLACARD (when required): SPONTANEOUSLY COMBUSTIBLE, DANGEROUS WHEN WET

MARINE POLLUTANTS: Trimethylaluminum is not listed as a marine pollutant by DOT.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: None

EHS RQ (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes

DELAYED: Yes

PRESSURE: No

REACTIVITY: Yes

FIRE: Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Trimethylaluminum is not subject to reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Trimethylaluminum is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Trimethylaluminum is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Trimethylaluminum is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable liquid or gas on site in one location in quantities of 10,000 lb (4536 kg) or greater is covered under this regulation unless the substance is used as a fuel.

STATE REGULATIONS:

CALIFORNIA: Trimethylaluminum is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Trimethylaluminum is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: *Pyrophoric, flammable liquid and vapor. Reacts with water and atmospheric moisture.* Use only in a closed system thoroughly purged with an inert gas prior to introduction of trimethylaluminum. ***Use only with compatible materials and equipment.*** Use piping and equipment adequately designed to withstand pressures to be encountered. ***Prevent reverse flow.*** Reverse flow into container may cause reaction. Use a check valve or other protective device in any line or piping from the container.

MIXTURES: When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, chemicals have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:**NFPA RATINGS:**

HEALTH = 3
FLAMMABILITY = 4
INSTABILITY = 3
SPECIAL = ~~W~~

HMIS RATINGS:

HEALTH = 3
FLAMMABILITY = 4
PHYSICAL HAZARD = 3

NOTE: The hazards of this material have not been fully investigated.

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current MSDSs for these products, contact your Praxair sales representative or local distributor or supplier, or download from www.praxair.com. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).

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