

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Tetraethyl silicate (MSDS No. P-6223)			Trade Name: TEOS
Chemical Name: Tetraethyl Silicate			Synonyms: Tetraethyl orthosilicate, ethyl silicate, tetraethoxysilane, ethyl orthosilicate, silicic acid tetraethyl ester
Formula: C ₈ H ₂₀ O ₄ Si			Chemical Family: Organosilane
Telephone:	Emergencies: 1-800-645-4633*	Company Name: Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113	
	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. Composition/Information on Ingredients

For custom mixtures of this product, request an MSDS for each component. See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCENTRATION	OSHA PEL	ACGIH TLV-TWA (1999)
Tetraethyl Silicate	78-10-4	>99%*	100 ppm	10 ppm

* The symbol > means "greater than"; the symbol <, "less than."

3. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Flammable liquid and vapor.

May form explosive mixtures with air.

Reaction with water may release flammable and toxic vapors.

May cause liver and kidney damage.

May irritate the eyes, skin, and respiratory tract.

Has anesthetic effects in high concentrations.

May cause dizziness and drowsiness.

Self-contained breathing apparatus and protective clothing must be worn by rescue workers.

Odor: Sharp, alcohol-like

THRESHOLD LIMIT VALUE: TLV-TWA, 10 ppm (ACGIH, 1999). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION—Vapors may irritate the respiratory tract causing headache, nausea, and vomiting. High concentrations may act as an anesthetic, first stimulating the central nervous system (CNS), then depressing it to varying degrees. CNS depression is marked by dizziness, drowsiness, and possibly unconsciousness.

SKIN CONTACT—Liquid or vapor may irritate the skin. Prolonged exposure may result in harmful amounts being absorbed through the skin.

SWALLOWING—May irritate the digestive tract causing nausea and vomiting.

EYE CONTACT—Liquid causes severe eye irritation; vapor may irritate the eyes.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: Repeated or prolonged exposure may cause liver, kidney, and lung damage. Chronic exposure of the skin may cause cracking and drying due to defatting of tissues.

OTHER EFFECTS OF OVEREXPOSURE: None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: The skin irritating properties of tetraethyl silicate may aggravate an existing dermatitis. Respiratory irritation may aggravate an existing asthma or other upper respiratory or pulmonary disease.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None known.

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

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: Remove contaminated clothing and shoes, and wash exposed areas with soap and plenty of water. Seek medical attention if irritation develops or discomfort persists.

SWALLOWING: If victim is conscious and alert, give 2 to 4 cupfuls of water or milk. Never give anything by mouth to a unconscious person. Get immediate medical aid. Do not induce vomiting except under supervision of competent medical authority.

EYE CONTACT: Immediately flush eyes thoroughly with 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

FLASH POINT (test method):	116°F (47°C) CC	
AUTOIGNITION TEMPERATURE:	460°F (238°C)	
FLAMMABLE LIMITS IN AIR, % by volume:	LOWER: Unknown	UPPER: 23.0%
EXTINGUISHING MEDIA: CO ₂ , dry chemical, fog, or foam.		
DANGER: Tetraethyl silicate is water-reactive and may release flammable or toxic gas when wet.		

SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Flammable liquid and vapor. Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately spray cylinders with water from maximum distance until cool, taking care not to spray water on any released product or to extinguish product flames. Remove sources of ignition if without risk. Remove all cylinders from fire area if without risk; continue cooling water spray while moving cylinders. Do not extinguish any flames emitted from cylinders; stop flow of gas if without risk, or allow flames to burn out. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapor forms explosive mixtures with air and oxidizing agents. If leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak and could explode if reignited by sparks or flames. Vapors are much heavier than air and may collect in low spots. Explosive atmospheres may linger. Before entering area, especially confined areas, check with an appropriate device.

HAZARDOUS COMBUSTION PRODUCTS: Carbon monoxide, carbon dioxide

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Flammable liquid and vapor. Vapor forms explosive mixtures with air. (See section 5.) Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus and protective clothing. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray, taking care not to spray water on leaking liquid. Shut off flow if without risk. Ventilate area or move container to a well-ventilated area. Flammable vapors may spread from leak and could explode if reignited by sparks or flames. Vapors are much heavier than air and may collect in low spots. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

WASTE DISPOSAL METHOD: Prevent waste from contaminating the surrounding environment. Keep personnel away. Take up material with sand or other compatible, noncombustible absorption material and place into containers for later disposal. 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 STORAGE: Store and use with adequate ventilation. Store in a cool, dry area only in the DOT-approved container in which product was received. Separate cylinders containing this product from oxygen, chlorine, and other oxidizers by at least 20 ft (6.1 m), or use a barricade of noncombustible material. This barricade should be at least 5 ft (1.53 m) high and have a fire resistance rating of at least ½ hour. Post “No Smoking or Open Flames” signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Keep containers closed. 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.

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect containers from damage. Use a suitable hand truck to move containers; do not drag, roll, slide, or drop. Electrical equipment must be non-sparking or explosion-proof. For other precautions in using this product, see section 16.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST—Use an explosion-proof local exhaust system with sufficient air flow velocity to prevent oxygen deficiency and keep hazardous vapors below the TLV in the worker's breathing zone.

MECHANICAL (general)—Under certain conditions, general exhaust ventilation may be acceptable if it can maintain an adequate supply of air and keep hazardous vapors below the TLV in the worker's breathing zone.

SPECIAL—None

OTHER—None

RESPIRATORY PROTECTION: Respirators must be acceptable to MSHA and NIOSH. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

SKIN PROTECTION: Wear work gloves when handling containers; rubber where contact with product may occur.

EYE PROTECTION: Wear safety glasses when handling containers. Select eye protection in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT:	208.37
SPECIFIC GRAVITY (H ₂ O = 1) at 39.2°/70°F (4°/21.1°C):	0.94
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	7.2
VAPOR PRESSURE at 70°F (21.1°C):	Negligible
SOLUBILITY IN WATER:	Decomposes
PERCENT VOLATILES BY VOLUME:	100
EVAPORATION RATE (Butyl Acetate = 1):	<1
BOILING POINT at 1 atm:	321.98°F (161.1°C)
MELTING POINT at 1 atm:	-106.6°F (-77°C)
APPEARANCE, ODOR, AND STATE: Colorless, flammable liquid. Sharp, alcohol-like odor.	

10. Stability and Reactivity

STABILITY: ☐ Unstable ☒ Stable

INCOMPATIBILITY (materials to avoid): Moisture or water; oxidizers, such as oxygen, chlorine, and fluorine; alkalis; mineral acids

HAZARDOUS DECOMPOSITION PRODUCTS: CO, CO₂, oxides of silicon

HAZARDOUS POLYMERIZATION: ☐ May Occur ☒ Will Not Occur

CONDITIONS TO AVOID: Exposure to heat, sparks, or flame

11. Toxicological Information

LD₅₀, 1 hr, rat: 6.3 mg/kg; 1 hr, rabbit: 5878 mg/kg

12. Ecological Information

No adverse ecological effects expected. Tetraethyl silicate does not contain any Class I or Class II ozone-depleting chemicals. Tetraethyl silicate is not listed as a marine pollutant by DOT.

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: Tetraethyl silicate

HAZARD CLASS: 3	IDENTIFICATION NUMBER: UN 1292	PRODUCT RQ: None
SHIPPING LABEL(s): FLAMMABLE LIQUID		
PLACARD (when required): FLAMMABLE LIQUID		

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

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 (40 CFR Part 355):

Threshold Planning Quantity (TPQ): None

Extremely Hazardous Substances (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: No

FIRE: Yes

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

This product does not require 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.

Tetraethyl silicate is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Tetraethyl silicate 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.

Tetraethyl silicate 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 gas is used as a fuel.

STATE REGULATIONS:

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

PENNSYLVANIA: Tetraethyl silicate 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: **Flammable liquid and vapor.** May irritate skin, eyes, and respiratory tract. Use only with adequate ventilation or respiratory protection. (See section 8.) Do not get liquid or vapor in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. Use piping and equipment adequately designed to withstand pressures to be encountered. Use only with compatible materials and equipment. *May form explosive mixtures with air.* Keep away from heat, sparks, and open flame. Use only spark-proof tools and explosion-proof equipment. Ground all equipment. Store and use with adequate ventilation at all times. Keep away from oxidizing agents and other flammables. *Never work on a pressurized system.* If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state, and local laws; then repair the leak. *Never place a compressed gas cylinder where it may become part of an electrical circuit.*

MIXTURES: When you mix two or more liquids, gases, or liquefied gases, 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, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:**NFPA RATINGS:**

HEALTH	= 2
FLAMMABILITY	= 2
REACTIVITY	= 0
SPECIAL	= None

HMIS RATINGS:

HEALTH	= 2
FLAMMABILITY	= 2
REACTIVITY	= 0

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

AV-1	<i>Safe Handling and Storage of Compressed Gases</i>
P-1	<i>Safe Handling of Compressed Gases in Containers</i>
P-14	<i>Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres</i>
SB-2	<i>Oxygen-Deficient Atmospheres</i>
—	<i>Handbook of Compressed Gases, Third Edition</i>

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 Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. 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 14150-7891).

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