

Safety Data Sheet

Version 3.3
Revision Date 03/20/2015

SDS Number 300000005296
Print Date 01/18/2016

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : TEOS

Chemical formula : C₈H₂₀O₄Si

Synonyms : Ethyl Silicate; Tetraethoxysilane; Tetraethyl Silicate

Product Use Description : Semiconductor Processing

Manufacturer/Importer/Distributor : Air Products and Chemicals, Inc
7201 Hamilton Blvd.
Allentown, PA 18195-1501
GST No. 123600835 RT0001
QST No. 102753981 TQ0001

Telephone : 1-610-481-4911 Corporate
1-800-345-3148 Chemicals Cust Serv
1-800-752-1597 Gases/Electronics Cust Serv

Emergency telephone number (24h) : 800-523-9374 USA
+1 610 481 7711 International

2. HAZARDS IDENTIFICATION

GHS classification

Flammable liquids - Category 3
Acute toxicity - Inhalation Category 4
Eye irritation - Category 2A
Specific target organ toxicity - single exposure - Inhalation Category 3

GHS label elements

Hazard pictograms/symbols



Signal Word: Warning

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Hazard Statements:

H226:Flammable liquid and vapour.
H319:Causes serious eye irritation.
H332:Harmful if inhaled.
H335:May cause respiratory irritation.

Precautionary Statements:

Prevention : P210:Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking.
P261:Avoid breathing dust/fume/gas/mist/vapours/spray.
P280a:Wear protective gloves and eye/face protection.

Response : P303+P361+P353 :IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 :IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 :Call a POISON CENTRE/doctor/physician if you feel unwell.
P337+P313 :If eye irritation persists: Get medical advice/attention.
P370+P378 :In case of fire, use recommended extinguishing media for extinction.

Storage : P403+P233:Store in a well-ventilated place. Keep container tightly closed.
P403+P235:Store in a well-ventilated place. Keep cool.

Hazards not otherwise classified

Keep away from heat and sources of ignition.
Components of the product may affect the nervous system.
Combustible Liquid.
Moderate eye irritant.
Moderate skin irritant.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Weight)
Silicic acid (H ₄ SiO ₄), tetraethyl ester	78-10-4	100 %

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications. Contains no other components or impurities which will influence the classification of the product.

4. FIRST AID MEASURES

General advice : Seek medical advice. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately.

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Eye contact	: Rinse immediately with plenty of water also under the eyelids for at least 20 minutes. Remove contact lenses.
Skin contact	: Wash off immediately with plenty of water for at least 20 minutes. Immediately remove contaminated clothing, and any extraneous chemical, if possible to do so without delay.
Ingestion	: Never give anything by mouth to an unconscious person. Immediately give large quantities of water to drink. Induce vomiting if person is conscious. Prevent aspiration of vomit. Turn victim's head to the side.
Inhalation	: Move to fresh air.
Most important symptoms/effects - acute and delayed	: Kidney disorders. Neurological disorders Liver disorders. Eye disease. Skin disorders and Allergies.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: Alcohol-resistant foam. Carbon dioxide (CO ₂). Dry chemical. Dry sand. Limestone powder.
Specific hazards	: Burning produces noxious and toxic fumes. In the event of fire, cool tanks with water spray . Downwind personnel must be evacuated. Fire or intense heat may cause violent rupture of packages. Flash back possible over considerable distance. May form explosive mixtures in air.
Special protective equipment for fire-fighters	: Use personal protective equipment. Wear self contained breathing apparatus for fire fighting if necessary.
Further information	: Do not allow run-off from fire fighting to enter drains or water courses., Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures	: Wear suitable protective clothing, gloves and eye/face protection. Use self-contained breathing apparatus and chemically protective clothing. Remove all sources of ignition. Evacuate personnel to safe areas.
Environmental precautions	: Prevent spilled product from entering streams or drinking water supplies. Local authorities should be advised if significant spillages cannot be contained. Shut off or remove all ignition sources. Construct a dike to prevent spreading.
Methods for cleaning up	: Contact Air Products' Emergency Response Center for advice. Approach suspected leak areas with caution. Absorb with inert absorbent materials such

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as: Dry sand. Vermiculite. Activated charcoal. Place in appropriate chemical waste container.

Additional advice : If possible, stop flow of product.

7. HANDLING AND STORAGE

Handling

See "Flammable and Combustible Liquid Code" NFPA No. 30, National Fire Protection Association, Boston, MA. Emergency showers and eye wash stations should be readily accessible. Adhere to work practice rules established by government regulations. Avoid contact with eyes. Use personal protective equipment. When using, do not eat, drink or smoke.

Storage

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Keep in a dry, cool place. Keep away from oxidizers.

Technical measures/Precautions

Keep away from open flames, hot surfaces and sources of ignition.

Storage Temperature : 32 - 104 °F (0 - 40 °C)

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Apply process controls to ensure safe operating conditions. Assess potential flammability hazards based on flashpoint and potential ignition sources.

Ensure adequate ventilation.

Provide readily accessible eye wash stations and safety showers.

Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits.

Personal protective equipment

Respiratory protection : Use Air Purifying Respirator with organic vapor cartridges when exposure is likely.

Hand protection : Impervious gloves.
Silvershield gloves.
Butyl-rubber
Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Chemical resistant goggles must be worn.

Skin and body protection : Long sleeve shirts and trousers without cuffs.

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Environmental exposure controls : Prevent spilled product from entering streams or drinking water supplies. Local authorities should be advised if significant spillages cannot be contained. Shut off or remove all ignition sources.

Special instructions for protection and hygiene : Wash hands at the end of each workshift and before eating, smoking or using the toilet. Provide readily accessible eye wash stations and safety showers.

Exposure limit(s)

Silicic acid (H ₄ SiO ₄), tetraethyl ester	Time Weighted Average (TWA): ACGIH	10 ppm	-
Silicic acid (H ₄ SiO ₄), tetraethyl ester	Recommended exposure limit (REL): NIOSH	10 ppm	85 mg/m ³
Silicic acid (H ₄ SiO ₄), tetraethyl ester	Permissible exposure limit: OSHA Z1	100 ppm	850 mg/m ³
Silicic acid (H ₄ SiO ₄), tetraethyl ester	Time Weighted Average (TWA): OSHA Z1A	10 ppm	85 mg/m ³
Silicic acid (H ₄ SiO ₄), tetraethyl ester	Time Weighted Average (TWA) Permissible Exposure Limit (PEL): US CA OEL	10 ppm	85 mg/m ³
Silicic acid (H ₄ SiO ₄), tetraethyl ester	Time Weighted Average (TWA): TN OEL	10 ppm	85 mg/m ³

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Liquid. Colorless.

Odor : Alcoholic. Poor warning properties at low concentrations.

Odor threshold : No data available.

pH : No data available.

Melting point/range : -116 °F (-82 °C)

Boiling point/range : 334 °F (168 °C)

Flash point : 105 °F (40.6 °C) closed cup

Evaporation rate : No data available.

Flammability (solid, gas) : Not applicable.

Upper/lower explosion/flammability limit : 5.75 %(V) / 0.9 %(V)

Vapor pressure : 1.33 mmHg at 68 °F (20 °C)

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Water solubility	: No data available.
Relative vapor density	: Not applicable.
Relative density	: > 0.934 (water = 1)
Partition coefficient (n-octanol/water)	: No data available.
Auto-ignition temperature	: 260 °C
Decomposition temperature	: No data available.
Viscosity	: No data available.
Molecular Weight	: 208.33 g/mol

10. STABILITY AND REACTIVITY

Chemical Stability	: Stable under normal conditions.
Conditions to avoid	: Heat, flames and sparks. Exposure to air. Exposure to light. Exposure to moisture.
Materials to avoid	: Oxidizing agents. Strong acids. Strong bases. Carbon steel. Plastics.
Hazardous decomposition products	: Hazardous combustion products: Carbon dioxide (CO ₂). Carbon monoxide. Silicon Dioxide. Hydrolysis products: Ethanol. Silicon compounds.
Possibility of hazardous Reactions/Reactivity	: Decomposes when moist.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Likely routes of exposure

Effects on Eye	: Causes eye irritation.
Effects on Skin	: If absorbed through the skin, may cause central nervous system effects, such as headache, nausea, dizziness, confusion, breathing difficulties. Causes skin

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irritation.

Inhalation Effects : May cause central nervous system effects, such as headache, nausea, dizziness, confusion, breathing difficulties. Severe cases of overexposure can result in respiratory failure. In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Irritation of mucous membranes.

Ingestion Effects : No data available.

Symptoms : No data available.

Acute toxicity

Acute Oral Toxicity : LD50 : 6,270 mg/kg Species : Rat.

Inhalation : LC50 (4 h) : 10 mg/l Species : Rat. males Method : OECD Test Guideline 403
LC50 (4 h) : 16.8 mg/l Species : Rat. females Method : OECD Test Guideline 403
(as aerosol)

Acute Dermal Toxicity : LD50 : 5,800 mg/kg Species : Rabbit.

Skin corrosion/irritation : Skin irritation.

Serious eye damage/eye irritation : Moderate eye irritation.

Sensitization. : No data available.

Chronic toxicity or effects from long term exposures

Carcinogenicity : No data available.

Reproductive toxicity : No data is available on the product itself.

Germ cell mutagenicity : No data is available on the product itself.

Specific target organ systemic toxicity (single exposure) : No data available.

Specific target organ systemic toxicity (repeated exposure) : No data available.

Aspiration hazard : No data available.

Delayed and Immediate Effects and Chronic Effects from Short and Long Term Exposure

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This product contains no listed carcinogens according to IARC, ACGIH, NTP and/or OSHA in concentrations of 0.1 percent or greater. Kidney disorders., Neurological disorders, Liver disorders., Eye disease., Skin disorders and Allergies.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity : LC50 (96 h) : > 245 mg/l Species : Zebrafish (Danio rerio).
EC50 (48 h) : > 500 mg/l Species : Daphnia magna.
EC50 (72 h) : > 100 mg/l Species : Algae.

Toxicity to other organisms : No data available.

Persistence and degradability

Biodegradability : Readily biodegradable, as defined by OECD, substance that degrades > 60-70% within a 10 day window over 28 days.

Mobility : No data available.

Bioaccumulation : No data is available on the product itself.

Further information

If released to atmosphere, soil, or water, the product will rapidly hydrolyze with the moisture present to form: Silicon Dioxide. Ethanol.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products : Contact supplier if guidance is required.

Contaminated packaging : Dispose of container and unused contents in accordance with federal, state, and local requirements.

14. TRANSPORT INFORMATION

DOT

UN/ID No. : UN1292
Proper shipping name : Tetraethyl silicate
Class or Division : 3
Packing group : III
Label(s) : 3
Marine Pollutant : No

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IATA

UN/ID No. : UN1292
Proper shipping name : Tetraethyl silicate
Class or Division : 3
Packing group : III
Label(s) : 3
Marine Pollutant : No

IMDG

UN/ID No. : UN1292
Proper shipping name : TETRAETHYL SILICATE
Class or Division : 3
Packing group : III
Label(s) : 3
Marine Pollutant : No

TDG

UN/ID No. : UN1292
Proper shipping name : TETRAETHYL SILICATE
Class or Division : 3
Packing group : III
Label(s) : 3
Marine Pollutant : No

Further Information

The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact an Air Products customer service representative.

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA) 12(b) Component(s):

None.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on EINECS inventory or polymer substance, monomers included on EINECS inventory or no longer polymer.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.

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China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification
Acute Health Hazard Fire Hazard.

EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level
None.

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

NFPA Rating

Health : 2
Fire : 2
Instability : 0

HMIS Rating

Health : 2
Flammability : 2
Physical hazard : 1

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

Telephone : 1-610-481-4911 Corporate
1-800-345-3148 Chemicals Cust Serv
1-800-752-1597 Gases/Electronics Cust Serv

Preparation Date : 01/18/2016

For additional information, please visit our Product Stewardship web site at
<http://www.airproducts.com/productstewardship/>