

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Water reactive liquid, corrosive, n.o.s. (tetrakis(dimethylamino)titanium(IV)) (MSDS No. P-6331-A)	Trade Names: Praxair [®] TDMAT
Chemical Name: Tetrakis(dimethylamino)titanium(IV)	Synonyms: Tetrakis(dimethylamido)- titanium(IV), titanium(IV)dimethylamide, TDMAT
Chemical Family: Metal amide complex	Product Grades: None assigned.
Telephone: Emergencies: 1-800-645-4633* CHEMTREC: 1-800-424-9300* Routine: 1-800-PRAXAIR	Company Name: Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113

**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! Water-reactive, corrosive, flammable liquid and vapor.

Harmful if inhaled.

May cause liver, kidney, and heart damage.

May burn skin, eyes, respiratory tract, and mucous membranes.

May cause dizziness and drowsiness.

Reacts with water and moisture in the air.

Rescue workers may require self-contained breathing apparatus and protective clothing.

Under ambient conditions, this is a yellow 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. Exposure to amine vapors above the 5 ppm TLV may irritate the respiratory tract causing sneezing, coughing, and a burning sensation in the throat. The larynx feels constricted, and the victim has difficulty breathing. Symptoms may include central nervous system (CNS) depression with headache, dizziness, drowsiness, vertigo, nausea, vomiting, fatigue, dullness, blurred vision, ataxia (poor coordination), and unconsciousness. Higher concentrations may damage the liver, kidneys, and heart and cause tracheitis, bronchitis, and pneumonitis (inflammation of the windpipe, bronchial passages, and lungs) and pulmonary edema (fluid in the lungs).

Skin Contact. Vapor may irritate the skin; liquid can cause burns. With prolonged or repeated exposure, harmful amounts may be absorbed through the skin.

Swallowing. May cause CNS depression with dizziness, drowsiness, headache, dullness, fatigue, ataxia, and unconsciousness.

Eye Contact. Liquid or vapor may cause mild to severe irritation with stinging sensation, redness, pain, blurred vision, and corneal inflammation (keratitis). Chemical burns can result in loss of vision.

Effects of Repeated (Chronic) Overexposure. Repeated or prolonged exposure of the skin may cause dermatitis (inflammation of the skin).

Other Effects of Overexposure. None known.

Medical Conditions Aggravated by Overexposure. The skin-irritating properties of tetrakis(dimethylamino)titanium may aggravate an existing dermatitis. Respiratory irritation may aggravate an existing asthma or other upper respiratory or pulmonary disease.

CARCINOGENICITY: Tetrakis(dimethylamino)titanium 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
Tetrakis(dimethylamino)-titanium(IV) <i>*The symbol > means "greater than."</i>	3275-24-9	>99%*

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. Closely monitor the victim for wheezing, coughing, or pain. Call a physician.

SKIN CONTACT: Remove contaminated clothing and shoes, and wash exposed areas with soap and plenty of water. Wash contaminated clothing prior to reuse; discard shoes. Seek medical attention if discomfort persists.

SWALLOWING: Keep the victim calm, and get immediate medical aid. If conscious, wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel.

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: *Victims of overexposure by inhalation should be observed for up to 72 hours for delayed onset of pulmonary edema. Use of acidics to neutralize swallowed contents is contraindicated.*

Exposure to the vapor may cause minor transient edema of the corneal epithelium. This condition, referred to as "glauropsia," "blue haze" or "blue-gray haze," produces a blurring of vision against a general bluish haze and the appearance of halos around bright objects. The effect disappears spontaneously within a few hours of the end of an exposure and leaves no

sequelae. Although not detrimental to the eye per se, glaucopsia predisposes an affected individual to physical accidents and reduces the ability to undertake skilled tasks such as driving a motorized vehicle. The hazards of this material are mainly due to its severe irritant and corrosive properties on the skin and mucosal surfaces.

Careful gastric lavage is required. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Flammable.

SUITABLE EXTINGUISHING MEDIA: CO₂, dry chemical powder. Do NOT use water or water-based foams.

PRODUCTS OF COMBUSTION: CO, CO₂, titanium oxides, nitrogen oxides, and organic fumes.

PROTECTION OF FIREFIGHTERS: DANGER! Water-reactive, corrosive, flammable liquid and vapor. May emit toxic, flammable, and corrosive fumes and vapors on reaction with water or upon thermal decomposition. Evacuate all personnel from danger area. Use self-contained breathing apparatus and protective clothing where needed. Remove ignition sources if without risk. Move containers away from fire area if without risk. If this material is on fire, extinguish flames with the recommended media. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

Specific Physical and Chemical Hazards. Heat of fire may cause violent rupture of package. Vapors may form explosive mixtures with air. May emit toxic, flammable, and corrosive fumes when heated. Reacts with water and moisture in the air. Vapors may travel considerable distance to source of ignition and flash back. Vapors are heavier than air and may collect in low spots.

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! Water-reactive, corrosive, flammable liquid and vapor.

Personal Precautions. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus and protective clothing where needed. Remove all sources of ignition if without risk. Shut off flow if without risk. Reacts with water and moisture in the air. Vapors may spread from leak. Vapors are heavier than air and may collect in low spots. Ventilate area or move container to a well-ventilated area.

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: *Reacts with water and moisture.* Do not breathe vapor. Do not get liquid or vapor in eyes, on skin, or on clothing. Keep away from acids, alcohol, oxidizing agents, flammables, and strong bases. Reaction with moisture in a sealed container could build pressure and create an explosion hazard. **Do not eat, drink, or smoke in areas where this material is stored or used.** After working with this product, 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 this product, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. Store in a cool, dry area under inert atmosphere and away from direct sunlight. Store only in the DOT-approved container in which product was received. Never store tetrakis(dimethylamino)titanium in open containers. 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.

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.

8. Exposure Controls/Personal Protection

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2008)
Tetrakis(dimethylamino)titanium(IV)	Not Established.	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; chemical resistant gloves where contact with product may occur. Protective clothing where needed. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

Eye/Face Protection. Wear safety glasses when handling containers. Select eye protection in accordance with OSHA 29 CFR 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:	Yellow liquid
ODOR:	Unknown
ODOR THRESHOLD:	Not available.
PHYSICAL STATE:	Liquid at normal temperature and pressure
pH:	Not applicable.
MELTING POINT at 1 atm:	Not available.
BOILING POINT at 0.001psi (0.05 mm Hg):	122°F (50°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 68°F (20°C):	Not available.
LIQUID DENSITY:	59.12 lb/ft ³ (0.947 g/cm ³)
SPECIFIC GRAVITY (H ₂ O = 1) at 19.4°F (-7°C):	Not available.
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	Not available.
SOLUBILITY IN WATER 68°F (20°C):	Reacts
PARTITION COEFFICIENT: n-octanol/water:	Not available.
AUTOIGNITION TEMPERATURE:	Not available.
DECOMPOSITION TEMPERATURE:	Not available.
PERCENT VOLATILES BY VOLUME:	Not available.
MOLECULAR WEIGHT:	224.19 g/mol
MOLECULAR FORMULA:	C ₈ H ₂₄ N ₄ Ti

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable

NOTE: Tetrakis(dimethylamino)titanium is stable as shipped under a blanket of dry nitrogen or helium.

CONDITIONS TO AVOID: Ignition sources, heat, moisture, oxidizing agents.

INCOMPATIBLE MATERIALS: Water, air, alcohol; protic solvents, oxidizers, acids; strong bases, halogens bases, aldehydes, ketones, silicones, neoprene, and paper.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition may produce CO, CO₂, titanium oxides, nitrogen oxides, and organic fumes.

POSSIBILITY OF HAZARDOUS REACTIONS: May Occur Will Not Occur

Thermal decomposition may produce CO, CO₂, titanium oxides, nitrogen oxides, and organic fumes.

11. Toxicological Information

ACUTE DOSE EFFECTS: None known.

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: Tetrakis(dimethylamino)titanium 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: Water reactive liquid, corrosive, n.o.s. (tetrakis-(dimethylamino)titanium(IV))

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
4.3	I	UN3129	None

SHIPPING LABEL(s): DANGEROUS WHEN WET, CORROSIVE

PLACARD (when required): DANGEROUS WHEN WET

MARINE POLLUTANTS: Tetrakis(dimethylamino)titanium 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.

Tetrakis(dimethylamino)titanium 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.

Tetrakis(dimethylamino)titanium is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Tetrakis(dimethylamino)titanium 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.

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

STATE REGULATIONS:

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

PENNSYLVANIA: Tetrakis(dimethylamino)titanium 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: *Water-reactive, corrosive, flammable liquid and vapor.* Use only with adequate ventilation or respiratory protection. *Use only with compatible materials and equipment.*

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, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:

HEALTH = 3

FLAMMABILITY = 3

INSTABILITY = 2

HMIS RATINGS:

HEALTH = 3

FLAMMABILITY = 3

PHYSICAL HAZARD = 2

NFPA RATINGS:

SPECIAL = ~~W~~

HMIS RATINGS:

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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