

MATERIAL SAFETY DATA SHEET (MSDS)



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Revision Date: 9/15/2006

For the following products:

#15-049 Smoke Sticks; #15-080 T-T Dura-Puffer™
#15-092 T-T Smoke Gun Kit;
#15-093 T-T Smoke Refills; #15-110 T-T Puffer™

Also read and understand the separate *Product Information* sheet before using or handling these products.

SECTIONS I & II: Material Identification and Ingredients

Material Name: Titanium Tetrachloride
CAS Registry Number: 7550-45-0
Ingredients: TiCl₄ - 99.0% to 100%

UN Number: 1838
Chemical Family: Titanium Salts

Other Designations: Titanic Chloride
Chemical Formula: TiCl₄

SECTION III: Hazards Identification

Appearance and Odor: Clear liquid with a sharp and irritating odor.

Statement of Hazards: Danger! Causes Severe eye, skin and respiratory tract burns. May be fatal if inhaled. May cause lung damage. Harmful if swallowed. Contents under pressure. Contact with water or moist air liberates toxic and corrosive hydrogen chloride.

Fire & Explosion Hazards: This product is not defined as flammable or combustible. However, this product may support combustion and decompose under fire conditions to produce toxic materials such as hydrogen chloride and chlorine gases. It is not sensitive to static discharge.

Primary Route of Exposure: Skin contact and inhalation are the primary routes of exposure to this product.

Inhalation Acute Exposure: Inhalation of vapors may cause inflammation of the respiratory tract, damage to the lungs, and possibly death. This is a poison inhalation hazard by DOT criteria.

Skin Contact - Acute: Skin contact can cause severe irritation with redness and edema.

Eye Contact - Acute: Eye contact may cause severe irritation or burns. May cause eye damage if not flushed out immediately.

Ingestion - Acute: Poison by ingestion. Swallowing will cause burns of the mouth, throat and stomach.

SECTION IV: First Aid Measures

Inhalation: Remove victim to fresh air while protecting yourself from exposure with an appropriate respirator. Remove any contaminated clothing to prevent further inhalation exposure. Use gloves to avoid contaminating yourself. If not breathing, clear victim's airway and start artificial respiration. Avoid inhaling expired air. Artificial respiration may be supplemented by the use of a bag-mask respirator or manually triggered oxygen supply capable of delivering one liter per second or more. If victim is breathing, supplemental oxygen may be given from a demand-type or continuous-flow inhaler, preferably with a physician's advice. Monitor breathing and pulse. If victim stops breathing, restart artificial respiration. If heart has stopped, begin cardiopulmonary resuscitation immediately. Keep person warm and at rest. Get medical attention immediately.

Skin Contact: Using a dry cloth, immediately wipe away excess material from the skin while removing all contaminated clothing and shoes. Under a safety shower, flush affected area with large quantities of water for at least 15 minutes. Do not attempt to neutralize with chemical agents. Get medical attention immediately. Discard contaminated clothing and shoes.

Eye Contact: Immediately flush eyes with large quantities of running water for a minimum of 15 minutes. If the victim is wearing contact lenses, remove them. Take care not to contaminate the victim's healthy skin and eyes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids. Do not let victim rub eye(s). Do not attempt to neutralize with chemical agents. Get medical attention immediately. Oils or ointments should not be used at this time. Continue flushing for an additional 15 minutes if a physician is not immediately available.

Ingestion: If swallowed, immediately give several glasses of water, but do not induce vomiting. This material is corrosive. If vomiting occurs, give water again. Get medical attention immediately. Never give anything by mouth to an unconscious or convulsing person.

Medical Conditions Aggravated: There are no data available that address medical conditions that are generally recognized as being aggravated by exposure to this product. **Note to Physician:** No specific antidote is known. Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical conditions.

SECTION V: Fire Fighting Measures

Flash Point: Not Determined

Flash Method: N/A

Auto Ignition Temp.: Not Determined

Upper Explosion Limit: Not Determined

Lower Explosion Limit: Not Determined

NFPA Ratings: Health- 3; Flammability - 0; Reactivity - 2; Other - None

Extinguishing Media: Small fires: Use dry chemical or carbon dioxide extinguishing agents. Large fires: Flood with water. Large quantities are required to scrub out the liberated hydrogen chloride and wash away the TiCl₄ residue. Contaminated buildings, areas and equipment must not be used until they are properly decontaminated.

Fire Fighting Procedures: Products of combustion are irritating to the respiratory tract and may cause breathing difficulty and pulmonary edema. Symptoms may be delayed several hours or longer depending upon the extent of the exposure. As in any fire, prevent human exposure to fire, smoke, fumes or products of combustion. Evacuate non-essential personnel. Fire fighters should wear self-contained breathing apparatus with full face-plate and impervious protective clothing. Apply water spray to cool fire exposed containers. Do not get water inside containers as a vigorous reaction may result.

Fire & Explosion Hazards: This product is not defined as flammable or combustible. However, the product may support combustion and decompose under fire conditions to produce toxic materials such as hydrogen chloride and chlorine gases. It is not sensitive to static discharge.

Other Fire & Explosion Hazards: Reacts with water to release hydrogen chloride, titanium dioxide and possibly chlorine gas.

Hazardous Products/Combustion: Oxides of titanium and hydrogen chloride gas are produced by the combustion of this product.

SECTION VI: Handling, Storage, Spill and Disposal Procedures

Handling: Wear protective clothing including a face shield and goggles or similar protection when handling this product to avoid eye and skin contact. Wash thoroughly after handling. Emptied container may retain product residues. Follow all warnings and precautions even after container is emptied.

Storage: Store away from foodstuffs and animal feed. Containers should be stored in a cool, dry, well-ventilated area away from flammable or oxidizing materials and sources of heat or flame. Exercise due caution to prevent damage to or leakage from the container. Containers should be opened only in a dry atmosphere.

Maximum Storage Temperature: Not Determined

Spills and Leaks: All personnel involved in spill cleanup should follow good industrial hygiene practices. Wear protective clothing to prevent eye and skin contact. Use adequate ventilation and/or wear a NIOSH approved organic vapor respirator with dust, mist, and fume filter to minimize

SECTION VI: Handling, Storage, Spill and Disposal Procedures (Continued)

inhalation exposure. Stop source of spill if this is possible without being injured. Small spills should be absorbed with a suitable, inert material (e.g., sand or earth). Remove the absorbed material, and place in an appropriate chemical waste container for disposal. Flush the spill area with detergent and water. Large spills should be diked to prevent spreading. Pump spilled material to salvage according to a predetermined plan. Remove residual material, and flush spill area with detergent and water.

Disposal: Dispose of in a manner compliant with all Federal, State and local laws and regulations.

SECTION VII: Exposure Controls/Personal Protection

Respiratory Protection: Where there is potential for inhalation exposure in excess of any given exposure limits, wear a NIOSH approved air purifying respirator equipped with organic vapor/acid gas cartridges and high efficiency filters, and an air supplied mask or a self-contained breathing apparatus.

Skin Protection: Skin contact with liquid or its aerosol must be prevented through the use of impervious clothing, impervious gloves and footwear selected with regard for use condition exposure potential. Safety showers, with quick opening valves which stay open, should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated or heat-traced lines to prevent freeze-ups in cold weather.

Eye Protection: Eye contact with liquid or aerosol must be prevented through the use of chemical safety goggles or a face shield selected with regard for use condition exposure potential. Eye wash fountains or other means of washing the eyes with a gentle flow of water should be readily available in all areas where this product is handled or stored. Water should be supplied through insulated and/or heat-traced pipes to prevent freeze-up in winter.

Ventilation Protection: Sufficient good general ventilation should be provided to keep concentration below the exposure limit. All work with samples should be conducted in a hood.

Other Protection: During the development of safe handling procedures, consideration should be given to the need for cleaning of equipment and piping systems to render them nonhazardous before maintenance and repair activities are performed. Waste resulting from these procedures should be handled in an environmentally safe manner. All food and smoking materials should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for significant exposure to this material. Before eating, drinking or smoking, hands and face should be thoroughly washed.

Applicable Exposure Limits (in MG/M3)

Reg. Agency	PEL	TLV	TWA	STEL	CEIL	Reg. Agency	PEL	TLV	TWA	STEL	CEIL
OSHA	N/D	N/D	N/D	N/D	N/D	ACGIH	N/D	N/D	N/D	N/D	N/D
NIOSH	N/D	N/D	N/D	N/D	N/D	SUPPLIER	N/D	N/D	0.5000	N/D	N/D

CEIL=Ceiling Exposure Limit; PEL=Permissible Exposure Limit; STEL=Short Term Exposure Limit; TLV Threshold Limit Value; TWA=Time Weighted Average; N/D = Not Determined

SECTION VIII: Stability and Reactivity

Stability: This product reacts violently with water resulting in the formation of toxic gases.

Incompatibilities: This product is water-reactive. **Polymerization:** Hazardous polymerization is not expected to occur.

Decomposition: Hydrogen chloride is a product of combustion and/or decomposition. Under fire conditions, thermal decomposition products may include toxic chlorine gas, titanium oxychloride and titanium oxides.

Conditions to Avoid: Care should be taken to prevent moisture condensation in the container.

SECTION IX: Toxicological Information

Toxicological - Inhalation: The acute inhalation LC50 is 0.4 mg/L in rats for a 4 hour exposure. The cause of death appeared to be pulmonary edema. Repeated inhalation exposures in rats to 0.04 mg/L for 6 hours per day 5 days per week for four weeks produced decreased weight gain, inflammation of the respiratory tract, pulmonary fibrosis and 8% mortality. Similar treatment at 0.005 mg/L showed no treatment related effects.

Inhalation Chronic Exposure: Prolonged and/or repeated inhalation may cause severe respiratory irritation, pulmonary edema, respiratory tract inflammation, and pulmonary fibrosis. This material is a poison inhalation hazard.

Toxicological - Dermal: The acute dermal LD50 is 3160 mg/kg in rabbits. A single dermal application of 1000 mg/kg did not produce symptoms of toxicity in rabbits. Local effects included moderate to severe necrosis and edema.

Skin Contact - Chronic: Skin contact may cause severe irritation including moderate to severe necrosis and edema.

Toxicological - Eye: This product is corrosive to the eyes.

Toxicological - Ingestion: The acute oral LD50 for this material is less than 464 mg/kg in male rats.

Ingestion - Chronic: Poison by ingestion. Ingestion will result in burns of the throat, esophagus, stomach and digestive tract.

Carcinogenicity/Mutagenicity: This product is not classified as a carcinogen by IARC, NTP, OSHA or ACGIH.

Reproductive Effects: The reproductive toxicity of this product is not known.

Neurotoxicity: The neurotoxic effects of this product are not known.

Other Toxicological Effects: Titanium tetrachloride is not classified as a carcinogen by IARC, NTP or OSHA. However, in a lifetime inhalation test microscopic lung tumors were found in 5 of 150 rats exposed at 10 mg/m³ TiCl₄. The authors concluded that the relevance to man of the type of lung tumor found in this study is highly questionable. In addition, a 1992 epidemiological study conducted by E. I. Dupont of workers exposed to titanium tetrachloride concluded that the risk of developing lung cancer was not significantly higher in the titanium tetrachloride exposed workers.

Target Organs: Overexposure to this product may affect the skin, eyes, lung and upper respiratory tract.

SECTION IX: Special Precautions and Comments

Store in a cool, dry place. Store product in a place safe from being broken, dropped or crushed. Keep product out of the reach of children.

Do not use or store around food or food products. Eating, drinking and smoking should be prohibited in areas where the product is stored or used. Before eating, drinking or smoking, hands and face must be thoroughly washed.

Product should be used only by those familiar with all safety documentation.

Note: For Physical Properties, additional Hazard Ratings and Ecological Data see separate *Product Information* sheet.

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Ref. Akzo MSDS 11-085111 12/18/98-008