

TITANIUM TETRACHLORIDE

TTT

CAUTIONARY RESPONSE INFORMATION

Common Synonyms

Watery liquid Colorless to light yellow Irritating odor

Reacts violently with water. Produces dense fumes in air.

Evacuate.
Keep people away. **AVOID CONTACT WITH LIQUID AND VAPOR.**
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Notify local health and pollution control agencies.

Fire

Not flammable.
DO NOT USE WATER ON ADJACENT FIRES.

Exposure

CALL FOR MEDICAL AID.

VAPOR

Irritating to eyes, nose and throat.
If inhaled, will cause coughing or headache.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

Will burn skin and eyes.
If swallowed, will cause nausea and vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse
Stop discharge
Chemical and Physical Treatment:
Neutralize

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.
2.2 Formula: TiCl_4
2.3 IMO/UN Designation: 8.0/1838
2.4 DOT ID No.: 1838
2.5 CAS Registry No.: 7550-45-0
2.6 NAERG Guide No.: 137
2.7 Standard Industrial Trade Classification: 52329

3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles and face shield; air-supplied mask or approved canister; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Vapors can cause severe irritation and damage to eyes, coughing, headache, dizziness, lung damage, bronchial pneumonia. Liquid causes thermal and acid burns of eyes, skin, throat, and stomach. If ingested, causes nausea, vomiting, cramps, diarrhea, and possible tissue ulceration.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if symptoms persist, call a doctor. INGESTION: give large amounts of water, then induce vomiting; give milk, eggs or olive oil; call a doctor. EYES: immediately flush with copious amounts of water for at least 15 min; call a doctor. SKIN: flush with water; obtain medical attention if irritation persists.
- 3.4 TLV-TWA: Not listed.
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Disturbances of upper respiratory and nervous system in man.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
3.14 OSHA PEL-TWA: Not listed.
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

- 4.1 **Flash Point:**
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Dry powder or carbon dioxide on adjacent fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water if it can contact titanium tetrachloride.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** If container leaks, a very dense white fume forms and can obscure operations.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with moisture in air, forming dense white fume. Reaction with liquid water gives off heat and forms hydrochloric acid.
- 5.2 **Reactivity with Common Materials:** The acid formed by reaction with moisture attacks metals, forming flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Acid formed by reaction with water can be neutralized by limestone, lime, or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**
None
- 6.5 **GESAMP Hazard Profile:**
Bioaccumulation: 0
Damage to living resources: 1
Human Oral hazard: 1
Human Contact hazard: II
Reduction of amenities: XX

7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4 |
| Flammability (Red)..... | 0 |
| Instability (Yellow)..... | 2 |
| Special (White)..... | W |
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCL List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 189.71
- 9.3 **Boiling Point at 1 atm:** 277°F = 136°C = 409°K
- 9.4 **Freezing Point:** -11°F = -24°C = 249°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.726 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.221
- 9.12 **Latent Heat of Vaporization:** 79.7 Btu/lb = 44.3 cal/g = 1.86 X 10⁵ J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -482.8 Btu/lb = -268.2 cal/g = -11.22 X 10⁵ J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

NOTES

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	109.700	40	0.190		N		N
40	109.400	50	0.190		O		O
45	109.099	60	0.190		T		T
50	108.799	70	0.190				
55	108.500	80	0.190		P		P
60	108.200	90	0.190		E		E
65	107.900	100	0.190		R		R
70	107.599	110	0.190		T		T
75	107.299	120	0.190		I		I
80	107.000	130	0.190		N		N
85	106.700	140	0.190		E		E
90	106.400	150	0.190		N		N
95	106.099	160	0.190		T		T
100	105.900	170	0.190				
105	105.599	180	0.190				
110	105.299	190	0.190				
115	105.000	200	0.190				
120	104.700	210	0.190				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	10	0.022	10	0.00082	85	0.058
	E	20	0.033	20	0.00122	90	0.058
	A	30	0.049	30	0.00176	95	0.058
	C	40	0.071	40	0.00250	100	0.058
	T	50	0.100	50	0.00348	105	0.058
	S	60	0.140	60	0.00477	110	0.058
		70	0.193	70	0.00644	115	0.058
		80	0.262	80	0.00857	120	0.058
		90	0.350	90	0.01125	125	0.058
		100	0.462	100	0.01458	130	0.058
		110	0.602	110	0.01868	135	0.058
		120	0.777	120	0.02368	140	0.058
		130	0.991	130	0.02971	145	0.058
		140	1.253	140	0.03693	150	0.058
		150	1.569	150	0.04547	155	0.058
		160	1.947	160	0.05553	160	0.058
		170	2.397	170	0.06727	165	0.058
		180	2.927	180	0.08087	170	0.058
		190	3.549	190	0.09654		
		200	4.273	200	0.11450		
		210	5.111	210	0.13490		
		220	6.076	220	0.15800		
		230	7.179	230	0.18400		
		240	8.436	240	0.21310		
		250	9.859	250	0.24550		
		260	11.460	260	0.28150		