MATERIAL SAFETY DATA SHEET

I PRODUCT IDENTIFICATION

Trade Name:	Hafnium Chloride	**Chemical Family**:	Metal halide
Synonym:	Hafnium chloride, Hafnium tetrachloride	**Formula**:	$HfCl_4$
Molecular Weight:	320.30	**CAS #**:	13499-05-3

II HAZARDOUS INGREDIENTS

Hazardous Components:	**OSHA PEL**:	**ACGIH TLV**:	**Other Limits**:	**Percentage**:
Hafnium chloride	0.5 mg Hf/m^3	0.5 mg Hf/m^3	N/E	0.0-100.0

Sec. 302 (EHS): No **Sec. 304 RQ**: No **Sec. 313**: No

HMIS Ratings(0-4): **Health**: 4 **Flammability**: 0 **Reactivity**: 2
HMIS Protective Equipment: Goggles, gloves, apron, and respirator.

III PHYSICAL DATA

Boiling Point 760 mm Hg:	319.0 °C	**Physical State**:	Solid
Specific Gravity (Water=1):	N/E	**Melting Point**:	N/E or N/A
Vapor Pressure (mm Hg):	1 mm at 190 °C	**Vapor Density (Air=1)**:	N/A
% Volatile by Volume:	N/E or N/A	**Evaporation Rate**:	N/A
Solubility (Weight in H_2O):	Decomposes to hafnium oxychloride		
Appearance and Odor:	White powder, very strong hydrochloric acid.		

IV FIRE AND EXPLOSION HAZARDS DATA

Flash Point: N/E or N/A **Method Used**: Non-flammable
Explosive Limits: **LEL**: N/A **UEL**: N/A
Extinguishing Media: USE: Not applicable. Use suitable extinguishing agent for surrounding materials and type of fire.

Special Firefighting Procedures: Firefighters must wear full-face, self-contained breathing apparatus with full protective clothing to prevent contact with skin and eyes. Fumes from fire are hazardous. Isolate runoff to prevent environmental pollution.

Unusual Fire and Explosion Hazards: When heated to decomposition, it may emit toxic fumes of Cl^-. Reacts with water to evolve hydrogen chloride.

V HEALTH HAZARD INFORMATION

Routes of Entry: Inhalation, skin, eyes, and ingestion.

Health Hazards (Acute and Chronic):

Hafnium is a poison by unspecified route. It is poorly soluble in water and thus is not absorbed efficiently by ingestion. Many hafnium compounds are poisons (Sax, Dangerous Properties of Industrial Materials, eighth edition).

Inhalation: Acute: SEVERE IRRITANT AND CORROSIVE. Large amounts are corrosive and may cause respiratory failure, pulmonary edema and possible death.
Chronic: May cause lung edema and laryngeal spasm.

Ingestion: Acute: SEVERE IRRITANT AND CORROSIVE. May cause chemical burns to the mouth, gastric irritation abdominal pain and diarrhea. Moderately toxic by ingestion.
Chronic: No chronic health effects recorded.

Skin: Acute: SEVERE IRRITANT AND CORROSIVE to moist or wet skin.
Chronic: No chronic health effects recorded.

Eye: Acute: SEVERE IRRITANT AND CORROSIVE.
Chronic: No chronic health effects recorded.

Target Organs: May affect the respiratory system, skin and eyes.
Carcinogenicity: **NTP**? No **IARC Monographs**? No **OSHA Regulated**? No

Signs and Symptoms of Exposure:

Inhalation: May cause coughing, choking, respiratory discomfort, headaches and nausea.
Ingestion: No signs and symptoms of exposure recorded.
Skin: May cause redness, itching and chemical burns.
Eye: May cause redness, itching watering and chemical burns.

Medical Conditions Generally Aggravated by Exposure: Pre-existing respiratory and skin disorders.
Other Hafnium Toxicity Data: orl-rat LD50: 2362 mg/kg; skn-rbt 500 mg MLD; ipr-mus LD50: 135 mg/kg

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: Remove victim to fresh air; keep warm and quiet; give oxygen if breathing is difficult and seek medical attention immediately.
INGESTION: Do not induce vomiting; seek medical attention immediately.
SKIN: Remove contaminated clothing; brush material off skin; wash affected area with mild soap and water; seek medical attention immediately.
EYE: Flush eyes with lukewarm water, lifting upper and lower eyelids, for at least 15 minutes. Seek medical attention immediately.

VI REACTIVITY DATA

Stability: Stable
Conditions to Avoid (Instability): None
Incompatibility (Material to Avoid): Water, steam, moisture, phenol and amines.

Hazardous Decomposition Products: Fumes of hydrogen chloride
Hazardous Polymerization: Will not Occur
Conditions to Avoid (Hazardous Polymerization): None

VII SPILL OR LEAK PROCEDURES

Steps to Be Taken in Case Material Is Released or Spilled: Wear appropriate respiratory and protective equipment specified in Section VIII-Special Protection Information. Isolate spill area and provide ventilation. Vacuum up spill using a high efficiency particulate absolute (HEPA) air filter and place in a closed container for proper disposal. Take care to raise dust.

Waste Disposal Method: Dispose of in accordance with Local, State and Federal regulations
Hazard Label Information: Store in a cool, dry area in a tightly sealed container. Wash thoroughly after handling

Precautions to Be Taken in Handling and Storing: None
Other Precautions: Hafnium chloride reacts with water to evolve hydrochloric acid and heat. Handle and store in a controlled environment and in an inert gas such as argon.

VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): NIOSH approved dust-mist-vapor cartridge respirator.

Ventilation: **Local Exhaust**: To maintain concentration at or below the PEL, TLV.
Mechanical (general): Not recommended **Other**: Handle in and inert gas such as argon.
Special: Handle in an enclosed, controlled environment

Protective Gloves: Rubber, neoprene or nitrile gloves **Eye Protection**: Safety goggles
Other Protective Clothing or Equipment: Protective gear suitable to prevent contamination.

Work/Hygienic/Maintenance Practices: Implement engineering and work practice to reduce and maintain concentration at low levels. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating and smoking. Do not blow dust off clothing or skin with compressed air.

IX ADDITIONAL COMMENTS

Some of the chemicals listed herein are research or experimental substances which may be toxic, as defined by various governmental regulations. In accordance with Environmental Protection Agency regulations and the Toxic Substance Control Act (TSCA), these materials should only be handled by, or under the direct supervision of, a “technically qualified individual”, as defined in 40 CFR 710.2(aa).

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