

## Praxair Material Safety Data Sheet

### 1. Chemical Product and Company Identification

<b>Product Name:</b> Nitrates, inorganic, n.o.s. [hafnium nitrate] (MSDS No. P-6295)	<b>Trade Name:</b> Not applicable
<b>Chemical Name:</b> Hafnium(IV)nitrate	<b>Synonyms:</b> Hafnium nitrate
<b>Formula:</b> Hf(NO <sub>3</sub> ) <sub>4</sub>	<b>Chemical Family:</b> Nitrate
<b>Telephone:</b>	<b>Company Name:</b> Praxair, Inc.
<b>Emergencies:</b> 1-800-645-4633*	39 Old Ridgebury Road
<b>CHEMTREC:</b> 1-800-424-9300*	Danbury, CT 06810-5113
<b>Routine:</b> 1-800-PRAXAIR	

\* 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. Composition/Information on Ingredients

See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCENTRATION	OSHA PEL	ACGIH TLV-TWA (2002)
Hafnium nitrate	15509-05-4	>99%*	None currently established.**	0.5 mg/m <sup>3</sup> ***

\* The symbol > means "greater than."

\*\* The OSHA PEL for hafnium is 0.5 mg/m<sup>3</sup>.

\*\*\* Hafnium and compounds, as Hf

### 3. Hazards Identification

#### EMERGENCY OVERVIEW

**DANGER! Corrosive solid.**

**Can cause severe eye, skin, and respiratory tract burns.**

**Harmful or fatal if ingested; harmful if absorbed through the skin.**

**May cause liver damage.**

**Oxidizer: May accelerate combustion.**

**May cause dizziness and drowsiness.**

**Self-contained breathing apparatus and protective clothing  
may be required by rescue workers.**

**Odor: Unknown**

**THRESHOLD LIMIT VALUE:** TLV-TWA, 0.5mg/m<sup>3</sup> (ACGIH, 2002). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

**EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:**

**INHALATION**—Contact with moist tissues of the respiratory tract may be acutely destructive. Inhalation may cause inflammation and edema of the larynx and bronchi, spasm, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include coughing, wheezing, burning sensation, laryngitis, shortness of breath, headache, nausea, and vomiting.

**SKIN CONTACT**—The byproducts of reaction with moisture in the skin are corrosive and may burn or irritate the skin. With prolonged or repeated exposure, harmful amounts may be absorbed through the skin.

**SWALLOWING**—Hafnium compounds may be fatal if ingested. Ingestion may be extremely corrosive to the mouth, throat, esophagus, and stomach. Hafnium compounds can cause liver damage.

**EYE CONTACT**—Eye contact can be extremely destructive due to formation of corrosive byproducts of moisture reaction.

**EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:** Repeated or prolonged exposure can be extremely destructive to mucous membranes, upper respiratory tract, eyes, and skin. With prolonged or repeated exposure, harmful amounts may be absorbed through the skin.

**OTHER EFFECTS OF OVEREXPOSURE:** Zirconium impurity may cause allergic rash.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** The skin irritating properties of hafnium(IV)nitrate may aggravate an existing dermatitis. Respiratory irritation may aggravate an existing asthma or other upper respiratory or pulmonary disease. Ingestion may aggravate digestive tract ailments.

**SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:** None known.

**CARCINOGENICITY:** Hafnium(IV)nitrate is not listed by NTP, OSHA, or IARC.

<b>4. First Aid Measures</b>
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**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 immediately.

**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:** Seek immediate medical attention. If the victim is conscious, wash out the mouth with water; the victim may also be given water. Never give anything by mouth to an unconscious person. Keep the victim calm. 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:** *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

*Exposure to zirconium, present as an impurity at <1%, has caused granulomatous lesions of probable allergic epitheloid origin in susceptible individuals.*

## 5. Fire Fighting Measures

<b>FLASH POINT</b> (test method):	Not applicable
<b>AUTOIGNITION TEMPERATURE:</b>	Not applicable
<b>FLAMMABLE LIMITS IN AIR</b> , % by volume:	<b>LOWER:</b> Not applicable   <b>UPPER:</b> Not applicable
<b>EXTINGUISHING MEDIA:</b> Hafnium(IV)nitrate will not burn. Use material appropriate for surrounding fire.	

**SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Corrosive solid.** May emit toxic or corrosive fumes under fire conditions. Evacuate all personnel from danger area. Use self-contained breathing apparatus and protective clothing. Immediately deluge containers with water spray from maximum distance until cool; then move them away from fire area if without risk. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** May emit toxic fumes under fire conditions. Fumes and vapors may spread from leak.

**HAZARDOUS COMBUSTION PRODUCTS:** Hafnium(IV)nitrate will not burn. Thermal decomposition may produce carbon monoxide, carbon dioxide, and hafnium and nitrogen oxides.

## 6. Accidental Release Measures

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Corrosive solid.** 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. Ventilate area or move container to a well-ventilated area.

**WASTE DISPOSAL METHOD:** Prevent waste from contaminating the surrounding environment. Keep personnel away. Avoid raising dust. Sweep up material, and place into containers for later disposal. Ventilate area and wash spill site when pickup is complete. Avoid runoff. 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 STORAGE:** Store and use with adequate ventilation. Store in a cool, dry area away from combustible materials, heat, sparks, and open flame. Store in the container in which product was received. Never store hafnium(IV)nitrate 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.

**PRECAUTIONS TO BE TAKEN IN HANDLING:** Protect containers from damage. For other precautions in using this product, see section 16.

## 8. Exposure Controls/Personal Protection

### VENTILATION/ENGINEERING CONTROLS:

**LOCAL EXHAUST**–Use only under a chemical fume hood.

**MECHANICAL (general)**–Inadequate.

**SPECIAL**–None

**OTHER**–None

**RESPIRATORY PROTECTION:** Respirators must be acceptable to MSHA and NIOSH. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

**SKIN PROTECTION:** Wear work gloves when handling containers; heavy rubber gloves where contact with product may occur.

**EYE PROTECTION:** Wear safety glasses when handling containers. Select eye protection in accordance with OSHA 29 CFR 1910.133.

**OTHER PROTECTIVE EQUIPMENT:** Protective clothing including rubber boots where needed. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

## 9. Physical and Chemical Properties

**MOLECULAR WEIGHT:** 426.51 g/mol

**MELTING POINT:** >572°F (300°C)

**APPEARANCE, ODOR, AND STATE:** Solid powder; odor unknown

## 10. Stability and Reactivity

**STABILITY:**  Unstable  Stable

**INCOMPATIBILITY (materials to avoid):** Strong oxidizers, organic materials, finely powdered metals

**HAZARDOUS DECOMPOSITION PRODUCTS:** Thermal decomposition or burning may produce CO, CO<sub>2</sub>, and hafnium and nitrogen oxides.

**HAZARDOUS POLYMERIZATION:**  May Occur  Will Not Occur

**CONDITIONS TO AVOID:** Ignition sources, air, moisture, heat

## 11. Toxicological Information

See section 3.

## 12. Ecological Information

Hafnium(IV)nitrate does not contain any Class I or Class II ozone-depleting chemicals.

Hafnium(IV)nitrate is not listed as a marine pollutant by DOT.

## 13. Disposal Considerations

**WASTE DISPOSAL METHOD:** Do not attempt to dispose of residual or unused quantities. Return container to supplier.

<b>14. Transport Information</b>
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<b>DOT/IMO SHIPPING NAME:</b> Nitrates, inorganic, n.o.s. [hafnium nitrate]			
<b>HAZARD CLASS:</b> 5.1	<b>PACKING GROUP:</b> II	<b>IDENTIFICATION NUMBER:</b> UN 1477	<b>PRODUCT RQ:</b> None
<b>SHIPPING LABEL(s):</b>		OXIDIZER	
<b>PLACARD (when required):</b>		OXIDIZER	

<b>15. Regulatory Information</b>
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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 (40 CFR Part 355):

**Threshold Planning Quantity (TPQ):** None

**Extremely Hazardous Substances (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

**PRESSURE:** No

**DELAYED:** Yes

**REACTIVITY:** Yes

**FIRE:** Yes

**SECTION 313:** Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Hafnium(IV)nitrate is not subject to the reporting requirements of this section.

**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.

Hafnium(IV)nitrate is not listed as a regulated substance.

**TSCA: TOXIC SUBSTANCES CONTROL ACT:** Hafnium(IV)nitrate 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.

Hafnium(IV)nitrate is not listed in Appendix A as a highly hazardous chemical.

**STATE REGULATIONS:**

**CALIFORNIA:** Hafnium(IV)nitrate is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

**PENNSYLVANIA:** Hafnium(IV)nitrate is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

<b>16. Other Information</b>
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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: *Corrosive solid.***

Do not breathe particles. Use only with adequate ventilation or respiratory protection. (See section 8.) Do not get in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. *Use only with compatible materials and equipment.* Keep away from flammables, oxidizers, and organic materials. *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.

**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 = 0  
REACTIVITY = 1  
SPECIAL = None

**HMIS RATINGS:**

HEALTH = 3  
FLAMMABILITY = 0  
REACTIVITY = 1

*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.

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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.

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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 Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. 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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