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## SAFETY DATA SHEET

Section 1- IDENTIFICATION		
COMPOSITION <b>Hf</b>		PRODUCT NAME <b>Hafnium</b>
SUPPLIER: <b>Plasmaterials, Inc. 2268 Research Drive Livermore, CA 94550 Ph: 925-447-4030</b>	RECOMMENDED USE: <b>Laboratory Chemicals Scientific Research</b>	EMERGENCY TELEPHONE NUMBERS <b>US: 800-424-9300 International: 001-703-527-3887</b>

Section 2- HAZARD(S) IDENTIFICATION	
<b>PHYSICAL HAZARDS:</b> Flammable solids Category 2 Pyrophoric Solids Category 1	<b>ENVIRONMENTAL HAZARDS:</b> Not Classified
<b>HEALTH HAZARDS:</b> Specific Target Organ Toxicity, Single exposure Category 3-Respiratory tract irritation	<b>OSHA DEFINED HAZARDS:</b> Not Classified
<b>LABEL ELEMENTS: Signal Word: Danger</b>	
	
<b><u>HAZARD STATEMENTS</u></b>	
<ul style="list-style-type: none"> <li>-H228: Flammable solid.</li> <li>-H250: Catches fire spontaneously if exposed to air.</li> <li>-H335: May cause respiratory irritation.</li> </ul>	
<b><u>PRECAUTIONARY STATEMENTS</u></b>	
<ul style="list-style-type: none"> <li>-P210: Keep away from heat/sparks/hot surfaces/open flames and other ignition sources. No smoking.</li> <li>-P222: Do not allow contact with air.</li> <li>-P240: Ground/bond container and receiving equipment.</li> <li>-P241: Use explosion proof electrical/ventilating/lighting/equipment</li> <li>-P261: Avoid breathing dust, fume, gas, mist, vapors, spray.</li> <li>-P264: Wash face, hands and any exposed skin thoroughly after handling</li> <li>-P271: Use only outdoors or in a well-ventilated area.</li> <li>-P280: Wear protective gloves/eye protection/face protection/ protective clothing</li> <li>-P304+P340+P312: IF INHALED, remove person to fresh air and keep comfortable for breathing. Call a poison center or physician/doctor if you feel unwell.</li> <li>-P335+P334: Brush off loose particles from skin. Immerse in cool water/wrap in wet bandages.</li> <li>-P370+P378: In case of fire, use appropriate media to extinguish.</li> <li>-P403+P233: Store in a well-ventilated place. Keep container tightly closed.</li> <li>-P405: Store locked up.</li> <li>-P422: Store contents under appropriate liquid or inert gas.</li> <li>-P501: Dispose of contents/container to an approved waste disposal plant</li> </ul>	
<b>Hazards not otherwise classified (HNOC):</b>	
-None identified.	

### Section 3- COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	CAS-No	Molecular Weight
Hafnium	7440-58-6	178.49 g/mol

### Section 4- FIRST AID MEASURES

**GENERAL ADVICE:** Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

**INHALATION:** Remove victim from exposure to fresh air and keep at rest in a position comfortable for breathing. Call a poison center/physician if you feel unwell.

**SKIN CONTACT:** Brush off loose particles Seek medical attention if irritation develops or persists.

**EYE CONTACT:** Do not rub eyes. Immediately flush eyes with plenty of water, lifting upper and lower lids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops or persists.

**INGESTION:** Rinse mouth with water. Never give anything by mouth to an unconscious person. If ingestion of a large amount does occur, call a poison center immediately.

**MOST IMPORTANT SYMPTOMS/EFFECTS:** May cause respiratory irritation.

#### INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT

**NEEDED:** Provide general supportive measures and treat symptomatically. Thermal burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim under observation. Symptoms may be delayed.

### Section 5- FIREFIGHTING MEASURES

#### Suitable Extinguishing Media:

Dry sand, dry chemical, soda ash, lime, water fog, alcohol resistant foam, carbon dioxide (CO<sub>2</sub>)

#### Unsuitable Extinguishing Media:

Do not use water jet as an extinguisher as this will spread the fire.

#### Specific Hazards Arising from the Chemical:

Gases hazardous to health may be formed

#### Protective Equipment & Precautions for Firefighters:

As in any fire, Firefighters must wear full face, self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective clothing to prevent contact with skin and eyes.

#### Fire Fighting Instructions:

In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.

#### Specific Methods:

Use standard firefighting procedures and consider the hazards of other involved materials.

#### General Fire Hazards:

Flammable solid. Catches fire spontaneously if exposed to air.

### Section 6- ACCIDENTAL RELEASE MEASURES

**Personal Precautions:** Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate all ignition sources, no smoking, flares, sparks or flames in immediate area. Wear appropriate protective equipment and clothing during clean-up. Ensure adequate ventilation. Avoid dust formation. Avoid breathing vapors, mist or gas. Local authorities should be advised if significant spillages cannot be contained. For personal protection see section 8.

**Environmental Precautions:** Avoid discharge into drains, water courses or onto the ground.

#### Methods for Containment & Clean Up:

-Neutralize with lime or soda ash.

-Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools.

-This product is immiscible with water and will spread on the water surface. Stop the flow of material if this is without risk.

-Large Spills: Wet down with water and dike for later disposal. Shovel the material into waste container.

Following product recovery, flush area with water.

-Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal.

-Never return spills to original containers for re-use. For waste disposal, see Section 13.

## Section 7- HANDLING AND STORAGE

**Handling:** Provide adequate precautions such as electrical grounding and bonding or inert atmospheres. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. When using do not smoke. Explosion-proof general and local exhaust ventilation. Avoid prolonged exposure. Wear appropriate personal protection equipment. Observe good industrial hygiene practices. Wash hands thoroughly after handling. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed.

**Storage:** Store locked up. Store in a cool, dry and well-ventilated place out of direct sunlight. Store in original tightly closed container. Keep away from heat, sources of ignition, sparks and open flame. Keep in an area equipped with sprinklers. Store away from incompatible materials. (see Section 10)

## Section 8- EXPOSURE CONTROLS/PERSONAL PROTECTION

### Exposure Guidelines:

Component	CAS-No.	Value	Control Parameters	Basis
Hafnium	7440-58-6	TWA	0.500000 mg/m3	USA Occupational exposure limits (OSHA)- Table Z-1 Limits for air contaminants
		TWA	0.500000 mg/m3	USA.ACGIH Threshold Limit Values (TLV)
	Remarks	Eye Irritation Upper Respiratory Tract Irritation Liver damage		
		TWA	0.500000 mg/m3	USA.NIOSH recommended exposure limits
		TWA	0.500000 mg/m3	USA.ACGIH Threshold Limit Values (TLV)
	Remarks	Eye Irritation Upper Respiratory Tract Irritation Liver damage		
		TWA	0.5 mg/m3	USA.NIOSH recommended exposure limits
		TWA	0.5 mg/m3	USA Occupational exposure limits (OSHA)- Table Z-1 Limits for air contaminants
		TWA	0.5 mg/m3	USA.ACGIH Threshold Limit Values (TLV)
	Remarks	Eye Irritation Upper Respiratory Tract Irritation Liver damage		
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8 Article 107)

**Biological Limit Values:** No biological exposure limits noted for the ingredient(s)

**Control Parameters:** Follow standard monitoring procedures.

### Personal Protective Equipment:

**Eye/Face Protection:** Wear safety glasses with side shields. Use equipment for eye protection tested and approved under appropriate standards such as NIOSH (US) or EN 166 (EU).

**Skin and Body Protection:** Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Wear suitable protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory Protection:** Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Thermal Hazards:** Wear appropriate thermal protective clothing when necessary.

**Hygiene Measures:** Handle in accordance with good industrial hygiene and safety practice. When using do not smoke. Keep away from food and drink. Wash thoroughly after handling and before eating, drinking and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Contaminated work clothing should not be allowed out of the workplace.

## Section 9- PHYSICAL AND CHEMICAL PROPERTIES

**Physical State:** Solid  
**Odor:** Not Applicable  
**Odor Threshold:** No information available  
**pH:** No information available  
**Melting Point/Range:** 2,227°C / 4,041°F – lit.  
**Boiling Point/Range:** 4,602°C / 8,316°F – lit.  
**Flash Point:** No information available  
**Evaporation Rate:** No information available  
**Flammability (solid,gas):** Flammable solid  
**Flammability or Exposure Limits:**  
    **Upper:** No data available  
    **Lower:** No data available  
**Vapor Pressure:** No information available  
**Vapor Density:** No information available  
**Relative Density:** 13.3 g/cm<sup>3</sup>  
**Solubility (Water):** Insoluble  
**Partition coefficient; n-octanol/water:** No information available  
**Auto Ignition Temperature:** No information available  
**Decomposition Temperature:** No information available  
**Viscosity:** No information available  
**Explosive Properties:** No information available  
**Oxidizing Properties:** No information available

## Section 10- STABILITY AND REACTIVITY

**Reactive Hazard:** Stable and non-reactive under normal conditions of use, storage and transport

**Stability:** Stable under normal conditions.

**Possibility of Hazardous Reactions:** No information available.

**Conditions to Avoid:** Heat, open flames, sparks and other ignition sources. Exposure to air. Contact with incompatible products.

**Incompatible Materials:** Strong oxidizing agents, bromine, chlorine, fluorine, hydrochloric acid, halogenated hydrocarbon, carbon tetrachloride, air

**Hazardous Decomposition Products:**

Hazardous decomposition products formed under fire conditions-Zirconium Oxides, Hafnium Oxides  
Other decomposition products-No information available

## Section 11- TOXICOLOGICAL INFORMATION

**Information on likely Routes of Exposure:**

**Inhalation:** May cause irritation to the respiratory system. Prolonged inhalation may be harmful.

**Skin Contact:** No adverse effects due to skin contact are expected

**Eye Contact:** Direct contact with eyes may cause temporary irritation

**Ingestion:** Expected to be a low ingestion hazard

**Information on Toxicological Effects:**

**Acute Toxicity:** May cause respiratory irritation

**Skin Corrosion/Irritation:** Prolonged skin contact may cause temporary irritation.

**Serious Eye Damage/Eye Irritation:** Direct contact with eyes may cause temporary irritation.

**Respiratory or Skin Sensitization:** No data available

**Carcinogenicity:**

-IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen.

-NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen.

-OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen.

**Mutagenic Effects:** No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic

**Reproductive Effects:** No data available

**STOT – single exposure:** May cause respiratory irritation

**STOT – repeated exposure:** No data available

**Aspiration Hazard:** No data available

**Chronic Effects:** Prolonged inhalation may be harmful.

**Additional Information: (RTECS: MG4600000)**

**Section 12- ECOLOGICAL INFORMATION**

**Ecotoxicity:** Not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Persistence and Degradability:** No data available

**Bioaccumulation/Accumulation:** No data available

**Results of PBT and vPvB assessment:** PBT/vPvB assessment not available as chemical safety assessment not required/not conducted.

**Mobility in soil:** No data available

**Other Adverse Effects:** No data available

**Section 13- DISPOSAL CONSIDERATIONS**

**Waste Disposal Methods:** Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dispose of contaminated packaging as unused product.

**Section 14- TRANSPORT INFORMATION**

**DOT:** Not regulated as dangerous goods

**IATA:** Not regulated as dangerous goods

**IMDG:** Not regulated as dangerous goods

**Section 15- REGULATORY INFORMATION**

**US Federal Regulations:** This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt.D):** Not regulated

**U.S. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):** Not Listed

**SARA 302 Extremely Hazardous Substance:** No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

**SARA 313 (TRI Reporting):** This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313

**SARA 311/312 Hazardous Chemical:** Yes

**SARA Hazard Categories:**

**Immediate Hazard:** Yes

**Delayed Hazard:** No

**Fire Hazard:** Yes  
**Pressure Hazard:** No  
**Reactive Hazard:** No

**Safe Drinking Water Act (SWDA):** Not regulated

**Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List:** Not regulated

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):** Not regulated

**CERCLA Hazardous Substance List (40 CFR 302.4):** Not Listed

**US California Controlled Substances. CA Dept of Justice (California Health & Safety Code Section 11100):** Not Listed

**US California Proposition 65:** This product does not contain any chemicals known to the State of California to cause cancer, birth defects or any other reproductive harm.

**US Massachusetts RTK:**

Component	CAS No.	Revision Date
Hafnium	7440-58-6	1993-04-24

**US New Jersey RTK:**

Component	CAS No.	Revision Date
Hafnium	7440-58-6	1993-04-24
Zirconium	7440-67-7	

**US Pennsylvania RTK:**

Component	CAS No.	Revision Date
Hafnium	7440-58-6	1993-04-24
Zirconium	7440-67-7	

**US Rhode Island RTK:** Not regulated

## Section 16- OTHER INFORMATION

The above information is accurate to the best of our knowledge. However, since data, safety standards and government regulations are subject to change, the conditions of handling and use, or misuse are beyond our control, Plasmaterials, Inc. makes no warranty, either expressed or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. Users should satisfy themselves that they have all current data relevant to their particular use.

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The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product.

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