Section 1: PRODUCT AND COMPANY IDENTIFICATION

A Product Name
Hafnium Tetrachloride

Synonyms
Hafnium Tetrachloride: Hafnium Chloride, (Product #405)

Product Code
SAC027

UN/ID No.
1759

B Recommended Use
Chemical intermediate

Uses advised against

C Supplier

Manufacturer
ATI, 1000 Six PPG Place, Pittsburgh, PA 15222 USA

Emergency Telephone
Chemtrec +1 703-741-5970

Section 2: HAZARDS IDENTIFICATION

A GHS - Classification

Skin corrosion/irritation Category 1B
Corrosive to metals Category 1

B Label elements

Emergency Overview

Signal word Danger

Hazard statements
H290 - May be corrosive to metals

H314 - Causes severe skin burns and eye damage

Appearance Powder

Physical state Solid

Odor Pungent, Slight chlorine

Precautionary Statements - Prevention
• Wear protective gloves/protective clothing/eye protection
• Do not breathe dust/gas/mist

Precautionary Statements - Response
• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
• IF exposed: Call a POISON CENTER or doctor/physician
• IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

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• IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
• Wash contaminated clothing before reuse
• Absorb spillage to prevent material damage

Precautionary Statements - Storage
• Store in a dry place
• Store in corrosion-resistant container

Precautionary Statements - Disposal
• Dispose of contents/container to an approved waste disposal plant

C Other Information
Harmful if swallowed
Hazard not otherwise classified (HNOC)
Reacts violently with water • (EUH014)

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Synonyms</th>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium Tetrachloride: Hafnium Chloride, (Product #405).</td>
<td>Hafnium Tetrachloride</td>
<td>13499-05-3</td>
<td>&gt;95</td>
</tr>
<tr>
<td></td>
<td>Zirconium Tetrachloride</td>
<td>10026-11-6</td>
<td>&lt;4</td>
</tr>
</tbody>
</table>

Section 4: FIRST AID MEASURES

A Eye contact
Flush with water for 15 minutes. See a physician

B Skin Contact
Brush off loose particles from skin Remove/Take off immediately all contaminated clothing
Rinse skin with water/shower

C Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a physician or poison control center immediately.

D Ingestion
Do NOT induce vomiting Have patient drink large quantities of water if able. Call Physician immediately for further instructions.

E Symptoms
May cause acute gastrointestinal effects if swallowed. Contact with moist skin may cause skin burns. May cause breathing difficulties if inhaled.

F. Indication of immediate medical attention and special treatment needed, if necessary
Treat symptomatically.

Section 5: FIRE FIGHTING MEASURES

A Suitable extinguishing media
Non-combustible

Unsuitable extinguishing media
If a fire occurs in the area, avoid water contact with the product to prevent evolution of hazardous gases

B Specific hazards arising from the chemical
Non-combustible

Hazardous combustion products
Hydrogen chloride gas may cause respiratory and/or eye irritation.

C Special protective equipment for fire-fighters
Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.

Section 6: ACCIDENTAL RELEASE MEASURES
A Personal precautions
Use personal protective equipment as required.

For emergency responders
Use personal protective equipment as required. Follow Emergency Response Guidebook, Guide No. 154.

B Environmental precautions
Collect spillage to prevent release to the environment

C. Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so

Methods for cleaning up
Sweep or shovel material into dry containers. Avoid creating uncontrolled dust. Wash the spill location thoroughly with water. Respiratory protection may be needed. Skin and eye protection should be used during cleanup.

Section 7: HANDLING AND STORAGE

A Advice on safe handling
Handle in accordance with good industrial hygiene and safety practice. Protect from moisture. Reacts with water. Ensure adequate ventilation, especially in confined areas. Handle under inert gas such as nitrogen or argon to maintain the integrity of the product.

B Storage Conditions
Keep in corrosion resistant containers. Keep in properly labeled containers. Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Containers may become pressurized. Handle and open container with care.

Incompatible materials
Water, alcohols, phenols, and amines. Rubber, coatings, and some plastics. Reacts with metals to produce heat and corrosive gases.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

A Control parameters

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium Tetrachloride</td>
<td>STEL: 10 mg/m³</td>
</tr>
<tr>
<td>Zirconium Tetrachloride</td>
<td>TWA: 5 mg/m³</td>
</tr>
</tbody>
</table>

B Engineering Controls
Avoid generation of uncontrolled particles. Local exhaust ventilation during processing is recommended.

C Personal Protective Equipment

Respiratory protection
When particulates/fumes/gases are generated and if exposure limits are exceeded or irritation is experienced, proper approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Eye/face protection
If a risk of eye injury or irritation is present, appropriate eye protection is recommended; for example, tight-fitting goggles, foam-lined safety glasses, face shield, or other protective equipment that shields the eyes.

Skin and body protection
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

General Hygiene Considerations
Handle in accordance with good industrial hygiene and safety practice.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

A Physical state
Solid

Appearance
Powder

B Odor
Pungent, Slight chlorine.

C Odor threshold

Color
white, orange
Section 10: STABILITY AND REACTIVITY

A Stability

Stable under normal conditions

Explosion data

Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

B Possibility of Hazardous Reactions

Reacts with water
Hazardous polymerization does not occur

C Conditions to avoid

Unintentional contact with water

D Incompatible materials

Water, alcohols, phenols, and amines. Rubber, coatings, and some plastics. Reacts with metals to produce heat and corrosive gases.

E Hazardous Decomposition Products

Reacts with water to produce hydrogen chloride gas or hydrochloric acid and heat.

Section 11: TOXICOLOGICAL INFORMATION

A Information on likely routes of exposure

Inhalation Product not classified.
Ingestion Harmful if swallowed.
Eye contact Causes severe eye damage.
Skin Contact Causes severe skin burns.

B Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation Causes severe skin burns.
Serious eye damage/eye irritation: Causes severe eye damage.
Sensitization: Product not classified.
Carcinogenicity: Product not classified.
Germ cell mutagenicity: Product not classified.
Reproductive toxicity: Product not classified.
STOT - single exposure: Product not classified.
STOT - repeated exposure: Product not classified.
Target Organ Effects: Aspiration hazard: Product not classified.

### C Numerical measures of toxicity

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium Tetrachloride</td>
<td>112 mg/kg bw</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zirconium Tetrachloride</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Information on toxicological effects

**Symptoms**
May cause skin burns. May cause severe upper respiratory irritation if inhaled. May cause acute gastrointestinal effects if swallowed. May cause burning sensation or redness in the eyes.

### Section 12: ECOLOGICAL INFORMATION

**A Ecotoxicity**
This product as shipped is not classified for aquatic toxicity.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Algae/aquatic plants</th>
<th>Fish</th>
<th>Toxicity to microorganisms</th>
<th>Crustacea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium Tetrachloride</td>
<td>The 72 h EC50 of Hafnium dioxide in water to Pseudokirchneriella subcapitata was greater than the solubility limit of 0.008 mg Hf/L.</td>
<td>The 96 h LC50 of Hafnium dioxide in water to Danio rerio was greater than the solubility limit of 0.007 mg Hf/L.</td>
<td>-</td>
<td>The 48 h EC50 of Hafnium dioxide to Daphnia magna was greater than the solubility limit of 0.007 mg Hf/L.</td>
</tr>
<tr>
<td>Zirconium Tetrachloride</td>
<td>The 14 d NOEC of zirconium tetrachloride to Chlorella vulgaris was greater than 262 mg of ZrCl₄/L.</td>
<td>The 96h LC50 value of zirconium tetrachloride to Oncorhynchus mykiss was greater than 51 mg ZrCl₄/L and the 96 h LL50 of zirconium tetrachloride to Danio rerio was greater than 190 mg of ZrCl₄/L.</td>
<td>-</td>
<td>The 48 h EC50 of zirconium tetrachloride to Daphnia magna was greater than 190 mg of ZrCl₄/L.</td>
</tr>
</tbody>
</table>

**B Persistence and degradability**

**C Bioaccumulation**

**D Mobility**

**E Other adverse effects**

### Section 13: DISPOSAL CONSIDERATIONS

**A Waste from residues/unused products**
Disposal should be in accordance with applicable regional, national and local laws and regulations.

**B Contaminated packaging**
Disposal should be in accordance with applicable regional, national and local laws and regulations.

### Section 14: TRANSPORT INFORMATION
Section 15: REGULATORY INFORMATION

A  Industrial Safety and Health Law  Not applicable

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ISHA - Harmful Substances Prohibited for Manufacturing, Importing, Transferring, or Supplying</th>
<th>Korea. Harmful Substances Requiring Permission</th>
<th>ISHA - Substances to be controlled - Organic Substances</th>
<th>ISHA - Substances to be controlled - Metals</th>
<th>ISHA - Substances to be controlled - Acids and bases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium Tetrachloride</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Zirconium Tetrachloride</td>
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<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

B  Toxic Chemicals Control Law  Not applicable

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Toxic Chemical Classification Listing (TCCL) - Toxic Chemicals</th>
<th>Toxic Chemicals Control Law - Banned and/or restricted</th>
<th>Toxic Chemicals Control Law - Restrictions on use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium Tetrachloride</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
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<tr>
<td>Zirconium Tetrachloride</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

C  Dangerous Material Safety Control  Not applicable

D  Wastes Management  Dispose of in accordance with federal, state and local regulations

E  Other Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Toxic Release Inventory Chemicals - Group 1</th>
<th>Toxic Release Inventory Chemicals - Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium Tetrachloride</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Zirconium Tetrachloride</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

International Inventories

- DSL/NDSL: Complies
- EINECS/ELINCS: Complies
- ENCS: Complies
- IECSC: Not Listed
- KECL: Complies
- PICCS: Not Listed
- AICS: Not Listed

Legend:

- TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
- DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
- EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
- ENCS - Japan Existing and New Chemical Substances
- IECSC - China Inventory of Existing Chemical Substances
- KECL - Korean Existing and Evaluated Chemical Substances
- PICCS - Philippines Inventory of Chemicals and Chemical Substances
- AICS - Australian Inventory of Chemical Substances

Section 16: OTHER INFORMATION

A  Prepared By
Note:
The information provided in this safety data sheet is correct to the best of our knowledge, information and belief at the
date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage,
transportation, disposal and release and is not to be considered a warranty or quality specification. The information
relates only to the specific material designated and may not be valid for such material used in combination with any other
materials or in any process, unless specified in the text.

End of Safety Data Sheet

Additional information available from:
Safety data sheets and labels available at ATImetals.com