Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Code SAC041
Product Name Hafnium Oxychloride Solution
UN/ID no 1760
Synonyms Hafnium Oxychloride Solution: Hafnium Chloride Oxide Solution, Hafnium Dichloride Oxide Solution, Hafnium Dichloride Monoxide Solution

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Chemical intermediate
Uses advised against

1.3. Details of the supplier of the safety data sheet

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

1.4. Emergency telephone number

Emergency Telephone Chemtrec: +1-703-741-5970

Section 2: HAZARDS IDENTIFICATION

This material is classified per Regulation (EC) No 1272/2008.

2.1. Classification of the substance or mixture

Regulation (EC) No 1272/2008

<table>
<thead>
<tr>
<th>Classification</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin corrosion/irritation</td>
<td>1B</td>
</tr>
<tr>
<td>Serious eye damage/eye irritation</td>
<td>1</td>
</tr>
<tr>
<td>May be corrosive to metals</td>
<td>1</td>
</tr>
</tbody>
</table>

2.2. Label elements

Emergency Overview

Danger

Hazard statements
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
Precautionary Statements - Prevention
Do not breathe gas/mist/vapours/spray
Wear protective gloves/protective clothing/eye protection/face protection

Precautionary Statements - Response
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/physician
IF ON SKIN (or hair): Rinse cautiously with water for several minutes. 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
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Wash contaminated clothing before reuse
Absorb spillage to prevent material damage

Precautionary Statements - Storage
Store in corrosive resistant container

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

2.3 Hazards not otherwise classified (HNOC)
Not applicable

Other Information

---

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>EC No</th>
<th>CAS No</th>
<th>Weight-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>231-791-2</td>
<td>7732-18-5</td>
<td>62 - 75</td>
</tr>
<tr>
<td>Hafnium Dichloride Oxide</td>
<td>237-345-3</td>
<td>13759-17-6</td>
<td>25 - 35</td>
</tr>
</tbody>
</table>

---

Section 4: FIRST AID MEASURES

4.1. Description of first aid measures

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

Skin Contact
Wash off immediately with soap and plenty of water. Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

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

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

4.2. Most important symptoms and effects, both acute and delayed

Symptoms
May cause acute gastrointestinal effects if swallowed. Contact with skin may cause skin burns. May cause breathing difficulties if inhaled.
4.3. Indication of any immediate medical attention and special treatment needed

Note to doctors Treat symptomatically.

---

**Section 5: FIREFIGHTING MEASURES**

5.1. Extinguishing media

Suitable extinguishing media
Non-combustible.

Unsuitable extinguishing media
Non-combustible

5.2. Special hazards arising from the substance or mixture

Non-combustible

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

5.3. Advice for firefighters

Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.

---

**Section 6: ACCIDENTAL RELEASE MEASURES**

6.1. Personal precautions, protective equipment and emergency procedures

**Personal precautions**
Use personal protective equipment as required.

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

6.2. Environmental precautions

Collect spillage to prevent release to the environment.

6.3. 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** Wash the spill location thoroughly with water. Respiratory protection may be needed. Skin and eye protection should be used during cleanup.

6.4. Reference to other sections

See Section 12: ECOLOGICAL INFORMATION.

---

**Section 7: HANDLING AND STORAGE**

7.1. Precautions for safe handling

**Advice on safe handling**
Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation, especially in confined areas.

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

7.2. Conditions for safe storage, including any incompatibilities

---
Storage Conditions

Incompatible materials
Alcohols, phenols, and amines. Rubber, coatings, and some plastics.

7.3. Specific end use(s)

Risk Management Methods (RMM)
The information required is contained in this Safety Data Sheet.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>European Union</th>
<th>United Kingdom</th>
<th>France</th>
<th>Spain</th>
<th>Germany</th>
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</thead>
<tbody>
<tr>
<td>Water</td>
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<tr>
<td>7732-18-5</td>
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<tr>
<td>Hafnium Dichloride Oxide</td>
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<tr>
<td>13759-17-6</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Italy</th>
<th>Portugal</th>
<th>Netherlands</th>
<th>Finland</th>
<th>Denmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
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<td></td>
<td></td>
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<tr>
<td>7732-18-5</td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Austria</th>
<th>Switzerland</th>
<th>Poland</th>
<th>Norway</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td></td>
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<td></td>
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<tr>
<td>7732-18-5</td>
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<td>13759-17-6</td>
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</tr>
</tbody>
</table>

Derived No Effect Level (DNEL) No DNELs are available for this product as a whole.

Predicted No Effect Concentration (PNEC) No PNECs are available for this product as a whole.

8.2. Exposure controls

Engineering Controls
Avoid generation of uncontrolled mist.

Personal protective equipment

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.

Respiratory protection
When gases/mists/vapours 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.

Environmental exposure controls Section 6: ACCIDENTAL RELEASE MEASURES.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks • Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>&lt;1</td>
<td></td>
</tr>
</tbody>
</table>
Melting point / freezing point - °C / - °F
Boiling point / boiling range -
Flash point -
Evaporation rate -
Flammability (solid, gas) - Not flammable
Flammability Limit in Air
  Upper flammability limit: -
  Lower flammability limit -
Vapour pressure -
Vapour density - Not applicable
Specific Gravity 1.4
Water solubility - Not applicable
Solubility(ies) -
Partition coefficient - Not applicable
Autoignition temperature - Not applicable
Decomposition temperature -
Kinematic viscosity - Not applicable
Dynamic viscosity - Not applicable
Explosive properties Not applicable
Oxidising properties Not applicable

9.2. Other information
Softening point -
Molecular weight -
VOC Content (%) Not applicable
Density -
Bulk density -

10.1. Reactivity
Not applicable

10.2. Chemical stability
Stable under normal conditions.

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

10.3. Possibility of hazardous reactions
Hazardous polymerisation
Hazardous polymerisation does not occur.

Possibility of Hazardous Reactions
None under normal processing.

10.4. Conditions to avoid
To avoid thermal decomposition, do not overheat.

10.5. Incompatible materials
Alcohols, phenols, and amines. Rubber, coatings, and some plastics.

10.6. Hazardous decomposition products
Thermal decomposition produces hydrogen chloride gas.
Section 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information

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

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hafnium Dichloride Oxide</td>
<td>3500 mg/kg bw</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.

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

- Acute toxicity: Harmful if swallowed.
- Skin corrosion/irritation: Causes severe burns.
- Serious eye damage/eye irritation: Causes severe eye damage.
- Sensitisation: Product not classified.
- Germ cell mutagenicity: Product not classified.
- Carcinogenicity: Product not classified.
- Reproductive toxicity: Product not classified.
- STOT - single exposure: Product not classified.
- STOT - repeated exposure: Product not classified.
- Aspiration hazard: Product not classified.

Section 12: ECOLOGICAL INFORMATION

12.1. Toxicity

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>Water</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hafnium Dichloride Oxide</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability


12.3. Bioaccumulative potential


12.4. Mobility in soil

Mobility

12.5. Results of PBT and vPvB assessment

The PBT and vPvB criteria do not apply to inorganic substances.

12.6. Other adverse effects

Section 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

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

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

Section 14: TRANSPORT INFORMATION

IMDG

14.1 UN/ID no 1760
14.2 Proper shipping name Corrosive liquid, n.o.s. (Hafnium Oxychloride)
14.3 Hazard Class 8
14.4 Packing Group II
14.5 Marine pollutant Not applicable
14.6 Special Provisions B2, IB2, T11, TP2, TP27
14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code Not applicable

RID

14.1 UN/ID no 1760
14.2 Proper shipping name Corrosive liquid, n.o.s. (Hafnium Oxychloride)
14.3 Hazard Class 8
14.4 Packing Group II
14.5 Environmental hazard Not applicable
14.6 Special Provisions B2, IB2, T11, TP2, TP27

ADR

14.1 UN/ID no 1760
14.2 Proper shipping name Corrosive liquid, n.o.s. (Hafnium Oxychloride)
14.3 Hazard Class 8
14.4 Packing Group II
14.5 Environmental hazard Not applicable
14.6 Special Provisions B2, IB2, T11, TP2, TP27

ICAO (air)

14.1 UN/ID no 1760
14.2 Proper shipping name Corrosive liquid, n.o.s. (Hafnium Oxychloride)
14.3 Hazard Class 8
14.4 Packing Group II
14.5 Environmental hazard Not applicable
14.6 Special Provisions B2, IB2, T11, TP2, TP27
Section 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>French RG number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7732-18-5</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Hafnium Dichloride Oxide</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>13759-17-6</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

European Union

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.

Authorisations and/or restrictions on use:
This product does not contain substances subject to authorisation (Regulation (EC) No. 1907/2006 (REACH), Annex XIV). This product does not contain substances subject to restriction (Regulation (EC) No. 1907/2006 (REACH), Annex XVII).

International Inventories

<table>
<thead>
<tr>
<th>DSL/NDSL</th>
<th>Complies</th>
</tr>
</thead>
<tbody>
<tr>
<td>EINECS/ELINCS</td>
<td>Complies</td>
</tr>
<tr>
<td>ENCS</td>
<td>Complies</td>
</tr>
<tr>
<td>IECSC</td>
<td>Not Listed</td>
</tr>
<tr>
<td>KECL</td>
<td>Complies</td>
</tr>
<tr>
<td>PICCS</td>
<td>Not Listed</td>
</tr>
<tr>
<td>AICS</td>
<td>Not Listed</td>
</tr>
</tbody>
</table>

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

15.2. Chemical safety assessment

No chemical safety assessment has been performed for this product.

Section 16: OTHER INFORMATION

Issue Date                      06-Apr-2017
Revision Date                   20-Dec-2019
Revision Note                   Updated to comply with GHS.
This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Note:
The information provided in this Material 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