1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier
Product Name
Niobium and Niobium Alloys

Other means of identification
Product Code
SAC004

Synonyms
Columbium and Columbium Alloys, Niobium Thermite Derby (Product #512)

Recommended use of the chemical and restrictions on use
Recommended Use
Alloy product manufacture.

Uses advised against

Details of the supplier of the safety data sheet
Manufacturer Address
ATI, 1000 Six PPG Place, Pittsburgh, PA 15222 USA

Emergency telephone number
Chemtrec: 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification
This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label elements

Emergency Overview

Appearance
Various massive product forms

Physical state
Solid

Odor
Odorless

Hazards not otherwise classified (HNOC)
Not applicable

Other Information
When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: Titanium dioxide an IARC Group 2B carcinogen. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms
Columbium and Columbium Alloys, Niobium Thermite Derby, (Product #512).
### Chemicals

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niobium (Columbium)</td>
<td>7440-03-1</td>
<td>40-&gt;99</td>
</tr>
<tr>
<td>Titanium</td>
<td>7440-32-6</td>
<td>0-60</td>
</tr>
<tr>
<td>Aluminum</td>
<td>7429-90-5</td>
<td>0-50</td>
</tr>
<tr>
<td>Tantalum</td>
<td>7440-25-7</td>
<td>0-30</td>
</tr>
<tr>
<td>Hafnium</td>
<td>7440-58-6</td>
<td>0-30</td>
</tr>
<tr>
<td>Tungsten</td>
<td>7440-33-7</td>
<td>0-20</td>
</tr>
<tr>
<td>Vanadium</td>
<td>7440-62-2</td>
<td>0-10</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>7439-98-7</td>
<td>0-10</td>
</tr>
<tr>
<td>Zirconium</td>
<td>7440-67-7</td>
<td>0-5</td>
</tr>
</tbody>
</table>

### 4. FIRST AID MEASURES

**First aid measures**

**Eye contact**
In the case of particles coming in contact with eyes during processing, treat as with any foreign object.

**Skin Contact**
None under normal use conditions.

**Inhalation**
If excessive amounts of smoke, fume, or particulate are inhaled during processing, remove to fresh air and consult a qualified health professional.

**Ingestion**
Not an expected route of exposure.

**Most important symptoms and effects, both acute and delayed**

**Symptoms**
None anticipated.

**Indication of any immediate medical attention and special treatment needed**

**Note to physicians**
Treat symptomatically.

### 5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media**
Product not flammable in the form as distributed, flammable as finely divided particles or pieces resulting from processing of this product. Isolate large fires and allow to burn out. Smother small fires with salt (NaCl) or class D dry powder fire extinguisher.

**Unsuitable extinguishing media**
Do not spray water on burning metal as an explosion may occur. This explosive characteristic is caused by the hydrogen and steam generated by the reaction of water with the burning material.

**Specific hazards arising from the chemical**
Intense heat. Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimize combustible dust hazard.

**Hazardous combustion products**
Titanium dioxide an IARC Group 2B carcinogen. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

**Explosion data**
- **Sensitivity to Mechanical Impact**: None.
- **Sensitivity to Static Discharge**: None.

**Protective equipment and precautions for firefighters**
Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.
6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions
Use personal protective equipment as required.

For emergency responders
Use personal protective equipment as required.

Environmental precautions
Not applicable to massive product.

Methods and material for containment and cleaning up

Methods for containment
Not applicable to massive product.

Methods for cleaning up
Not applicable to massive product.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling
Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimize combustible dust hazard.

Conditions for safe storage, including any incompatibilities

Storage Conditions
Keep chips, turnings, dust, and other small particles away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity).

Incompatible materials
Dissolves in hydrofluoric acid. Ignites in the presence of fluorine. When heated above 200°C, reacts exothermically with the following. Chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, and freon.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niobium (Columbium) 7440-03-1</td>
<td>TWA: 1 mg/m³ respirable fraction</td>
<td>TWA: 15 mg/m³ total dust</td>
</tr>
<tr>
<td>Titanium 7440-32-6</td>
<td>-</td>
<td>TWA: 5 mg/m³ respirable fraction</td>
</tr>
<tr>
<td>Aluminum 7429-90-5</td>
<td>TWA: 0.5 mg/m³ TWA: 0.5 mg/m³ Hf</td>
<td>TWA: 0.5 mg/m³</td>
</tr>
<tr>
<td>Tantalum 7440-25-7</td>
<td>TWA: 5 mg/m³ inhalable fraction</td>
<td>Ceiling: 0.5 mg/m³ V2O5 respirable dust</td>
</tr>
<tr>
<td>Hafnium 7440-58-6</td>
<td>STEL: 10 mg/m³ STEL: 10 mg/m³ W</td>
<td>Ceiling: 0.1 mg/m³ V2O5 fume</td>
</tr>
<tr>
<td>Tungsten 7440-33-7</td>
<td>STEL: 10 mg/m³ TWA: 5 mg/m³ W</td>
<td>(vacated) STEL: 10 mg/m³ (vacated) STEL: 10 mg/m³ W</td>
</tr>
<tr>
<td>Vanadium 7440-62-2</td>
<td>-</td>
<td>Ceiling: 0.1 mg/m³ V2O5 fume</td>
</tr>
<tr>
<td>Molybdenum 7439-98-7</td>
<td>TWA: 3 mg/m³ respirable fraction</td>
<td>-</td>
</tr>
<tr>
<td>Zirconium 7440-67-7</td>
<td>STEL: 10 mg/m³ STEL: 10 mg/m³ Zr</td>
<td>TWA: 5 mg/m³ Zr</td>
</tr>
</tbody>
</table>

Appropriate engineering controls
Engineering Controls

Avoid generation of uncontrolled particles.

Individual protection measures, such as personal protective equipment

- **Eye/face protection**: When airborne particles may be present, appropriate eye protection is recommended. For example, tight-fitting goggles, foam-lined safety glasses or other protective equipment that shield the eyes from particles.

- **Skin and body protection**: Fire/flame resistant/retardant clothing may be appropriate during hot work with the product. Cut-resistant gloves and/or protective clothing may be appropriate when sharp surfaces are present.

- **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.

**General Hygiene Considerations**

Handle in accordance with good industrial hygiene and safety practice.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

**Information on basic physical and chemical properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
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</tr>
<tr>
<td>Appearance</td>
<td>Various massive product forms</td>
<td></td>
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<tr>
<td>Color</td>
<td>Metallic gray silver</td>
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<td>Odor</td>
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<td>Odor threshold</td>
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</tr>
<tr>
<td>pH</td>
<td>-</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>1800-2500 °C / 3270-4530 °F</td>
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</tr>
<tr>
<td>Boiling point / boiling range</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
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<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>-</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>-</td>
<td>Product not flammable in the form as distributed, flammable as finely divided particles or pieces resulting from processing of this product</td>
<td></td>
</tr>
<tr>
<td>Flammability Limit in Air</td>
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<td></td>
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</tr>
<tr>
<td>Upper flammability limit</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Lower flammability limit</td>
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<tr>
<td>Vapor pressure</td>
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<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>Vapor density</td>
<td>-</td>
<td>Not applicable</td>
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<tr>
<td>Specific Gravity</td>
<td>5.6-11.9</td>
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<td>Water solubility</td>
<td>Insoluble</td>
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</tr>
<tr>
<td>Solubility in other solvents</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Partition coefficient</td>
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</tr>
<tr>
<td>Autoignition temperature</td>
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<tr>
<td>Decomposition temperature</td>
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<td>Kinematic viscosity</td>
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<td></td>
</tr>
<tr>
<td>Dynamic viscosity</td>
<td>-</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>Not applicable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other Information**

- **Softening point**
- **Molecular weight**
- **VOC Content (%)**
- **Density**
- **Bulk density**
10. STABILITY AND REACTIVITY

Reactivity
Not applicable

Chemical stability
Stable under normal conditions.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization
Hazardous polymerization does not occur.

Conditions to avoid
Dust formation and dust accumulation.

Incompatible materials
Dissolves in hydrofluoric acid. Ignites in the presence of fluorine. When heated above 200°C, reacts exothermically with the following. Chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, and freon.

Hazardous Decomposition Products
When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: Titanium dioxide an IARC Group 2B carcinogen. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

Inhalation
Not an expected route of exposure for product in massive form.

Eye contact
Not an expected route of exposure for product in massive form.

Skin Contact
Product not classified.

Ingestion
Not an expected route of exposure for product in massive form.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niobium (Columbium) 7440-03-1</td>
<td>&gt; 10,000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>-</td>
</tr>
<tr>
<td>Titanium 7440-32-6</td>
<td>&gt; 5000 mg/kg bw</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Aluminum 7429-90-5</td>
<td>15,900 mg/kg bw</td>
<td>-</td>
<td>&gt; 1 mg/L</td>
</tr>
<tr>
<td>Tantalum 7440-25-7</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 5.18 mg/L</td>
</tr>
<tr>
<td>Hafnium 7440-58-6</td>
<td>&gt; 5000 mg/kg bw</td>
<td>-</td>
<td>&gt;4.3mg/L</td>
</tr>
<tr>
<td>Tungsten 7440-33-7</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 5.4 mg/L</td>
</tr>
<tr>
<td>Vanadium 7440-62-2</td>
<td>&gt; 2000 mg/kg bw</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Molybdenum 7439-98-7</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 5.10 mg/L</td>
</tr>
<tr>
<td>Zirconium 7440-67-7</td>
<td>&gt; 5000 mg/kg bw</td>
<td>-</td>
<td>&gt;4.3 mg/L</td>
</tr>
</tbody>
</table>

Information on toxicological effects

Symptoms
None known.
Delayed and immediate effects as well as chronic effects from short and long-term exposure

**Acute toxicity**
- Product not classified.

**Skin corrosion/irritation**
- Product not classified.

**Serious eye damage/eye irritation**
- Product not classified.

**Sensitization**
- 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.

### 12. ECOLOGICAL INFORMATION

#### 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>Niobium (Columbium)</td>
<td>7440-03-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Titanium</td>
<td>7440-32-6</td>
<td>The 72 h EC50 of titanium dioxide to Pseudokirchneriella subcapitata was 61 mg of TiO2/L.</td>
<td>The 96 h LC50 of titanium dioxide to Cyprinodon variegatus was greater than 10,000 mg of TiO2/L.</td>
<td>The 48 h EC50 of titanium dioxide to Daphnia Magna was greater than 1000 mg of TiO2/L.</td>
</tr>
<tr>
<td>Aluminum</td>
<td>7429-90-5</td>
<td>The 96-h EC50 values for reduction of biomass of Pseudokirchneriellia subcapitata in AAP-Medium at pH 6, 7, and 8 were estimated as 20.1, 5.4, and 150.6 µg/L, respectively, for dissolved Al.</td>
<td>The 96 h LC50 of aluminum to Oncorhynchus mykiss was 7.4 mg of Al/L at pH 6.5 and 14.6 mg of Al/L at pH 7.5.</td>
<td>The 48-hr LC50 for Ceriodaphnia dubia exposed to Aluminium chloride increased from 0.72 to greater than 99.6 mg/L with water hardness increasing from 25 to 200 mg/L.</td>
</tr>
<tr>
<td>Tantalum</td>
<td>7440-25-7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hafnium</td>
<td>7440-58-6</td>
<td>The 72 h EC50 of hafnium to Pseudokirchneriella subcapitata was greater than 8 µg of Hf/L (100% saturated solution).</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>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>Tungsten</td>
<td>7440-33-7</td>
<td>The 72 h EC50 of sodium tungstate to Pseudokirchneriella subcapitata was 31.0 mg of W/L.</td>
<td>The 96 h LC50 of sodium tungstate to Danio rerio was greater than 106 mg of W/L.</td>
<td>The 48 h EC50 of sodium tungstate to Daphnia magna was greater than 96 mg of W/L.</td>
</tr>
<tr>
<td>Vanadium</td>
<td>7440-62-2</td>
<td>The 72 h EC50 of vanadium pentoxide to Desmodesmus subspicatus was 2,907 µg of V/L.</td>
<td>The 96 h LC50 of vanadium pentoxide to Pimephales promelas was 1,850 µg of V/L.</td>
<td>The 48 h EC50 of sodium vanadate to Daphnia magna was 2,661 µg of V/L.</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>7439-98-7</td>
<td>The 72 h EC50 of sodium molybdate dithydrate to Pseudokirchneriella subcapitata was 362.9 mg of Mo/L.</td>
<td>The 96 h LC50 of sodium molybdate dithydrate to Pimephales promelas was 644.2 mg/L.</td>
<td>The 48 h LC50 of sodium molybdate dithydrate to Ceriodaphnia dubia was 1,015 mg/L. The 48 h LC50 of sodium molybdate dithydrate to Daphnia magna was greater than 1,727.8 mg/L.</td>
</tr>
</tbody>
</table>
### Zirconium

| **7440-67-7** | The 14 d NOEC of zirconium dichloride oxide to *Chlorella vulgaris* was greater than 102.5 mg of Zr/L. | The 96 h LL50 of zirconium to *Danio rerio* was greater than 74.03 mg/L. | - | The 48 h EC50 of zirconium dioxide to *Daphnia magna* was greater than 74.03 mg of Zr/L. |

**Persistence and degradability**

- 

**Bioaccumulation**

- 

**Other adverse effects**

### 13. DISPOSAL CONSIDERATIONS

**Waste treatment methods**

**Disposal of wastes**

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

**Contaminated packaging**

None anticipated.

This product contains one or more substances that are listed with the State of California as a hazardous waste.

### 14. TRANSPORT INFORMATION

**DOT**

Not regulated

### 15. REGULATORY INFORMATION

**International Inventories**

- **TSCA**
  - Complies
- **DSL/NDSL**
  - Complies
- **EINECS/ELINCS**
  - Complies
- **ENCS**
  - Complies
- **IECSC**
  - Complies
- **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

**US Federal Regulations**

**SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

**SARA 311/312 Hazard Categories**
### Acute health hazard
No

### Chronic Health Hazard
No

### Fire hazard
No

### Sudden release of pressure hazard
No

### Reactive Hazard
No

### CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

### CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

### US State Regulations

#### California Proposition 65
This product does not contain any Proposition 65 chemicals

#### U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7440-32-6</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Aluminum</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7429-90-5</td>
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<td></td>
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</tr>
<tr>
<td>Tantalum</td>
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</tr>
<tr>
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<tr>
<td>Hafnium</td>
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<td></td>
</tr>
</tbody>
</table>

### U.S. EPA Label Information

**EPA Pesticide Registration Number**
Not applicable

### 16. OTHER INFORMATION

#### NFPA
Health hazards 0  Flammability 0  Instability 0

#### HMIS
Health hazards 1*  Flammability 0  Physical hazards 0  Personal protection X

* = Chronic Health Hazard

**Chronic Hazard Star Legend**

**Issue Date**
28-May-2015

**Revision Date**
18-Mar-2019

**Revision Note**
Updated Section(s): 1, 3, 5, 6, 9, 11, 15

**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