# SAFETY DATA SHEET

**Issue Date** 28-May-2015 **Revision Date** 09-Feb-2022 **Version** 3

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

**Product identifier**

**Product Name** Hafnium and Hafnium Alloy Scrap: Borings, Clippings, Shavings, Turnings and Scalpings, Fines, Swarf

**Other means of identification**

**Product Code** SAC044
**UN/ID No.** UN3089
**Synonyms** All hafnium scrap including: borings, clippings, shavings, turnings, scalpings, fines, dust, and swarf.

**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**

**Emergency Telephone** Chemtrec: 1-800-424-9300

## 2. HAZARDS IDENTIFICATION

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Flammable solids | Category 1 |

**Label elements**

**Emergency Overview**

**Danger**

**Hazard statements**
Flammable solids

**Appearance** Metal turnings, fines, swarf **Physical state** Solid **Odor** Odorless

**Precautionary Statements - Prevention**
Wear protective gloves/protective clothing/eye protection
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment

If dust clouds can occur, use explosion-proof electrical/ ventilating/lighting/equipment

**Precautionary Statements - Response**
In case of fire: Use salt (NaCl) for extinction.

**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: Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**Synonyms** All hafnium scrap including: borings, clippings, shavings, turnings, scalpings, fines, dust, and swarf.

| Chemical Name | CAS No. | Weight-% |
|---|---|---|
| Hafnium | 7440-58-6 | 90-99 |
| Zirconium | 7440-67-7 | 0-10 |
| Niobium (Columbium) | 7440-03-1 | 0-4 |
| Tin | 7440-31-5 | 0-3 |
| Molybdenum | 7439-98-7 | 0-2 |
| Chromium | 7440-47-3 | 0-1 |
| Iron | 7439-89-6 | 0-1 |
| Nickel | 7440-02-0 | 0-<0.1 |

## 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** IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

**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**
Isolate large fires and allow to burn out. Smother small fires with salt (NaCl).

**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** Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

**Explosion data**

**Sensitivity to Mechanical Impact** None.

**Sensitivity to Static Discharge** May be ignited by heat, sparks or flames.

**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. Follow Emergency Response Guidebook, Guide No. 170.

**Environmental precautions**

**Environmental precautions** Collect spillage to prevent release to the environment.

**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 using non-sparking tools. Avoid creating uncontrolled dust.

## 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 away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). For long-term storage, keep sealed in argon-filled steel drums.

**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**

| Chemical Name | ACGIH TLV | OSHA PEL |
|---|---|---|
| Hafnium<br>7440-58-6 | TWA: 0.5 mg/m³ TWA: 0.5 mg/m³ Hf | TWA: 0.5 mg/m³ |
| Zirconium<br>7440-67-7 | STEL: 10 mg/m³ STEL: 10 mg/m³ Zr<br>TWA: 5 mg/m³ TWA: 5 mg/m³ Zr | TWA: 5 mg/m³ Zr<br>(vacated) STEL: 10 mg/m³ (vacated) STEL: 10 mg/m³ Zr |
| Niobium (Columbium)<br>7440-03-1 | - | - |
| Tin<br>7440-31-5 | TWA: 2 mg/m³ TWA: 2 mg/m³ Sn except Tin hydride | TWA: 2 mg/m³ Sn except oxides |
| Molybdenum<br>7439-98-7 | TWA: 10 mg/m³ inhalable fraction<br>TWA: 3 mg/m³ respirable fraction | - |
| Iron<br>7439-89-6 | - | - |
| Chromium<br>7440-47-3 | TWA: 0.5 mg/m³ | TWA: 1 mg/m³ |
| Nickel<br>7440-02-0 | TWA: 1.5 mg/m³ inhalable fraction | TWA: 1 mg/m³ |

**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**

| | | | |
|---|---|---|---|
| **Physical state** | Solid | | |
| **Appearance** | Metal turnings, fines, swarf | **Odor** | Odorless |
| **Color** | Metallic gray or silver | **Odor threshold** | Not applicable |

| Property | Values | Remarks • Method |
|---|---|---|
| **pH** | - | |
| **Melting point / freezing point** | 1830-1870 °C / 3330-3400 °F | |
| **Boiling point / boiling range** | - | |
| **Flash point** | - | |
| **Evaporation rate** | - | Not applicable |
| **Flammability (solid, gas)** | - | Flammable |
| **Flammability Limit in Air** | | |
| **Upper flammability limit:** | - | |

| | | |
|---|---|---|
| **Lower flammability limit:** | - | |
| **Vapor pressure** | - | Not applicable |
| **Vapor density** | - | Not applicable |
| **Specific Gravity** | 6.49-6.64 | |
| **Water solubility** | Insoluble | |
| **Solubility in other solvents** | - | - |
| **Partition coefficient** | - | Not applicable |
| **Autoignition temperature** | - | Not applicable |
| **Decomposition temperature** | - | Not applicable |
| **Kinematic viscosity** | - | Not applicable |
| **Dynamic viscosity** | - | Not applicable |
| **Explosive properties** | Not applicable | |
| **Oxidizing properties** | Not applicable | |

**Other Information**

| | |
|---|---|
| **Softening point** | - |
| **Molecular weight** | - |
| **VOC Content (%)** | Not applicable |
| **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: Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation. Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer.

## 11. TOXICOLOGICAL INFORMATION

**Information on likely routes of exposure**

**Product Information**

**Inhalation** Product not classified.

**Eye contact** Product not classified.

**Skin Contact** Product not classified.

**Ingestion** Product not classified.

| Chemical Name | Oral LD50 | Dermal LD50 | Inhalation LC50 |
|---|---|---|---|
| Hafnium 7440-58-6 | > 5000 mg/kg bw | - | >4.3mg/L |
| Zirconium 7440-67-7 | > 5000 mg/kg bw | - | >4.3 mg/L |
| Niobium (Columbium) 7440-03-1 | > 10,000 mg/kg bw | > 2000 mg/kg bw | - |
| Tin 7440-31-5 | > 2000 mg/kg bw | > 2000 mg/kg bw | > 4.75 mg/L |
| Molybdenum 7439-98-7 | > 2000 mg/kg bw | > 2000 mg/kg bw | > 5.10 mg/L |
| Iron 7439-89-6 | 98,600 mg/kg bw | - | > 0.25 mg/L |
| Chromium 7440-47-3 | > 3400 mg/kg bw | - | > 5.41 mg/L |
| Nickel 7440-02-0 | > 9000 mg/kg bw | - | > 10.2 mg/L |

**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.

| Chemical Name | ACGIH | IARC | NTP | OSHA |
|---|---|---|---|---|
| Chromium 7440-47-3 | | Group 3 | | |
| Nickel 7440-02-0 | | Group 1<br>Group 2B | Known<br>Reasonably Anticipated | X |

**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.

| Chemical Name | Algae/aquatic plants | Fish | Toxicity to microorganisms | Crustacea |
|---|---|---|---|---|
| Hafnium 7440-58-6 | The 72 h EC50 of hafnium to Pseudokirchneriella subcapitata was great than 8 ug of Hf/L (100% saturated solution). | The 96 h LC50 of Hafnium dioxide in water to Danio rerio was greater than the solubility limit of 0.007 mg Hf/L . | - | The 48 h EC50 of Hafnium dioxide to Daphnia magna was greater than the solubility limit of 0.007 mg Hf/L. |
| Zirconium 7440-67-7 | The 14 d NOEC of zirconium dichloride oxide to Chlorella vulgaris was greater than | 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 |

| | | | | |
|---|---|---|---|---|
| | 102.5 mg of Zr/L. | | | of Zr/L. |
| Niobium (Columbium)<br>7440-03-1 | - | - | - | - |
| Tin<br>7440-31-5 | The 72 h EC50 of tin chloride pentahydrate to Pseudokirchnerella subcapitata was 9,846 ug of Sn/L | The 7 d LOEC of tin chloride pentahydrate to Pimephales promelas was 827.9 ug of Sn/L | - | The 7 d LC50 of tin chloride pentahydrate to Ceriodaphnia dubia was greater than 3,200 ug of Sn/L. |
| Molybdenum<br>7439-98-7 | The 72 h EC50 of sodium molybdate dihydrate to Pseudokirchneriella subcapitata was 362.9 mg of Mo/L. | The 96 h LC50 of sodium molybdate dihydrate to Pimephales promelas was 644.2 mg/L | The 3 h EC50 of molybdenum trioxide for activated sludge was 820 mg/L. | The 48 h LC50 of sodium molybdate dihydrate to Ceriodaphnia dubia was 1,015 mg/L.<br>The 48 h LC50 of sodium molybdate dihydrate to Daphnia magna was greater than 1,727.8 mg/L. |
| Iron<br>7439-89-6 | - | The 96 h LC50 of 50% iron oxide black in water to Danio rerio was greater than 10,000 mg/L. | The 3 h EC50 of iron oxide for activated sludge was greater than 10,000 mg/L. | The 48 h EC50 of iron oxide to Daphnia magna was greater than 100 mg/L. |
| Chromium<br>7440-47-3 | - | - | - | - |
| Nickel<br>7440-02-0 | NOEC/EC10 values range from 12.3 µg/l for Scenedesmus accuminatus to 425 µg/l for Pseudokirchneriella subcapitata. | The 96h LC50s values range from 0.4 mg Ni/L for Pimephales promelas to 320 mg Ni/L for Brachydanio rerio. | The 30 min EC50 of nickel for activated sludge was 33 mg Ni/L. | The 48h LC50s values range from 0.013 mg Ni/L for Ceriodaphnia dubia to 4970 mg Ni/L for Daphnia magna. |

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

| Chemical Name | RCRA - D Series Wastes |
|---|---|
| Chromium<br>7440-47-3 | 5.0 mg/L regulatory level |

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

## 14. TRANSPORT INFORMATION

**DOT** Regulated

**UN/ID No.** UN3089

**Proper shipping name** Metal powder, flammable, n.o.s. (Hafnium)

| | |
|---|---|
| **Hazard Class** | 4.1 |
| **Packing Group** | II |
| **Special Provisions** | IB8, IP2, IP4, T3, TP33 |
| **Emergency Response Guide Number** | 170 |

## 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 contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

| Chemical Name | CAS No. | Weight-% | SARA 313 - Threshold Values % |
|---|---|---|---|
| Chromium - 7440-47-3 | 7440-47-3 | 0-1 | 1.0 |
| Nickel - 7440-02-0 | 7440-02-0 | 0-<0.1 | 0.1 |

**SARA 311/312 Hazard Categories**

| | |
|---|---|
| **Acute health hazard** | No |
| **Chronic Health Hazard** | No |
| **Fire hazard** | Yes |
| **Sudden release of pressure hazard** | No |
| **Reactive Hazard** | No |

**CWA (Clean Water Act)**

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

| Chemical Name | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants | CWA - Hazardous Substances |
|---|---|---|---|---|
| Chromium 7440-47-3 | | X | X | |
| Nickel 7440-02-0 | | X | X | |

**CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Chemical Name | Hazardous Substances RQs |
|---|---|

| | |
|---|---|
| Chromium<br>7440-47-3 | 5000 lb |
| Nickel<br>7440-02-0 | 100 lb |

## US State Regulations

### California Proposition 65

This product contains the Proposition 65 chemicals listed below. Proposition 65 warning label available at ATImetals.com.

| Chemical Name | California Proposition 65 |
|---|---|
| Nickel - 7440-02-0 | Carcinogen |

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

| Chemical Name | New Jersey | Massachusetts | Pennsylvania |
|---|---|---|---|
| Hafnium<br>7440-58-6 | X | X | X |
| Zirconium<br>7440-67-7 | X | X | X |
| Tin<br>7440-31-5 | X | X | X |
| Molybdenum<br>7439-98-7 | X | X | X |
| Chromium<br>7440-47-3 | X | X | X |
| Nickel<br>7440-02-0 | X | X | X |

### U.S. EPA Label Information

**EPA Pesticide Registration Number** Not applicable

## 16. OTHER INFORMATION

**NFPA** **Health hazards** 0 **Flammability** 1 **Instability** 0 **Physical and Chemical Properties** -

**HMIS** **Health hazards** 1* **Flammability** 2 **Physical hazards** 0 **Personal protection** X

*Chronic Hazard Star Legend* * = Chronic Health Hazard

**Issue Date** 28-May-2015
**Revision Date** 09-Feb-2022
**Revision Note**
SDS sections updated: 2, 3, 5, 6, 9, 11

**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