SAFETY DATA SHEET

Issue Date 28-May-2015 **Revision Date** 09-Feb-2017 **Version** 4

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

Product identifier

Product Name Hafnium and Hafnium Alloys

Other means of identification

Product Code SAC010

Synonyms Includes massive forms of hafnium including crystal bar, foil or other massive forms. Hafnium foil, Hafnium Compacts (Product #431). Does NOT include shot, sponge, or dust. Does NOT include nickel-bearing alloys.

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 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

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms Includes massive forms of hafnium including crystal bar, foil or other massive forms, Hafnium foil, Hafnium Compacts, (Product #431). Does NOT include shot, sponge, or dust. Does NOT include nickel-bearing alloys.

Chemical Name	CAS No.	Weight-%
Hafnium	7440-58-6	95- >99
Zirconium	7440-67-7	0-5

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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
Not flammable in the form of this product as distributed, flammable as finely divided particles or pieces resulting from processing of this product. Smother 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. Foil products may ignite if exposed to temperatures between 350-450°C, depending on foil thickness and rate of heating.

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

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH approved (or equivalent) respirator and full protective 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

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. Foil products may ignite if exposed to temperatures between 350-450°C, depending on foil thickness and rate of heating.

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

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL
Hafnium 7440-58-6	TWA: 0.5 mg/m³ TWA: 0.5 mg/m³ Hf	TWA: 0.5 mg/m³
Zirconium 7440-67-7	STEL: 10 mg/m³ STEL: 10 mg/m³ Zr TWA: 5 mg/m³ TWA: 5 mg/m³ Zr	TWA: 5 mg/m³ Zr (vacated) STEL: 10 mg/m³ (vacated) STEL: 10 mg/m³ Zr

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 contaminat 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	Various massive product forms	**Odor**	Odorless
Color	metallic Grey or silver	**Odor threshold**	Not applicable

Property	**Values**	**Remarks • Method**
pH	-	
Melting point/freezing point	2230 °C / 4050 °F	
Boiling point / boiling range	.	
Flash point	-	
Evaporation rate	-	Not applicable
Flammability (solid, gas)	350-450 °C	Foil products may ignite between 350-450°C, depending on foil thickness and rate of heating.
Flammability Limit in Air		
Upper flammability limit:	-	
Lower flammability limit:	-	
Vapor pressure	-	Not applicable
Vapor density	-	Not applicable
Specific Gravity	13.30	
Water solubility	Insoluble	
Solubility in other solvents	-	Not applicable
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	350-830 lb/ft3
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
Not applicable.

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.

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

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.

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 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

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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	Complies
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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Hafnium 7440-58-6	X	X	X
Zirconium 7440-67-7	X	X	X

U.S. EPA Label Information
EPA Pesticide Registration Number Not applicable

16. OTHER INFORMATION

NFPA	**Health hazards** 0	**Flammability** 0	**Instability** 0	**Physical and Chemical Properties** -
HMIS	**Health hazards** 1*	**Flammability** 0	**Physical hazards** 0	**Personal protection** X

Chronic Hazard Star Legend * = Chronic Health Hazard

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Revision Note
Updated Section(s): 6, 7, 8, 12, 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