SAFETY DATA SHEET

Issue Date 28-May-2015 **Revision Date** 21-Oct-2024 **Version** 6

Section 1: PRODUCT AND COMPANY IDENTIFICATION

A Product Name Hafnium and Hafnium Alloys

Synonyms Hafnium and Hafnium Alloys: Includes massive forms of hafnium including crystal bar, foil or other massive forms. Hafnium foil, Hafnium Compacts (Product #431).

Product Code SAC010

B Recommended Use Alloy product manufacture

Uses advised against

C Supplier

Company Name

ATI Specialty Alloys & Components, 1600 Old Salem Rd NE, Albany, OR 97321 USA
ATI SDS Manager: +1-412-225-4911

Emergency Telephone Chemtrec +1 703-741-5970

Section 2: HAZARDS IDENTIFICATION

A GHS - Classification

Not a hazardous substance or mixture according to the Globally Harmonized System (GHS)

B Label elements

Emergency Overview

Appearance Various massive product forms	**Physical state** Solid	**Odor** Odorless

C Other Information

Hazards not otherwise classified (HNOC)

• Not applicable

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms Hafnium and Hafnium Alloys: Includes massive forms of hafnium including crystal bar, foil or other massive forms, Hafnium foil, Hafnium Compacts, (Product #431).

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

Section 4: FIRST AID MEASURES

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

B Skin Contact None under normal use conditions

C Inhalation	If excessive amounts of smoke, fume, or particulate are inhaled during processing, remove to fresh air and consult a qualified health professional
D Ingestion	Not an expected route of exposure
E Symptoms	None anticipated.
F. Indication of immediate medical attention and special treatment needed, if necessary	Treat symptomatically.

Section 5: FIRE FIGHTING MEASURES

A 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.
B 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. Hafnium foil, which is shipped as rolls, may ignite after unrolling if exposed to temperatures between 350-450°C, depending on foil thickness and rate of heating
Hazardous combustion products	Not applicable.
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.
B Environmental precautions	Not applicable to massive product

C. 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

Section 7: HANDLING AND STORAGE

A 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.

Hafnium foil, which is shipped as rolls, may ignite after unrolling if exposed to temperatures between 350-450°C, depending on foil thickness and rate of heating

B 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

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

A Control parameters

Chemical Name	Korea
Hafnium	TWA: 0.5 mg/m³
Zirconium	STEL: 10 mg/m³ TWA: 5 mg/m³

B Engineering Controls Avoid generation of uncontrolled particles

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 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.

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 Various massive product forms **Color** Metallic gray or silver

B Odor Odorless

C Odor threshold Not applicable

Property	Values	Remarks • Method
D pH	-	Not applicable
E Melting point / freezing point	2230 °C / 4050 °F	
F Boiling point / boiling range	-	
G Flash point	-	
H Evaporation rate	-	Not applicable
I Flammability (solid, gas)	350-450 °C	Product not flammable in the form as distributed, flammable as finely divided particles or pieces resulting from processing of this product. Hafnium foil, which is shipped as rolls, may ignite after unrolling if exposed to temperatures between 350-450°C, depending on foil thickness and rate of heating.
J Flammability Limit in Air		
Upper flammability limit:		-
Lower flammability limit:		-
K Vapor pressure	-	Not applicable
L Solubility(ies)		

Water solubility	Insoluble	
Solubility in other solvents		
M Vapor density	-	Not applicable
N Specific Gravity	13.30	
O. Partition coefficient	-	Not applicable
P. Autoignition temperature	-	Not applicable
Q. Decomposition temperature	-	Not applicable
R Kinematic viscosity	-	Not applicable
Dynamic viscosity	-	Not applicable
S. Molecular weight	-	

Other Information

Explosive properties	Not applicable
Oxidizing properties	Not applicable
Softening point	-
VOC Content (%)	Not applicable
Density	-
Bulk density	350-830 lb/ft3

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 None under normal processing
Hazardous polymerization Hazardous polymerization does not occur

C Conditions to avoid Dust formation and dust accumulation

D 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

E Hazardous Decomposition Products Not applicable

Section 11: TOXICOLOGICAL INFORMATION

A Information on likely routes of exposure

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

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

Skin corrosion/irritation	Product not classified.
Serious eye damage/eye irritation	Product not classified.
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	None known
Aspiration hazard	Product not classified

C Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Hafnium	> 5000 mg/kg bw	-	>4.3mg/L
Zirconium	> 5000 mg/kg bw	-	>4.3 mg/L

Information on toxicological effects

Symptoms None known.

Section 12: ECOLOGICAL INFORMATION

A Ecotoxicity

This product as shipped is not classified for aquatic toxicity.

Chemical Name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Hafnium	*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	*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.*

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 None anticipated

Section 14: TRANSPORT INFORMATION

A UN/ID No. Not regulated
B Proper shipping name Not regulated
C Hazard Class Not regulated
D Packing Group Not regulated
E Marine pollutant Not regulated

Section 15: REGULATORY INFORMATION

A Industrial Safety and Health Law Not applicable

Chemical Name	ISHA - Harmful Substances Prohibited for Manufacturing, Importing, Transferring, or	Korea. Harmful Substances Requiring Permission	ISHA - Substances to be controlled - Organic Substances	ISHA - Substances to be controlled - Metals	ISHA - Substances to be controlled - Acids and bases

	Supplying				
Hafnium	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Zirconium	Not applicable	Not applicable	Not applicable	X	Not applicable

B Toxic Chemicals Control Law Not applicable

Chemical Name	Toxic Chemical Classification Listing (TCCL) - Toxic Chemicals	Toxic Chemicals Control Law - Banned and/or restricted	Toxic Chemicals Control Law - Restrictions on use
Hafnium	Not applicable	Not applicable	Not applicable
Zirconium	Not applicable	Not applicable	Not applicable

C Dangerous Material Safety Control Not applicable

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

E Other Regulations

Chemical Name	Toxic Release Inventory Chemicals - Group 1	Toxic Release Inventory Chemicals - Group 2
Hafnium	Not applicable	Not applicable
Zirconium	Not applicable	Not applicable

International Inventories

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

Section 16: OTHER INFORMATION

A Prepared By

B Issue Date 28-May-2015

C Revision Date 21-Oct-2024
Version 2
Revision Note SDS sections updated: 1, 16

D Other Information

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 Safety data sheets and labels available at ATImaterials.com

from: