



SAFETY DATA SHEET

Issue Date 10-Apr-2024

Revision Date 22-Apr-2024

Version 1

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

Product identifier

Product Name Zirconium and Zirconium Alloys

Other means of identification

Product Code SRP009

Synonyms Zirconium and Zirconium Alloys: Includes the following non-powder products: Zirconium foil, Zircaloy-2, Zircaloy-4, Zr-2.5Nb, ZrNb705, Zircadyne 702, Zircadyne 704, Zircadyne 706, ASTM Grades B350-R60802, B350-B60804, B350-B60901, B352-R60812, B352-R60814, B493-R60704, B493-R60705, B493-R60706 (Product #334)

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 Specialty Rolled Products, 100 River Road, Brackenridge, PA 15014 USA

Emergency telephone number

Company Phone Number ATI SDS Manager: 1-412-225-4911

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

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

Zirconium and Zirconium Alloys: Includes the following non-powder products: Zirconium foil, Zircaloy-2, Zircaloy-4, Zr-2.5Nb, ZrNb705, Zircadyne 702, Zircadyne 704, Zircadyne 706, ASTM Grades B350-R60802, B350-B60804, B350-B60901, B352-R60812, B352-R60814, B493-R60704, B493-R60705, B493-R60706, (Product #334).

Chemical Name	CAS No.	Weight-%
Zirconium	7440-67-7	90-98.5
Hafnium	7440-58-6	0.005-10
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	0.1-1
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

In the case of skin irritation or allergic reactions see a physician.

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

May cause allergic skin reaction.

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. Zirconium 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 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 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

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. Zirconium 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.

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
Zirconium 7440-67-7	STEL: 10 mg/m ³ STEL: 10 mg/m ³ Zr TWA: 5 mg/m ³ TWA: 5 mg/m ³ Zr	TWA: 5 mg/m ³ Zr (vacated) STEL: 10 mg/m ³ (vacated) STEL: 10 mg/m ³ Zr
Hafnium 7440-58-6	TWA: 0.5 mg/m ³ TWA: 0.5 mg/m ³ Hf	TWA: 0.5 mg/m ³
Niobium (Columbium)	-	-

7440-03-1		
Tin 7440-31-5	TWA: 2 mg/m ³ TWA: 2 mg/m ³ Sn except Tin hydride	TWA: 2 mg/m ³ Sn except oxides
Molybdenum 7439-98-7	TWA: 10 mg/m ³ inhalable fraction TWA: 3 mg/m ³ respirable fraction	-
Iron 7439-89-6	-	-
Chromium 7440-47-3	TWA: 0.5 mg/m ³	TWA: 1 mg/m ³
Nickel 7440-02-0	TWA: 1.5 mg/m ³ inhalable fraction	TWA: 1 mg/m ³

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	Odor	Odorless
Appearance	Various massive product forms	Odor threshold	Not applicable
Color	Metallic gray or silver		
Property	Values	Remarks • Method	
pH	-	Not applicable	
Melting point / freezing point	1850 °C / 3362 °F		
Boiling point / boiling range	-		
Flash point	-		
Evaporation rate	-	Not applicable	
Flammability (solid, gas)	350-450 °C (Zr foil only)	Product not flammable in the form as distributed, flammable as finely divided particles or pieces resulting from processing of this product. Zirconium 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	
Flammability Limit in Air			
Upper flammability limit:	-		
Lower flammability limit:	-		
Vapor pressure	-	Not applicable	
Vapor density	-	Not applicable	
Specific Gravity	6.49		

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	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	Nickel or Cobalt containing alloys may cause sensitization by skin contact.
Ingestion	Not an expected route of exposure for product in massive form.

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
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Zirconium 7440-67-7	> 5000 mg/kg bw	-	>4.3 mg/L
Hafnium 7440-58-6	> 5000 mg/kg bw	-	>4.3mg/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 Nickel or Cobalt containing alloys may cause sensitization by skin contact.

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 Nickel or Cobalt containing alloys may cause sensitization by skin contact.
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 Group 2B	Known 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
Zirconium 7440-67-7	The 14 d NOEC of zirconium dichloride oxide to <i>Chlorella vulgaris</i> was greater than 102.5 mg of Zr/L.	The 96 h LL50 of zirconium to <i>Danio rerio</i> was greater than 74.03 mg/L.	-	The 48 h EC50 of zirconium dioxide to <i>Daphnia magna</i> was greater than 74.03 mg of Zr/L.
Hafnium 7440-58-6	The 72 h EC50 of hafnium to <i>Pseudokirchneriella subcapitata</i> was greater than 8 ug of Hf/L (100% saturated solution).	The 96 h LC50 of Hafnium dioxide in water to <i>Danio rerio</i> was greater than the solubility limit of 0.007 mg Hf/L.	-	The 48 h EC50 of Hafnium dioxide to <i>Daphnia magna</i> was greater than the solubility limit of 0.007 mg Hf/L.
Niobium (Columbium) 7440-03-1	-	-	-	-
Tin 7440-31-5	The 72 h EC50 of tin chloride pentahydrate to	The 7 d LOEC of tin chloride pentahydrate to <i>Pimephales</i>	-	The 7 d LC50 of tin chloride pentahydrate to

	Pseudokirchnerella subcapitata was 9,846 ug of Sn/L	promelas was 827.9 ug of Sn/L		Ceriodaphnia dubia was greater than 3,200 ug of Sn/L.
Molybdenum 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. The 48 h LC50 of sodium molybdate dihydrate to Daphnia magna was greater than 1,727.8 mg/L.
Iron 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 7440-47-3	-	-	-	-
Nickel 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 None anticipated.

Chemical Name	RCRA - D Series Wastes
Chromium 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 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 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	No
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 7440-47-3	5000 lb
Nickel 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 ATImaterials.com.

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

U.S. State Right-to-Know Regulations

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

New Safety Data Sheet

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 ATImaterials.com