



SAFETY DATA SHEET

Issue Date 28-May-2015

Revision Date 09-Feb-2017

Version (

Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Code SAC011
Product Name Zirconium and Zirconium Alloy Scrap: Borings, Clippings, Shavings, Turnings and Scalpings, Fines

UN/ID no 3089 (dry), 1358 (wet)
Synonyms Includes all dry and wetted (not less than 25% water) zirconium scrap including: borings, clippings, shavings, turnings and scalpings, fines, dust, swarf

Contains Cobalt, Nickel

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Alloy product manufacture

Uses advised against

1.3. Details of the supplier of the safety data sheet

Manufacturer Address
ATI, 1000 Six PPG Place, Pittsburgh, PA 15222 USA

1.4. Emergency telephone number

Emergency Telephone Chemtrec: +1-703-741-5970

Section 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Regulation (EC) No 1272/2008

Flammable solids	Category 1
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2.2. Label elements

Emergency Overview

Danger

Hazard statements

Flammable solids



Appearance Various massive product forms

Physical state Solid

Odour Odourless

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) or class D dry powder for extinction

2.3 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.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms Includes all dry and wetted (not less than 25% water) zirconium scrap including: borings, clippings, shavings, turnings and scalpings, fines, dust, swarf.

Chemical Name	EC No	CAS No	Weight-%
Zirconium	231-176-9	7440-67-7	90- >99
Hafnium	231-166-4	7440-58-6	0-10
Niobium	231-113-5	7440-03-1	0-4
Tin	231-141-8	7440-31-5	0-3
Molybdenum	231-107-2	7439-98-7	0-2
Iron	231-096-4	7439-89-6	0-1
Chromium	231-157-5	7440-47-3	0-1
Nickel	231-111-4	7440-02-0	0-0.1

Section 4: FIRST AID MEASURES

4.1. Description of first aid measures

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

Skin Contact In the case of skin irritation or allergic reactions see a doctor. Wash off immediately with soap and plenty of water.

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

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

4.2. Most important symptoms and effects, both acute and delayed

Symptoms May cause allergic skin reaction.

4.3. Indication of any immediate medical attention and special treatment needed

Note to doctors Treat symptomatically.

Section 5: FIRE FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media

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

5.2. Special hazards arising from the substance or mixture

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 minimise 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.

5.3. Advice for firefighters

Wear self-contained breathing apparatus and protective suit. Use personal protective equipment as required.

Section 6: ACCIDENTAL RELEASE MEASURES

6.1. 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.

6.2. Environmental precautions

Collect spillage.

6.3. 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. Avoid creating uncontrolled dust.

6.4. Reference to other sections

See Section 12: ECOLOGICAL INFORMATION.

Section 7: HANDLING AND STORAGE

7.1. 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 minimise combustible dust hazard.

General Hygiene Considerations

Handle in accordance with good industrial hygiene and safety practice.

7.2. 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). For long-term storage, keep sealed in argon-filled steel drums. Keep tightly closed in a dry and cool place.

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.

7.3. Specific end use(s)

Risk Management Methods (RMM)

The information required is contained in this Safety Data Sheet.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Chemical Name	European Union	United Kingdom	France	Spain	Germany
Zirconium 7440-67-7	-	TWA: 5 mg/m ³	-	STEL: 10 mg/m ³ TWA: 5 mg/m ³	TWA: 1 mg/m ³ Ceiling / Peak: 1 mg/m ³
Hafnium 7440-58-6	-	-	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	-
Niobium 7440-03-1	-	-	-	-	-
Tin 7440-31-5	TWA 2 mg/m ³ as Sn	TWA: 2 mg/m ³	-	TWA: 2 mg/m ³	-
Molybdenum 7439-98-7	-	-	-	TWA: 10 mg/m ³ TWA: 3 mg/m ³	-
Iron 7439-89-6	-	-	-	-	-
Chromium 7440-47-3	TWA: 2 mg/m ³	STEL: 1.5 mg/m ³ TWA: 0.5 mg/m ³	TWA: 2 mg/m ³	TWA: 2 mg/m ³	TWA: 2 mg/m ³
Nickel 7440-02-0	-	STEL: 1.5 mg/m ³ TWA: 0.5 mg/m ³	TWA: 1 mg/m ³	TWA: 1 mg/m ³	Skin
Chemical Name	Italy	Portugal	Netherlands	Finland	Denmark
Zirconium 7440-67-7	-	STEL: 10 mg/m ³ TWA: 5 mg/m ³	-	TWA: 1 mg/m ³	TWA: 5 mg/m ³
Hafnium 7440-58-6	-	TWA: 0.5 mg/m ³	-	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³
Niobium 7440-03-1	-	-	-	-	TWA: 5 mg/m ³ TWA: 0.5 mg/m ³
Tin 7440-31-5	-	TWA: 2 mg/m ³	-	TWA: 2 mg/m ³	TWA: 2 mg/m ³
Molybdenum 7439-98-7	-	TWA: 10 mg/m ³ TWA: 3 mg/m ³	-	TWA: 0.5 mg/m ³	-
Iron 7439-89-6	-	-	-	-	-
Chromium 7440-47-3	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³
Nickel 7440-02-0	-	TWA: 1.5 mg/m ³	-	TWA: 1 mg/m ³ TWA: 0.1 mg/m ³	TWA: 0.05 mg/m ³
Chemical Name	Austria	Switzerland	Poland	Norway	Ireland
Zirconium 7440-67-7	TWA: 5 mg/m ³	TWA: 5 mg/m ³	STEL: 10 mg/m ³ TWA: 5 mg/m ³	TWA: 5 mg/m ³ STEL: 10 mg/m ³	TWA: 5 mg/m ³ STEL: 10 mg/m ³
Hafnium	STEL 5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³

7440-58-6	TWA: 0.5 mg/m ³			STEL: 1.5 mg/m ³	STEL: 1.5 mg/m ³
Niobium 7440-03-1	STEL 10 mg/m ³ STEL 1 mg/m ³ TWA: 5 mg/m ³ TWA: 0.5 mg/m ³	-	-	-	-
Tin 7440-31-5	STEL 4 mg/m ³ TWA: 2 mg/m ³	Skin STEL: 4 mg/m ³ TWA: 2 mg/m ³	TWA: 2 mg/m ³	TWA: 2 mg/m ³ STEL: 4 mg/m ³	TWA: 2 mg/m ³
Molybdenum 7439-98-7	STEL 20 mg/m ³ TWA: 10 mg/m ³	TWA: 10 mg/m ³	STEL: 10 mg/m ³ TWA: 4 mg/m ³	-	TWA: 0.5 mg/m ³
Iron 7439-89-6	-	-	-	-	-
Chromium 7440-47-3	TWA: 2 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³	TWA: 0.5 mg/m ³ STEL: 1.5 mg/m ³	TWA: 2 mg/m ³
Nickel 7440-02-0	-	TWA: 0.5 mg/m ³	TWA: 0.25 mg/m ³	TWA: 0.05 mg/m ³ STEL: 0.15 mg/m ³	TWA: 0.5 mg/m ³

Derived No Effect Level (DNEL) No DNELs are available for this product as a whole

Predicted No Effect Concentration (PNEC) No PNECs are available for this product as a whole.

8.2. Exposure controls

Engineering Controls Avoid generation of uncontrolled particles.

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

Wear fire/flammable resistant/retardant clothing. 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.

Environmental exposure controls Section 6: ACCIDENTAL RELEASE MEASURES.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical state	Solid	Odour	Odourless
Appearance	Various massive product forms	Odour threshold	Not applicable
Colour	metallic; grey or Silver		
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		-	
Vapour pressure	-	Not applicable	
Vapour density	-	Not applicable	
Specific Gravity	6.49-6.64		
Water solubility	Insoluble		

Solubility(ies)		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	
Oxidising properties	Not applicable	

9.2. Other information

Softening point	-
Molecular weight	-
VOC Content (%)	Not applicable
Density	110-190 lb/ft3
Bulk density	-

Section 10: STABILITY AND REACTIVITY

10.1. Reactivity

Not applicable

10.2. Chemical stability

Stable under normal conditions.

Explosion data

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

10.3. Possibility of hazardous reactions

Hazardous polymerisation

Hazardous polymerisation does not occur.

Possibility of Hazardous Reactions

None under normal processing.

10.4. Conditions to avoid

Dust formation and dust accumulation.

10.5. 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.

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

Section 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information

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Inhalation Product not classified.
Eye contact Product not classified.
Skin Contact May cause sensitisation by skin contact.
Ingestion Product not classified.

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Zirconium	> 5000 mg/kg bw	-	>4.3 mg/L
Hafnium	> 5000 mg/kg bw	-	>4.3mg/L
Niobium	> 10,000 mg/kg bw	> 2000 mg/kg bw	-
Tin	> 2000 mg/kg bw	> 2000 mg/kg bw	> 4.75 mg/L
Molybdenum	> 2000 mg/kg bw	> 2000 mg/kg bw	> 5.10 mg/L
Iron	98,600 mg/kg bw	-	> 0.25 mg/L
Chromium	> 3400 mg/kg bw	-	> 5.41 mg/L
Nickel	> 9000 mg/kg bw	-	> 10.2 mg/L

Information on toxicological effects

Symptoms May cause sensitisation 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.

Sensitisation May cause sensitisation 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.

Section 12: ECOLOGICAL INFORMATION

12.1. Toxicity

This product as shipped is not classified for aquatic toxicity

Chemical Name	Algae/aquatic plants	Fish	Toxicity to Micro-organisms	Crustacea
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.
Hafnium	The 72 h EC50 of hafnium to Pseudokirchneriella	The 96 h LC50 of Hafnium dioxide in water to Danio	-	The 48 h EC50 of Hafnium dioxide to Daphnia magna

	subcapitata was greater than 8 ug of Hf/L (100% saturated solution).	erio was greater than the solubility limit of 0.007 mg Hf/L .		was greater than the solubility limit of 0.007 mg Hf/L.
Niobium	-	-	-	-
Tin	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	The 72 h EC50 of sodium molybdate dihydrate to Pseudokirchnerella 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	-	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	-	-	-	-
Nickel	NOEC/EC10 values range from 12.3 µg/l for Scenedesmus accuminatus to 425 µg/l for Pseudokirchnerella 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.

12.2. Persistence and degradability

12.3. Bioaccumulative potential

12.4. Mobility in soil

12.5. Results of PBT and vPvB assessment

The PBT and vPvB criteria do not apply to inorganic substances.

12.6. Other adverse effects

Section 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from residues/unused products

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.

Section 14: TRANSPORT INFORMATION

IMDG

14.1 UN/ID no 3089 (dry), 1358 (wet)
14.2 Proper shipping name Metal powders, flammable, n.o.s. (Zirconium) [dry]; Zirconium powder, wetted with not less than 25% water [wet]
14.3 Hazard Class 4.1
14.4 Packing Group II
14.5 Marine pollutant Not applicable
14.6 Special Provisions IB8, IP2, IP4, T3, TP33 (dry); A19, A20, IB6, IP2, N34, T3, TP33 (wet)
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable

RID

14.1 UN/ID no 3089 (dry), 1358 (wet)
14.2 Proper shipping name Metal powders, flammable, n.o.s. (Zirconium) [dry]; Zirconium powder, wetted with not less than 25% water [wet]
14.3 Hazard Class 4.1
14.4 Packing Group II
14.5 Environmental hazard Not applicable
14.6 Special Provisions IB8, IP2, IP4, T3, TP33 (dry); A19, A20, IB6, IP2, N34, T3, TP33 (wet)

ADR

14.1 UN/ID no 3089 (dry), 1358 (wet)
14.2 Proper shipping name Metal powders, flammable, n.o.s. (Zirconium) [dry]; Zirconium powder, wetted with not less than 25% water [wet]
14.3 Hazard Class 4.1
14.4 Packing Group II
14.5 Environmental hazard Not applicable
14.6 Special Provisions IB8, IP2, IP4, T3, TP33 (dry); A19, A20, IB6, IP2, N34, T3, TP33 (wet)

ICAO (air)

14.1 UN/ID no 3089 (dry), 1358 (wet)
14.2 Proper shipping name Metal powders, flammable, n.o.s. (Zirconium) [dry]; Zirconium powder, wetted with not less than 25% water [wet]
14.3 Hazard Class 4.1
14.4 Packing Group II
14.5 Environmental hazard Not applicable
14.6 Special Provisions IB8, IP2, IP4, T3, TP33 (dry); A19, A20, IB6, IP2, N34, T3, TP33 (wet)

IATA

14.1 UN/ID no 3089 (dry), 1358 (wet)
14.2 Proper shipping name Metal powders, flammable, n.o.s. (Zirconium) [dry]; Zirconium powder, wetted with not less than 25% water [wet]
14.3 Hazard Class 4.1
14.4 Packing Group II
Description .
14.5 Environmental hazard Not applicable
14.6 Special Provisions IB8, IP2, IP4, T3, TP33 170
 (dry); A19, A20, IB6, IP2, N34, T3, TP33 (wet) **ERG Code**

Section 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Chemical Name	French RG number	Title
Zirconium 7440-67-7	-	-
Hafnium	-	-

7440-58-6		
Niobium 7440-03-1	-	-
Tin 7440-31-5	-	-
Molybdenum 7439-98-7	-	-
Iron 7439-89-6	RG 44, RG 44bis, RG 94	-
Chromium 7440-47-3	RG 10	-
Nickel 7440-02-0	RG 37ter	-

European Union

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

Authorisations and/or restrictions on use:

This product does not contain substances subject to authorisation (Regulation (EC) No. 1907/2006 (REACH), Annex XIV). This product does not contain substances subject to restriction (Regulation (EC) No. 1907/2006 (REACH), Annex XVII).

International Inventories

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

15.2. Chemical safety assessment

No chemical safety assessment has been performed for this product.

Section 16: OTHER INFORMATION

Issue Date	28-May-2015
Revision Date	09-Feb-2017
Revision Note	SDS sections updated: 2, 14, 15.

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Note:

The information provided in this Material 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