SAFETY DATA SHEET

Issue Date 19-Feb-2020 **Revision Date** 19-Feb-2020 **Version** 1

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

Product identifier
Product Name Titanium Polishing Swarf

Other means of identification
Product Code SM101
UN/ID No. 3089
Synonyms Titanium Polishing Swarf: Polisher Fines

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 material 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 Agglomeration of fine stringy material **Physical state** Solid **Odor** Odorless

Precautionary Statements - Prevention
Wear protective gloves/protective clothing/eye protection/face 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:: Titanium dioxide an IARC Group 2B carcinogen. Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system. Zinc, copper, magnesium, or cadmium fumes may cause metal fume fever. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms Titanium Polishing Swarf: Polisher Fines.

Chemical Name	CAS No.	Weight-%
Titanium	7440-32-6	50 - 100
Aluminum	7429-90-5	0 - 40
Molybdenum	7439-98-7	1 - 15
Chromium	7440-47-3	0 - 10
Niobium (Columbium)	7440-03-1	0 - 10
Vanadium	7440-62-2	0 - 10
Zirconium	7440-67-7	0 - 10
Tin	7440-31-5	0 - 5
Copper	7440-50-8	0 - 5
Iron	7439-89-6	0 - 5
Silicon	7440-21-3	0 - 1
Nickel	7440-02-0	0 - 0.9

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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 In the case of skin allergic reactions see a physician. Wash off immediately with soap and plenty of water.

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 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
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 processing this product may ignite spontaneously at room temperature. WARNING: Fine particles 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 Titanium dioxide an IARC Group 2B carcinogen. Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Vanadium pentoxide (V_2O_5) affects eyes, skin, respiratory system. Zinc, copper, magnesium, or cadmium fumes may cause metal fume fever. 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. Skin and eye protection should be used during cleanup.

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 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

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL
Titanium 7440-32-6	-	-
Aluminum 7429-90-5	TWA: 1 mg/m³ respirable fraction	TWA: 15 mg/m³ total dust TWA: 5 mg/m³ respirable fraction
Molybdenum 7439-98-7	TWA: 10 mg/m³ inhalable fraction TWA: 3 mg/m³ respirable fraction	-
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
Vanadium 7440-62-2	-	Ceiling: 0.5 mg/m³ V2O5 respirable dust Ceiling: 0.1 mg/m³ V2O5 fume
Niobium (Columbium) 7440-03-1	-	-
Chromium 7440-47-3	TWA: 0.5 mg/m³	TWA: 1 mg/m³
Tin 7440-31-5	TWA: 2 mg/m³ TWA: 2 mg/m³ Sn except Tin hydride	TWA: 2 mg/m³ Sn except oxides
Iron 7439-89-6	-	-
Copper 7440-50-8	TWA: 0.2 mg/m³ fume TWA: 1 mg/m³ Cu dust and mist	TWA: 0.1 mg/m³ fume TWA: 1 mg/m³ dust and mist
Silicon 7440-21-3	-	TWA: 15 mg/m³ total dust TWA: 5 mg/m³ respirable fraction
Nickel 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. Wear protective gloves.

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	Agglomeration of fine stringy material	**Odor**	Odorless
Color	Metallic gray or silver	**Odor threshold**	Not applicable

Property	Values	Remarks • Method
pH	-	Not applicable
Melting point / freezing point	1540-1650 °C 2800-3000 °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	4.5	
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:: Titanium dioxide an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

Inhalation Product not classified.

Eye contact Product not classified.

Skin Contact Nickel or Cobalt containing alloys may cause sensitization by skin contact.

Ingestion Product not classified.

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Titanium 7440-32-6	> 5000 mg/kg bw	-	-
Aluminum 7429-90-5	15,900 mg/kg bw	-	> 1 mg/L
Molybdenum 7439-98-7	> 2000 mg/kg bw	> 2000 mg/kg bw	> 5.10 mg/L
Zirconium 7440-67-7	5000 mg/kg bw	-	>4.3 mg/L
Vanadium 7440-62-2	> 2000 mg/kg bw	-	-
Niobium (Columbium) 7440-03-1	> 10,000 mg/kg bw	> 2000 mg/kg bw	-
Chromium 7440-47-3	> 3400 mg/kg bw	-	> 5.41 mg/L
Tin 7440-31-5	> 2000 mg/kg bw	> 2000 mg/kg bw	> 4.75 mg/L
Iron 7439-89-6	98,600 mg/kg bw	-	> 0.25 mg/L
Copper 7440-50-8	481 mg/kg bw	>2000 mg/kg bw	>5.11 mg/L
Silicon 7440-21-3	> 5000 mg/kg bw	> 5000 mg/kg bw	> 2.08 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

This product contains a chemical which is listed as a severe marine pollutant according to DOT.

Ecotoxicity

This product as shipped is not classified for aquatic toxicity.

Chemical Name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Titanium 7440-32-6	The 72 h EC50 of titanium dioxide to Pseudokirchnerella subcapitata was 61 mg of TiO2/L.	The 96 h LC50 of titanium dioxide to Cyprinodon variegatus was greater than 10,000 mg of TiO2/L. The 96 h LC50 of titanium dioxide to Pimephales promelas was greater than 1,000 mg of TiO2/L .	The 3 h EC50 of titanium dioxide for activated sludge were greater than 1000 mg/L.	The 48 h EC50 of titanium dioxide to Daphnia Magna was greater than 1000 mg of TiO2/L.
Aluminum 7429-90-5	The 96-h EC50 values for reduction of biomass of Pseudokirchneriella subcapitata in AAP-Medium at pH 6, 7, and 8 were estimated as 20.1, 5.4, and 150.6 µg/L, respectively, for dissolved Al.	The 96 h LC50 of aluminum to Oncorhynchus mykiss was 7.4 mg of Al/L at pH 6.5 and 14.6 mg of Al/L at pH 7.5	-	The 48-hr LC50 for Ceriodaphnia dubia exposed to Aluminium chloride increased from 0.72 to greater than 99.6 mg/L with water hardness increasing from 25 to 200 mg/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.
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.
Vanadium 7440-62-2	The 72 h EC50 of vanadium pentoxide to Desmodesmus subspicatus was 2,907 ug of V/L.	The 96 h LC50 of vanadium pentoxide to Pimephales promelas was 1,850 ug of V/L .	The 3 h EC50 of sodium metavanadate for activated sludge was greater than 100 mg/L.	The 48 h EC50 of sodium vanadate to Daphnia magna was 2,661 ug of V/L.
Niobium (Columbium) 7440-03-1	-	-	-	-
Chromium 7440-47-3	-	-	-	-
Tin 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.
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.
Copper 7440-50-8	The 72 h EC50 values of copper chloride to Pseudokirchneriella subcapitata ranged between 30 µg/L (pH 7.02, hardness 250 mg/L CaCO3, DOC 1.95 mg/L) and 824 µg/L (pH 6.22, hardness 100 mg/L CaCO3, DOC 15.8 mg/L).	The 96-hr LC50 for Pimephales promelas exposed to Copper sulfate ranged from 256.2 to 38.4 ug/L with water hardness increasing from 45 to 255.7 mg/L.	The 24 h NOEC of copper chloride for activated sludge ranged from 0.32 to 0.64 mg of Cu/L.	The 48 h LC50 values for Daphnia magna exposed to copper in natural water ranged between 33.8 µg/L (pH 6.1, hardness 12.4 mg/L CaCO3, DOC 2.34 mg/L) and 792 µg/L (pH 7.35, hardness 139.7 mg/L CaCO3, DOC 22.8 mg/L).
Silicon 7440-21-3	The 72 h EC50 of sodium metasilicate pentahydrate to Pseudokirchnerella subcapitata was greater than 250 mg/L.	-	-	-
Nickel 7440-02-0	NOEC/EC10 values range from 12.3 µg/l for Scenedesmus accuminatus	The 96h LC50s values range from 0.4 mg Ni/L for Pimephales promelas to 320	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

	to 425 µg/l for Pseudokirchneriella subcapitata.	mg Ni/L for Brachydanio rerio.		mg Ni/L for Daphnia magna.

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 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.	3089
Proper shipping name	Metal powders, flammable, n.o.s. (Titanium)
Hazard Class	4.1
Subsidiary class	Hazard Class 9, if transported in bulk or by vessel
Packing Group	II
Special Provisions	IB8, IP2, IP4, T3, TP33 - If Class 9, also 8, 146, 335, A112, B54, B120, IP3, N20, N91, T1
Marine pollutant	This product contains a chemical which is listed as a severe marine pollutant according to DOT.
Description	Copper metal powder
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	Complies

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 - 10	1.0
Copper - 7440-50-8	7440-50-8	0 - 5	1.0
Nickel - 7440-02-0	7440-02-0	0 - 0.9	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	
Copper 7440-50-8		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
Copper 7440-50-8	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 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
Titanium 7440-32-6	X		
Aluminum 7429-90-5	X	X	X
Molybdenum 7439-98-7	X	X	X
Zirconium 7440-67-7	X	X	X
Vanadium 7440-62-2	X	X	X
Chromium	X	X	X

7440-47-3			
Tin 7440-31-5	X	X	X
Copper 7440-50-8	X	X	X
Silicon 7440-21-3	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** 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 19-Feb-2020
Revision Date 19-Feb-2020
Revision Note
Updated to comply with GHS
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