

Issue Date 28-May-2015

Revision Date 05-Aug-2016

Version 1

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

Product identifier**Product Name** Titanium Alloy Powder**Other means of identification****Synonyms**

Titanium Alloy Powder: - CP Ti Powder, Ti-6Al-4V Powder, Ti-6Al-4V-1B Powder, Ti-6Al-2Sn-4Zr-2Mo Powder, Ti-5Al-5V-5Mo-3Cr Powder, ATI 425 Powder, Ti-48Al-2Cr-2Nb Powder, Ti-6Al-4V-1B Powder, TNM Powder

Recommended use of the chemical and restrictions on use**Recommended Use** Titanium alloy product manufacture.**Uses advised against****Details of the supplier of the safety data sheet****Manufacturer Address**

23661 Birtcher Dr., Lake Forest, CA 92630 U.S.A.

Emergency telephone number**Emergency Telephone** (949) 407-8904

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** Powder**Physical state** Solid**Odor** Odorless**Hazards not otherwise classified (HNOC)**

Not applicable

Other InformationWhen 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.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms

Titanium Alloy Powder: - CP Ti Powder, Ti-6Al-4V Powder, Ti-6Al-4V-1B Powder, Ti-6Al-2Sn-4Zr-2Mo Powder, Ti-5Al-5V-5Mo-3Cr Powder, ATI 425 Powder,

Ti-48Al-2Cr-2Nb Powder, Ti-6Al-4V-1B Powder, TNM Powder.

Chemical Name	CAS No.	Weight-%
Titanium	7440-32-6	50-100
Aluminum	7429-90-5	0-40
Niobium (Columbium)	7440-03-1	0 - 27
Iron	7439-89-6	0-10
Molybdenum	7439-98-7	0 - 10
Tungsten	7440-33-7	0 - 10
Chromium	7440-47-3	0-10
Vanadium	7440-62-2	0-10
Zirconium	7440-67-7	0-5
Yttrium	7440-65-5	0-3
Tin	7440-31-5	0-3
Boron	7440-42-8	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	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	IF SWALLOWED. Call a POISON CENTER or doctor/physician if you feel unwell.

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

Smother with salt (NaCl) or class D dry powder fire extinguisher. Non-combustible.

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. Non-combustible.

Hazardous combustion products 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.

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 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. Avoid creating uncontrolled dust.

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.

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.

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

Chemical Name	ACGIH TLV	OSHA PEL
Titanium 7440-32-6	-	-
Aluminum 7429-90-5	TWA: 1 mg/m ³ respirable fraction	TWA: 15 mg/m ³ total dust TWA: 5 mg/m ³ respirable fraction
Niobium (Columbium) 7440-03-1	-	-
Vanadium 7440-62-2	-	Ceiling: 0.5 mg/m ³ V2O5 respirable dust Ceiling: 0.1 mg/m ³ V2O5 fume
Tungsten 7440-33-7	STEL: 10 mg/m ³ STEL: 10 mg/m ³ W TWA: 5 mg/m ³ TWA: 5 mg/m ³ W	(vacated) STEL: 10 mg/m ³ (vacated) STEL: 10 mg/m ³ W
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
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
Yttrium 7440-65-5	TWA: 1 mg/m ³ Y	TWA: 1 mg/m ³
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
Boron 7440-42-8	-	-

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.
- 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	Powder	Odor threshold	Not applicable
Color	metallic Grey silver		
Property	Values	Remarks • Method	
pH	-		
Melting point/freezing point	1320-1400 °C / 2560-2800 °F		
Boiling point / boiling range	-		
Flash point	-		
Evaporation rate	-	Not applicable	
Flammability (solid, gas)	-	Not flammable in the form of this product as distributed, flammable as finely divided particles or pieces resulting from processing of this product	
Flammability Limit in Air		Not applicable	
Upper flammability limit:	-		
Lower flammability limit:	-		
Vapor pressure	-	Not applicable	
Vapor density	-	Not applicable	
Specific Gravity	8.0-8.5 -		
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 -
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 Product not classified.
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
Niobium (Columbium) 7440-03-1	> 10,000 mg/kg bw	> 2000 mg/kg bw	-
Vanadium 7440-62-2	> 2000 mg/kg bw	-	-
Tungsten 7440-33-7	> 2000 mg/kg bw	> 2000 mg/kg bw	> 5.4 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
Zirconium 7440-67-7	> 5000 mg/kg bw	-	>4.3 mg/L
Yttrium 7440-65-5	> 5000 mg/kg bw	-	> 5.09 mg/L
Tin 7440-31-5	> 2000 mg/kg bw	> 2000 mg/kg bw	> 4.75 mg/L
Boron 7440-42-8	> 2000 mg/kg bw	-	> 5.08 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.

Chemical Name	ACGIH	IARC	NTP	OSHA
Chromium 7440-47-3		Group 3		

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
Titanium 7440-32-6	The 72 h EC50 of titanium dioxide to <i>Pseudokirchneriella subcapitata</i> was 61 mg of TiO ₂ /L.	The 96 h LC50 of titanium dioxide to <i>Cyprinodon variegatus</i> was greater than 10,000 mg of TiO ₂ /L. The 96 h LC50 of titanium dioxide to <i>Pimephales promelas</i> was greater than 1,000 mg of TiO ₂ /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 <i>Daphnia Magna</i> was greater than 1000 mg of TiO ₂ /L.
Aluminum 7429-90-5	The 96-h EC50 values for reduction of biomass of <i>Pseudokirchneriella subcapitata</i> 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 <i>Oncorhynchus mykiss</i> 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 <i>Ceriodaphnia dubia</i> exposed to Aluminum chloride increased from 0.72 to greater than 99.6 mg/L with water hardness increasing from 25 to 200 mg/L.
Niobium (Columbium) 7440-03-1	-	-	-	-
Vanadium 7440-62-2	The 72 h EC50 of vanadium pentoxide to <i>Desmodesmus</i>	The 96 h LC50 of vanadium pentoxide to <i>Pimephales</i>	The 3 h EC50 of sodium metavanadate for activated	The 48 h EC50 of sodium vanadate to <i>Daphnia magna</i>

	subspicatus was 2,907 ug of V/L.	promelas was 1,850 ug of V/L.	sludge was greater than 100 mg/L.	was 2,661 ug of V/L.
Tungsten 7440-33-7	The 72 h EC50 of sodium tungstate to Pseudokirchnerella subcapitata was 31.0 mg of W/L.	The 96 h LC50 of sodium tungstate to Danio rerio was greater than 106 mg of W/L.	The 30 min EC50 of sodium tungstate for activated sludge were greater than 1000 mg/L.	The 48 h EC50 of sodium tungstate to Daphnia magna was greater than 96 mg of W/L.
Molybdenum 7439-98-7	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 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	-	-	-	-
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.
Yttrium 7440-65-5	-	The 96 h LL50 of Yttrium oxide to Danio rerio was greater than 100 mg/L.	The 3 h NOEC of Yttrium oxide for activated sludge was greater than 1000 mg/L.	The 48 h LL50 of Yttrium oxide to Daphnia magna was greater than 100 mg/L.
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.
Boron 7440-42-8	The 72-h EC50 value for reduction of biomass of Pseudokirchnerella subcapitata exposed to Boric acid at pH 7.5 to 8.3 was 40.2 mg/L.	The 96-hr LC50 for Pimephales promelas exposed to Boric acid (82%)/borax (18%) mixture was 79.7 mg/L with water hardness of 91 mg/L and water pH of 8.0.	The 3 h NOEC of boric acid for activated sludge ranged from 17.5 to 20 mg/L.	The 48-hr LC50 for Ceriodaphnia dubia exposed to Boric acid/borax mixture ranged from 91 to 165 mg/L with pH ranging from 6.7 to 8.4.

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

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 Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
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

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	

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

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
Titanium 7440-32-6	X		
Aluminum 7429-90-5	X	X	X
Vanadium 7440-62-2	X	X	X
Tungsten 7440-33-7	X	X	X
Molybdenum 7439-98-7	X	X	X
Chromium 7440-47-3	X	X	X
Zirconium 7440-67-7	X	X	X
Yttrium 7440-65-5	X	X	X
Tin 7440-31-5	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 1 Physical hazards 0 Personal protection X

Chronic Hazard Star Legend

* = Chronic Health Hazard

Issue Date 28-May-2015

Revision Date 05-Aug-2016

Revision Note

Updated Section(s): 1, 3

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 samaterials.com