



SAFETY DATA SHEET

Issue Date 28-May-2015

Revision Date 05-Aug-2016

Version)

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

Product identifier

Product Name Titanium Alloy Compacts

Other means of identification

Product Code PM010

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

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

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

Emergency telephone number

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: 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 Compacts: - CP Ti Compacts, Ti-6Al-4V Compacts, Ti-6Al-2Sn-4Zr-2Mo

Compacts, Ti-5Al-5V-5Mo-3Cr Compacts, ATI 425 Compacts, Ti-6Al-4V-1B Compacts, Ti-48Al-2Cr-2Nb Compacts, TNM Compacts.

| 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 | Not an expected route of exposure. |
| <u>Most important symptoms and effects, both acute and delayed</u> | |
| Symptoms | None anticipated. |
| <u>Indication of any immediate medical attention and special treatment needed</u> | |
| Note to physicians | Treat symptomatically. |

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Not flammable in the form of this product as distributed, flammable as finely divided particles or pieces resulting from processing of this product. 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.

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.

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** 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.

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

| 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>Pseudokirchnerella 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>Pseudokirchnerella 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 subspicatus</i> was 2,907 ug of V/L. | The 96 h LC50 of vanadium pentoxide to <i>Pimephales promelas</i> 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 <i>Daphnia magna</i> was 2,661 ug of V/L. |
| Tungsten 7440-33-7 | The 72 h EC50 of sodium tungstate to <i>Pseudokirchnerella subcapitata</i> was 31.0 mg of W/L. | The 96 h LC50 of sodium tungstate to <i>Danio rerio</i> 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 <i>Daphnia magna</i> was greater than 96 mg of W/L. |
| Molybdenum 7439-98-7 | The 72 h EC50 of sodium molybdate dihydrate to <i>Pseudokirchneriella subcapitata</i> was 362.9 mg of Mo/L. | The 96 h LC50 of sodium molybdate dihydrate to <i>Pimephales promelas</i> 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 <i>Ceriodaphnia dubia</i> was 1,015 mg/L. The 48 h LC50 of sodium molybdate dihydrate to <i>Daphnia magna</i> was greater than 1,727.8 mg/L. |
| Iron 7439-89-6 | - | The 96 h LC50 of 50% iron oxide black in water to <i>Danio rerio</i> 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 <i>Daphnia magna</i> was greater than 100 mg/L. |
| Chromium 7440-47-3 | - | - | - | - |
| 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. |
| Yttrium 7440-65-5 | - | The 96 h LL50 of Yttrium oxide to <i>Danio rerio</i> 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 <i>Daphnia magna</i> was greater than 100 mg/L. |
| Tin 7440-31-5 | The 72 h EC50 of tin chloride pentahydrate to <i>Pseudokirchnerella subcapitata</i> was 9,846 ug of Sn/L. | The 7 d LOEC of tin chloride pentahydrate to <i>Pimephales promelas</i> was 827.9 ug of Sn/L. | - | The 7 d LC50 of tin chloride pentahydrate to <i>Ceriodaphnia dubia</i> was greater than 3,200 ug of Sn/L. |
| Boron 7440-42-8 | The 72-h EC50 value for reduction of biomass of <i>Pseudokirchneriella subcapitata</i> exposed to Boric acid at pH 7.5 to 8.3 was 40.2 mg/L. | The 96-hr LC50 for <i>Pimephales promelas</i> 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 <i>Ceriodaphnia dubia</i> 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 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 | 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 0 | Physical hazards 0 | Personal protection X |
| <i>Chronic Hazard Star Legend</i> | <i>* = Chronic Health Hazard</i> | | | |

Issue Date 28-May-2015

Revision Date 05-Aug-2016

Revision Note

Updated Section(s): 1, 7

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