

SAFETY DATA SHEET



Titanium (Unalloyed Titanium)

Titanium Industries, Inc. (T.I.)
18 Green Pond Road
Rockaway, NJ 07866 USA
t: (+1) (973) 983-1185

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Revision Date:

Section 1: Identification

- 1a. Product Identifier:** Titanium or Commercially Pure (CP) Titanium or Unalloyed Titanium
1b. Other means of identification: Titanium as noted in ASTM & AMS Specifications
1c. Name, address and phone number of supplier of safety data sheet:
Titanium Industries, Inc.
18 Green Pond Road
Rockaway, New Jersey 07866
973-983-1185
1d. Emergency Phone Number: Chemtrec: 1-800-424-9300 (USA) 703-527-3887 (outside USA)
1e. Recommended use of Titanium and restrictions on use: Titanium Distribution

Section 2: Hazard(s) Identification

- 2a. Classification:** This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (28 CFR 1910.1200) This SDS is written for unalloyed titanium articles supplied in the solid form and not subject to REACH Regulation (EC) No 1907/2006 and is not subject to classification under CLP Regulation (EC) No 1272/2008.
2b. Precautionary Statement: Airborne particulate may cause damage to the respiratory tract, liver, and kidney through repeated or prolonged inhalation. When product is subject to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other heat generating processes, potentially hazardous airborne particles and/or fumes may be generated.
2c. Hazards not otherwise classified: None known
2d. Unknown toxicity statement: None known

Section 3: Composition/Information on Ingredients

- 3a. Chemical Name, common name, synonyms, CAS/EC number, identifiers, concentrations**
CAS – Chemical Abstract Service EC – European Community
Titanium contains small amounts of trace elements in addition to those listed herein. The small amounts are referred to as 'trace elements that are generated from the raw materials being used.'
Chemical identity of regulated substances under 29 CFR 1910.1200 (Hazard Communication Standard)

Chemical Name	CAS Number	EC Number	Weight %
Titanium	7440-32-6	231-142-3	90-98%

Section 4: First-Aid Measures

- 4a. Necessary first aid instructions:**
Inhalation: In the event dust particulate, fumes or smoke is inhaled during processing, move to fresh air and consult a qualified health professional if feeling ill.
Skin Contact: In case of an allergic skin reaction, seek a qualified health professional.
Eye Contact: In the event dust particulate enters the eye, flush eyes repeatedly and seek a qualified medical professional if condition persists.
Ingestion: Not a suspected route of exposure however if during processing, dust particulates are ingested and conditions exist, seek a qualified medical professional.
4b. Description of most important symptoms or effects:
Respiratory System- operations such as welding, burning, sawing, brazing, machining and grinding may irritate the respiratory tract, see section 8

Section 5: Fire-Fighting Measures

- 5a. Recommendations of suitable extinguishing equipment:** Titanium is not flammable as distributed but is flammable in the form of fines and turnings resulting from processing. In this case the recommended extinguishing media would be to use a Class D Dry Powder fire extinguisher.
5b. Recommendations of unsuitable extinguishing equipment: DO NOT SPRAY WATER on burning particulate.
5c. Specific hazards arising from titanium: Dust, turnings, or fines may ignite when presented with an ignition source.
5d. Special PPE and precautions for firefighters: MSHA/NIOSH approved SCBA apparatus and full typical firefighting protective gear.

Section 6: Accidental Release Measures

- 6a. Personal precautions and protective equipment:** Not applicable in solid state. If dust or turnings are accumulated, personnel are recommended to wear appropriated PPE to protect against airborne particulate coming in contact with the respiratory tract, eyes or skin.
6b. Emergency procedures: Use personal protective gear as required

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6c. Methods and materials used for containment: Not applicable as distributed
6d. Cleanup procedures: Use personal protective gear as required

Section 7: Handling and Storage

7a. Precautions for safe handling: Not applicable as distributed. Dust, turnings, or small particulate should be handled in a manner to protect against eye or skin contact by utilizing gloves and/or breathing masks where required.
7b. Recommendations on the conditions for safe storage including any incompatibilities: Not applicable as distributed however for small fines, turnings, etc... keep away from ignition sources.

Section 8: Exposure Controls/Personal Protection

8a. Occupational exposure limits:

Chemical	OSHA PEL ¹	ACGIH TLV ²	NIOSH REL ³	IDLH ⁴
Titanium	15 mg/m ³ (TiO ₂ , total dust)	10 mg/m ³ (TiO ₂)	LFC (TiO ₂) ⁵	5000 mg/m ³ (TiO ₂)

NE – None Established

1. OSHA PELs (Permissible Exposure Limits) are 8-hour TWA (time weighted average) concentration unless otherwise noted. A ("C") designation denotes a ceiling limit, which should not be exceeded during any part of the working exposure unless otherwise noted. A Short Term Exposure Limit (STEL) is defined as a 15 minute exposure, which should not be exceeded at any time during a work day.
 2. Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guidance purposes only and as such are not legal, regulatory limits for compliance purposes.
 3. The National Institute for Occupational Safety and Health Recommended Exposure Limits (NIOSH-REL): Compendium of Policy and Statements, NIOSH, Cincinnati, Oh (1992). NIOSH is the federal agency designated to conduct research relative to occupational safety and health. As is the case with ACGIH TLVs, NIOSH RELs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
 4. The "immediately dangerous to life or health" air concentration values (IDLHs) are used by NIOSH as part of respirator selection criteria and were first developed in the mid 1970s by NIOSH. The documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs) is a compilation of the rationale and sources of information used by NIOSH during the original determination of 387 IDLHs and their subsequent review and revision in 1994.
 5. LFC- Lowest Feasible Concentration, refer to Section 11, Toxicological Information.
- 8b. Appropriate engineering controls: Use controls as appropriate to minimize exposure to metal fumes and dusts during handling operations. Provide general or local exhaust ventilation systems to minimize airborne concentrations. Local exhaust is necessary for use in enclosed or confined spaces. Provide sufficient general/local exhaust ventilation in pattern/volume to control inhalation exposures below current exposure limits.

8c. Recommendations for personal protective equipment (PPE):

Respiratory Protection: Limit exposure to airborne particulate. Follow OSHA respiratory regulations (29 CFR 1910.134) and, if necessary, use only a NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions. Half-face, negative-pressure, air-purifying respirator equipped with P100 filter is acceptable for concentrations up to 10 times the exposure limit. Full-face, negative-pressure, air-purifying respirator equipped with P100 filter is acceptable for concentrations up to 50 times the exposure limit. Protection from air-purifying negative-pressure and powered air respirators is limited. Use a positive-pressure-demand, full face, supplier air respirator, or self contained breathing apparatus (SCBA) for concentrations above 50 times the exposure limit. If exposure is above the IDLH (Immediately Dangerous to Life or Health) for any of the constituents, or there is a possibility of an uncontrolled release or exposure levels are unknown, then use a positive-demand, full-face, supplied air respirator with escape bottle of SCBA.

Warning! Air purifying respirators, both negative-pressure, and powered air do not protect workers in oxygen-deficient atmospheres.

Eyes: Wear appropriate eye protection to prevent eye contact. For operations, which result in elevated temperature of the product to or above its melting point or result in the generation of airborne particulates, use safety glasses or goggles to prevent eye contact. Contact lenses should not be worn where industrial exposures to this material are likely. Use appropriate eye protection as required for welding, burning, sawing, brazing, grinding or machining operations.

Skin: For operations which result in elevating the temperature of the product to or above its melting point, or result in the generation of airborne particulates, use eye protection, protective clothing, and gloves to prevent skin contact. Protective gloves and eye protection should be worn as required for welding, burning, or handling operations.

Other protective equipment: An eyewash station or shower should be readily available in the work area when operations which could result in fumes and or particulates are being performed.

Section 9: Physical and Chemical Properties

9a. Appearance (physical state, color, etc...): Solid silver gray metal

9b. Odor: Odorless

9c. pH: N/A

9d. Melting point: >2800°F

9f. Vapor density (air = 1): N/A

9g. pH: N/A

9h. Relative density: 5-6 (H₂O = 1)

9i. Viscosity: N/A

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9j. Solubility: Water insoluble
9k. Flash point: N/A
9l. Evaporation rate: N/A
9m. Flamability (solid/gas): Non flammable, non combustible
N/A – Not applicable
ND – Not determined

Section 10: Stability and Reactivity

10a. Reactivity: Not determined (ND) for titanium in solid form
10b. Chemical stability: Titanium products are stable under normal storage and handling conditions
10c. Possibilities of hazardous reactions: None Known
10d. Conditions that should be avoided: Storage with strong acids or calcium hypochlorite
10e. Classes of incompatible materials: Molten titanium may react violently with water

Section 11: Toxicological Information

11a. Toxicological information for titanium has not been established for this product as sold. However, processing of this product in operations such as high temperature (welding, burning), sawing, brazing, machining, and grinding may produce fumes or airborne particulates.

Notes:

- No LC₅₀ or LD₅₀ has been established for Titanium semi or finished products.
- No Skin (Dermal) Irritation No data is available for Titanium
- No Eye Irritation No data is available for Titanium.
- No Skin (Dermal) Sensitization No data is available for Titanium
- No Germ Cell Mutagenicity No data is available for Titanium
- Carcinogenicity: IARC, NTP, and OSHA do not list Titanium as a carcinogen.
- No Toxic Reproduction data available for Titanium

Section 12: Ecological Information (non-mandatory)

12a. Hazard Category: Not reported
12b. Hazard Symbol: No symbol
12c. Signal Word: No signal word
12d. Hazard Statement: No hazard statement
12e. Ecotoxicity: No data available for titanium semi or finished product.
12f. Mobility: No data available for titanium
12g. Persistence and Degradability: No data available
12h. Bioaccumulative Potential: No data available
The listings and regulations relating to a titanium product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.

Section 13: Disposal Considerations (non-mandatory)

13a. Disposal: Titanium scrap should be recycled whenever possible. Dust and fumes from processing operations should also be recycled, or classified by a competent environmental professional and disposed of in accordance with applicable federal, state or local regulations.
13b. Container Cleaning and Disposal: The product as supplied does not possess characteristics which qualify as hazardous waste. Following processing and use, resulting titanium powders, turnings, fines and/or swarf will impact cleaning and disposal and should be evaluated by a competent environmental professional.
Note: The information is for Titanium in solid form. Any alterations can void this information.

Section 14: Transport Information (non-mandatory)

Transportation Information: The following listings of regulations relating to titanium product may not be complete and should not be solely relied upon for all regulatory compliance requirements.
The US Department of Transportation (DOT) under 49 CFR 172 does not regulate titanium as a hazardous material. All federal, state and local laws and regulations that apply to the transport of this type of material must be adhered to.

Shipping Name: N/A
Shipping Symbols: N/A
Hazard Class: N/A
UN No.: N/A
Packing Group: N/A
DOT/IMO Label: N/A
Special Provisions (172.102): N/A

Packaging Authorizations
a) Exceptions: N/A
b) Group: N/A
c) Authorization: N/A

Quantity Limitations
a) Passenger, Aircraft or Railcar: N/A
b) Cargo Aircraft Only: N/A
Vessel Stowage Requirements
a) Vessel Stowage: N/A
b) Other: N/A
DOT Reportable Quantities: N/A



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International Maritime Dangerous Goods (IMDG) and the Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID) classification, packaging, and shipping requirements follow the US Department of Transportation Hazardous Materials Regulation.

Regulations the International Carriage of Dangerous Goods by Road (ADR) does not regulate titanium as a hazardous material.

Shipping Name: N/A Classification Code: N/A UN No.: N/A Packing Group: N/A ADR Label: N/A Special Provisions: N/A Limited Quantities: N/A	Packaging a) Packing Instructions: N/A b) Special Packaging Provisions: N/A c) Mixed Packaging Provisions: N/A	Portable Containers and Bulk Containers a) Instructions: N/A b) Special Provisions: N/A
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International Air Transport Association (ITA) does not regulate titanium as a hazardous material

Shipping Name: N/A Class/Division: N/A Hazard Label: N/A UN No.: N/A Packing Group: N/A Excepted Quantities (EQ): N/A	Passenger and Cargo Aircraft Limited Quantity (EQ) Packaging Inst: N/A Max Net Qty/Pkg: N/A	Cargo Aircraft Only Pkg. Instructions: N/A Max Net Qty/Pkg: N/A	Special Provisions: N/A ERG Code: N/A
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Pkg – Packing Max Net Qty/Pkg – determined by the freight carrier capability

Transport Dangerous Goods (TDG) Classification : Titanium does not have a TDG classification.

Section 15: Regulatory Information (non-mandatory)

Regulatory information: The following listing of regulations relating to titanium product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.

This product and/or its constituents are subjected to the following regulations:

OSHA Regulations: Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-2, Z-3): Titanium is not listed.

Regulations
SWDA, SARA 313
SARA 313
CAA, CWA, SARA 313, CERCLA, RCRA, SDWA
SDWA
CERCLA, CWA, SARA 313, RCDA, SDWA

SARA Potential Hazard Categories: Immediate Acute Health Hazard: Delayed Chronic Health Hazard

Regulations Key

CAA – Clean Air Act (42 USC Sec. 7412; 40 CFR Part 61 [as of 8/2/2006])

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act (42 USC secs. 9601(14), 9603(a), 40 CFR sec.302.4, Table 302.4 and App. A)

CWA – Clean Water Act (33 USC Secs. 1311;1314(b), (c), (e), (g); 136(b), (c); 137(b), (c) [as of 8/2/2006])

RCRA – Resource Conservation Recovery Act (42 USC Sec.6921;40 CFR Part 261 App. VIII)

SARA – Superfund Amendments and Reauthorization Title III Section 302 Extremely Hazardous Substances (42 USC secs. 11023, 13106; 40 CFR Sec.372.65) and section 313 Toxic Chemicals (42 USC secs. 11023, 13106; 40 CFR sec. 372.65 [as of 6/30/2005])

TSCA – Toxic Substance Control Act (15 U.S.C.s/s 2601 et seq.[1976])

SDWA – Safe Drinking Water Act (42 U.S.C.s/s 300f et seq. [1974])

This information should be included in all SDS's that are copied and distributed for this material

State Regulations: Titanium is not listed in any state regulations. However, individual components of the product are listed in various state regulations:

California Prop. 65: Titanium semi or finished product may contain trace elements, generally much less than 0.1% of metallic elements known to the state of California to cause cancer or reproductive toxicity.

New Jersey: Contains regulated material in the following categories:

Hazardous Substance List: Titanium, Molybdenum, Vanadium, Aluminum (dust and fume), and Nickel

Environmental Hazards: Not Listed

Other Regulations:

WHMIS Classification (Canadian):

Ingredients	WHMIS Classification
Titanium	D26

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the controlled Products Regulations.

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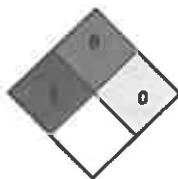
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Section 16: Other Information

16a. Hazardous Material Identification System (HMIS)

Health Hazard	1
Fire Hazard	0
Physical Hazard	0

National Fire Protection Association (NFPA)



HEALTH-1 Denotes possible chronic hazard if airborne

FIRE- 0 Materials will not burn

PHYSICAL HAZARD-0 Materials that are normally stable, do not
condense or self react. Non-explosives

posure,

16b. National Fire Protection Association (NFPA)

Health-1 Exposure could cause irritation but only minor residual injury even if no treatment is given

Flammability-0 Materials that will not burn

Instability-0 Normally stable, even under fire exposure conditions, and are not reactive with water

DISCLAIMER:

The data in this Safety Data Sheet is correct to the best of our knowledge at the date of this publication. All information, recommendations and suggestions concerning the product are based on data believed to be reliable. It is the user's responsibility to determine the safety, toxicity and suitability for their own use of the product. The information given is a guideline for safe handling, use processing, storage, transportation and disposal. Since the applications of the product is beyond our control, no guarantee or warranty is expressed or implied is made by Titanium Industries Inc. It is the user's responsibility to comply with all federal, state and local regulations. This SDS is not intended to serve as a complete regulatory compliance document.