OmniSource
The Best in Metals Recycling

Titanium Scrap

Safety Data Sheets (SDS)

Section 1 – Identification

1(a) Product Identifier used on Label: Titanium Scrap

1(b) Other means of identification: Titanium Scrap Products (All Grades), SDS ID: NFE-0114

1(c) Recommended use of the chemical and restrictions on use: Scrap metal use. None Known

1(d) Name, address, and telephone number:

OMNISOURCE Corporation
7575 West Jefferson Blvd
Fort Wayne, Indiana 46804

Phone: (800) 666-4789 (Safety Department)

1(e) Emergency Phone Number: (800) 424-9300 (CCN# 221258) CHEMTREC

Section 2 – Hazard(s) Identification

2(a) Classification of the chemical: Titanium Scrap is considered an article under Reach regulation (REACH REGULATION (EC) No 1907/2006) and is not subject to classification under CLP regulation (REGULATION (EC) No 1272/2008). However, **Titanium Scrap** is not exempt as an article under OSHA's Hazard Communication Standard (29 CFR 1910.1200) due to its downstream use, thus this product is considered a mixture and a hazardous material. Therefore, the categories of Health Hazards as defined in "GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELING OF CHEMICALS (GHS), Third revised edition ST/SG/AC.10/30/Rev. 3" United Nations, New York and Geneva, 2009 have been evaluated. Refer to Section 3, 8 and 11 for additional information.

2(b) Signal word, hazard statement(s), symbols and precautionary statement(s):

Hazard Symbol	Hazard Classification	Signal Word	Hazard Statement(s)
	Single Target Organ Toxicity (STOT) Repeat Exposure - 2	**DANGER**	May cause damage to lungs through prolonged or repeated exposure.

Precautionary Statement(s):

Prevention	Response	Storage/Disposal
Do not breath dusts, mists or sprays.	Get medical advice/attention if you feel unwell.	Dispose of contents in accordance with federal, state and local regulations.

2(c) Hazards not otherwise classified: None Known

2(d) Unknown acute toxicity statement (mixture): None Known

Section 3 – Composition/Information on Ingredients

3(a-c) Chemical name, common name (synonyms), CAS number and other identifiers, and concentration:

Chemical Name	CAS Number	EC Number	% weight
Titanium	7440-32-6	231-142-3	>80
Aluminum	7429-90-5	231-072-3	<8
Vanadium	7440-62-2	231-171-1	<5
Molybdenum	7439-98-7	231-107-2	<5
Tin	7440-31-5	231-141-8	<4
Chromium and Chromium Oxides	7440-47-3	231-157-5	<4
Zirconium	7440-67-7	231-142-3	<4

EC - European Community

CAS - Chemical Abstract Service

Commercial steel products contain small amounts of various elements in addition to those listed. These small quantities are frequently referred to as "trace" or "residual" elements that generally originate in the raw materials used. Steel products may contain the following trace or residual elements including typical percentages for the elements identified: Nickel (<0.1%)

Section 4 – First-aid Measures

4(a) Description of necessary measures:

- **Inhalation: Titanium Scrap** as sold/shipped is not a likely form of exposure. If inhaled: Remove person to fresh air and keep comfortable for breathing.
- **Eye Contact: Titanium Scrap** as sold/shipped is not a likely form of exposure. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- **Skin Contact: Titanium Scrap** as sold/shipped is not a likely form of exposure
- **Ingestion: Titanium Scrap** as sold/shipped is not a likely form of exposure.

Section 4 – First-aid Measures (continued)

4(b) Most important symptoms/effects, acute and delayed (chronic):

- **Inhalation: Titanium Scrap** as sold/shipped is not likely to present an acute or chronic health effect.
- **Eye: Titanium Scrap** as sold/shipped is not likely to present an acute or chronic health effect.
- **Skin: Titanium Scrap** as sold/shipped is not likely to present an acute or chronic health effect.
- **Ingestion: Titanium Scrap** as sold/shipped is not likely to present an acute or chronic health effect.

However, during further processing (welding, grinding, burning, etc.) individual components may illicit an acute or chronic health effect. Refer to Section 11-Toxicological Information.

4(c) Immediate Medical Attention and Special Treatment: None Known

Section 5 – Fire-fighting Measures

5(a) Suitable (and unsuitable) Extinguishing Media: Not Applicable for **Titanium Scrap** as sold/shipped. Use extinguishers appropriate for surrounding materials.

5(b) Specific Hazards arising from the chemical: Not Applicable for **Titanium Scrap** as sold/shipped. When burned, toxic smoke, fume and vapor may be emitted.

5(c) Special protective equipment and precautions for fire-fighters: Self-contained NIOSH approved respiratory protection and full protective clothing should be worn when fumes and/or smoke from fire are present. Heat and flames cause emittance of acrid smoke and fumes. Do not release runoff from fire control methods to sewers or waterways. Firefighters should wear full face-piece self-contained breathing apparatus and chemical protective clothing with thermal protection. Direct water stream will scatter and spread flames and, therefore, should not be used.

Section 6 - Accidental Release Measures

6(a) Personal Precautions, Protective Equipment and Emergency Procedures: Not Applicable for **Titanium Scrap** as sold/shipped. For spills involving finely divided particles, clean-up personnel should be protected against contact with eyes and skin. If material is in a dry state, avoid inhalation of dust.

6(b) Methods and materials for containment and clean up: Not Applicable for **Titanium Scrap** as sold/shipped. Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations. Follow applicable OSHA regulations (29 CFR 1910.120) and all other pertinent state and federal requirements.

Section 7 - Handling and Storage

7(a) Precautions for safe handling: Not Applicable for **Titanium Scrap** as sold/shipped, however further processing (welding, burning, grinding, etc.) with the potential for generating high concentrations of airborne particulates should be evaluated and controlled as necessary. Wear protective gloves / protective clothing / eye protection / face protection. In case of inadequate ventilation, wear respiratory protection. Cut resistant gloves and sleeves should be worn when working with steel products.

7(b) Conditions for safe storage, including any incompatibilities: Store away from acids and incompatible materials.

Section 8 - Exposure Controls / Personal Protection

8(a) Occupational Exposure Limits (OELs): Titanium Scrap as sold/shipped in its physical form does not present an inhalation, ingestion or contact hazard, nor would any of the following exposure data apply. However, operations such as burning, welding (high temperature), sawing, brazing, machining, grinding, etc may produce fumes and/or particulates. The following exposure limits are offered as reference for an experienced industrial hygienist to review:

Ingredients	OSHA PEL [1]	ACGIH TLV [2]	NIOSH REL [3]	IDLH [4]
Titanium	15 mg/m³ (as TiO_2, total dust)	10 mg/m³ (as TiO_2)	LFC[5] (as TiO_2)	5,000 mg/m³ (as TiO_2)
Aluminum	15 mg/m³ (as total dust, PNOR[5]) 5.0 mg/m³ (as respirable fraction, PNOR)	10 mg/m³ (as metal dust) 5.0 mg/m³ (as welding fume)	10 mg/m³ (as total dust) 5.0 mg/m³ (as respirable dust)	NE
Vanadium	"C" 0.5 mg/m³(repsirable dust, V_2O_5)	0.05 mg/m³ (as inhalable fraction[6])	"C" 0.05 mg/m³(15 min)	35 mg/m³ (as V)
Molybdenum	15 mg/m³ (as total dust, PNOR) 5.0 mg/m³ (as respirable fraction, PNOR)	10 mg/m³ (as Mo insoluble compounds, inhalable fraction) 3.0 mg/m³ (as Mo insoluble compounds, respirable fraction[7]) 0.5 mg/m³ (as Mo soluble compounds, respirable fraction)	NE	NE
Tin	2.0 mg/m³ (as inorganic compounds, Sn)	2.0 mg/m³ (as metal and inorganic compounds, Sn)	2.0 mg/m³ (also applies to other inorganic tin compounds, as Sn except tin oxides)	100 mg/m³ (as Sn)
Chromium and Chromium Oxides	0.1 mg/m³ (as fume, Cu) 1.0 mg/m³ (as dusts & mists, Cu)	0.2 mg/m³ (as fume) 1.0 mg/m³ (as dusts & mists, Cu)	1.0 mg/m³ (as dusts & mists)	100 mg Cu/m³

Section 8 - Exposure Controls / Personal Protection (continued)

8(a) Occupational Exposure Limits (OELs) (continued):

Ingredients	OSHA PEL [1]	ACGIH TLV [2]	NIOSH REL [3]	IDLH [4]
Zirconium	15 mg/m³ (as total dust, PNOR) 5.0 mg/m³ (as respirable fraction, PNOR)	10 mg/m³ (as Mo insoluble compounds, inhalable fraction) 3.0 mg/m³ (as Mo insoluble compounds, respirable fraction) 0.5 mg/m³ (as Mo soluble compounds, respirable fraction)	NE	NE

NE - None Established

1. OSHA Permissible Exposure Limits (PELs) are 8-hour TWA (time-weighted average) concentrations 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 Peak is defined as the acceptable maximum peak for a maximum duration above the ceiling concentration for an eight-hour shift. A skin notation refers to the potential significant contribution to the overall exposure by the cutaneous route, either by contact with vapors or, of probable greater significance, by direct skin contact with the substance. A Short Term Exposure Limit (STEL) is defined as a 15-minute exposure, which should not be exceeded at any time during a workday. An Action level (AL) is used by OSHA and NIOSH to express a health or physical hazard. They indicate the level of a harmful or toxic substance/activity, which requires medical surveillance, increased industrial hygiene monitoring, or biological monitoring. Action Levels are generally set at one half of the PEL but the actual level may vary from standard to standard. The intent is to identify a level at which the vast majority of randomly sampled exposures will be below the PEL.
2. Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. A Short Term Exposure Limit (STEL) is defined as the maximum concentration to which workers can be exposed for a short period of time (15 minutes) for only four times throughout the day with at least one hour between exposures. A "skin" notation refers to the potential significant contribution to the overall exposure by the cutaneous route, either by contact with vapors or, of probable greater significance, by direct skin contact with the substance. ACGIH-TLVs are only recommended guidelines based upon consensus agreement of the membership of the ACGIH. As such, the ACGIH TLVs are for guideline use purposes and are not legal regulatory standards for compliance purposes. The TLVs are designed for use by individuals trained in the discipline of industrial hygiene relative to the evaluation of exposure to various chemical or biological substances and physical agents that may be found in the workplace.
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 the respirator selection criteria and were first developed in the mid-1970's 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. PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the PNOR limit which is the same as the inert or nuisance dust limit of 15 mg/m^3 for total dust and 5.0 mg/m^3 for the respirable fraction (containing less than 1% crystalline silica).
6. Inhalable fraction. The concentration of inhalable particulate for the application of this TLV is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH 2017 TLVs ® and BEIs ® (Biological Exposure Indices) Appendix D, paragraph A..
7. Respirable fraction. The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in ACGIH 2017 TLVs ® and BEIs ® Appendix D, paragraph C

8(b) 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.

8(c) Individual Protection Measures:

- **Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator 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, level of airborne contamination, and presence of sufficient oxygen. Concentration in air of the various contaminants determines the extent of respiratory protection needed. 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 by air-purifying negative-pressure and powered air respirators is limited. Use a positive-pressure-demand, full-face, supplied 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 or 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 elevating the temperature of the product to or above its melting point or result in the generation of airborne particulates, use safety glasses to prevent eye contact. Contact lenses should not be worn where industrial exposures to this material are likely. Use safety glasses or goggles as required for welding, burning, sawing, brazing, grinding or machining operations.
- **Skin**: Wear appropriate personal protective clothing to prevent skin contact. Cut resistant gloves and sleeves should be worn when working with steel products. 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 protective clothing, and gloves to prevent skin contact. Protective gloves should be worn as required for welding, burning or handling operations. Contaminated work clothing must not be allowed out of the workplace.
- **Other protective equipment**: An eyewash fountain and deluge shower should be readily available in the work area.

Section 9 - Physical and Chemical Properties

9(a) Appearance (physical state, color, etc.): Depends on Scrap composition, most often appears as a dark gray amorphous powder or lustrous whit metal

9(b) Odor: Odorless

9(j) Upper/lower Flammability or Explosive Limits: NA

9(k) Vapor Pressure: ND

Section 9 - Physical and Chemical Properties

9(c) Odor Threshold: NA

9(d) pH: NA

9(e) Melting Point/Freezing Point: 310°F

9(f) Initial Boiling Point and Boiling Range: 6000°F

9(g) Flash Point: NA

9(h) Evaporation Rate: NA

9(i) Flammability (solid, gas): Non-flammable, non-combustible

9(l) Vapor Density (Air = 1): NA

9(m) Relative Density: 5

9(n) Solubility(ies): Water Insoluble

9(o) Partition Coefficient n-octanol/water: ND

9(p) Auto-ignition Temperature: NA

9(q) Decomposition Temperature: ND

9(r) Viscosity: NA

NA - Not Applicable

ND - Not Determined for product as a whole

Section 10 - Stability and Reactivity

10(a) Reactivity: Not Determined (ND) for product in a solid form.

10(b) Chemical Stability: Steel products are stable under normal storage and handling conditions.

10(c) Possibility of hazardous reaction: None Known

10(d) Conditions to Avoid: Storage with strong acids.

10(e) Incompatible Materials: Will react with strong acids to form hydrogen.

10(f) Hazardous Decomposition Products: Thermal oxidative decomposition of steel products can produce fumes containing oxides of iron and manganese as well as other alloying elements.

Section 11 - Toxicological Information

8(a) Occupational Exposure Limits (OELs): Titanium Scrap as sold/shipped in its physical form does not present an inhalation, ingestion or contact hazard, nor would any of the following exposure data apply. However, operations such as burning, welding (high temperature), sawing, brazing, machining, grinding, etc may produce fumes and/or particulates. The following exposure limits are offered as reference for an experienced industrial hygienist to review:

Hazard Classification	Hazard Category		Hazard Symbols	Signal Word	Hazard Statement
	EU	OSHA			
STOT following Repeated Exposure (covers Categories 1 and 2)	NA*	2[j]		**Warning**	May cause damage to lungs through prolonged or repeated inhalation exposure.

* Not Applicable - Semi-formed steel products are considered articles under Reach regulation (REACH REGULATION (EC) No 1907/2006) and are not subject to classification under CLP regulation (REGULATION (EC) No 1272/2008).

Toxicological data listed below are presented regardless to classification criteria. Individual hazard classification categories where the toxicological information has met or exceeded a classification criteria threshold are listed above.

a. No LC_{50} or LD_{50} has been established for **Titanium Scrap**. The following data has been determined for the components:

- **Titanium Dioxide:** LD_{50} > 10,000 mg/kg (Oral/Rat); LC_{50} > 6.82 mg/l (Inhalation/Rat)
- **Vanadium Pentoxide:** LD_{50} = 145 mg/kg (Oral/Mouse)
- **Aluminum:** Rat LD_{50} > 15.9 g/kg (REACH)
- **Zirconium:** Rat LD_{50} >5000 mg/kg (powder)
  Rat LD_{50} > 9000 mg/kg (NLM Toxnet)

b. No Skin (Dermal) Irritation data available for **Titanium Scrap** as a mixture. The following Skin (Dermal) Irritation information was found for the components or its components:

- **Molybdenum:** May cause skin irritation

c. No Eye Irritation data available for **Titanium Scrap** as a mixture or its components.

d. No Skin (Dermal)/respiratory Sensitization data available for **Titanium Scrap** as a mixture. The following Skin (Dermal) Sensitization information was found for the components:

- **Nickel:** May cause allergic skin sensitization.

e. No Respiratory Sensitization data available for **Titanium Scrap** as a mixture or its components.

f. No Germ Cell Mutagenicity data available for **Titanium Scrap** as a mixture or its components.

g. Carcinogenicity: IARC, NTP, and OSHA do not list **Titanium Scrap** as carcinogens. The following Carcinogenicity information was found for the components:

- **Chromium (as metal and trivalent chromium compounds)** – IARC Group 3 carcinogens, not classifiable as to their human carcinogenicity.
- **Welding Fumes -** IARC Group 2B carcinogen, a mixture that is possibly carcinogenic to humans.
- **Titanium Dioxide -** According to the experimental studies and reviewed IUCLID toxicological data, Rats (but not mice) exposed to ultrafine TiO_2 particles at 10 mg/m3 developed lung tumors; probably results from inhibited particle clearance from lung. Titanium and titanium compounds, for the most part, have been considered virtually inert and not highly toxic to man. Titanium dioxide has recently been considered a potential occupational carcinogen based on inhalation studies on rats. Results indicated increases in bronchioloalveolar adenomas and squamous cell carcinomas. As a result, NIOSH recommends exposure to titanium dioxide be reduced to the lowest feasible concentration (LFC).
- **Vanadium Pentoxide:** IARC - 2B, ACGIH - Animal carcinogen A-4. 104 wk Rat inhalation carcinogenicity - some evidence of lung neoplasms in males. 104 wk Mouse inhalation carcinogenicity - clear evidence of carcinogenicity.

Section 11 - Toxicological Information (continued)

11 Information on toxicological effects (continued):

h. No Toxic Reproduction data available for **Titanium Scrap** as a mixture. The following Toxic Reproductive information was found for the components:

- **Vanadium Pentoxide:** Mouse 3 mo inhalation decreases in epididymal sperm motility. Rat 3 mo inhalation no effects in males increase in estrous in females (REACH and NTP).

i. No Specific Target Organ Toxicity (STOT) following a Single Exposure data available for **Titanium Scrap** as a mixture. The following STOT following a Single Exposure data was found for the components:

- **Aluminum**: Repeated exposure associated with Asthma, fibrosis in lungs and encephalopathy in humans.
- **Vanadium Pentoxide:** Kidney, lung, and thorax cardiac rate increased.

j. No Specific Target Organ Toxicity (STOT) following Repeated Exposure data was available for **Titanium Scrap** as a whole. The following STOT following Repeated Exposure data was found for the components:

- **Titanium Dioxide:** Inflammatory lesions in rat lungs produced by 3-month exposures to either 22.3 mg/m^3 of ultrafine TiO2; lesions "regressed" during a 1-year period following cessation of exposure.
- **Aluminum:** Reviews have found chronic exposure to aluminum flake has been reported to cause pneumoconiosis in workers. Repeat oral exposure to aluminum results in decrements in neurobehavioral function and development.
- **Vanadium Pentoxide:** Rat 90 da feeding LOEL 3 mg/kg based on erythropenia, anemia in all groups. Rat 16 da inhalation LOEC = 2 mg/m^3 based on survival and inflammation in Lung (NTP Study). Rat 90 da inhalation NOAEC 1 mg/m^3 based on lung effects (NTP and REACH).

The above toxicity information was determined from available scientific sources to illustrate the prevailing posture of the scientific community. The scientific resources includes: The American Conference of Governmental Industrial Hygienist (ACGIH) Documentation of the Threshold Limit Values (TLVs) and Biological Exposure indices (BEIs) with Other Worldwide Occupational Exposure Values 2014, The International Agency for Research on Cancer (IARC), The National Toxicology Program (NTP) updated documentation, the World Health Organization (WHO) and other available resources, the International Uniform Chemical Information Database (IUCLID), European Union Risk Assessment Report (EU-RAR), Concise International Chemical Assessment Documents (CICAD), European Union Scientific Committee for Occupational Exposure Limits (EU-SCOEL), Agency for Toxic Substances and Disease Registry (ATSDR), Hazardous Substance Data Bank (HSDB), and International Programme on Chemical Safety (IPCS).

The following health hazard information is provided regardless to classification criteria and is based on the individual component(s) and potential resultant components from further processing:

Acute Effects:

- **Inhalation:** Excessive exposure to high concentrations of metal dust may cause irritation to the mucous membranes of the upper respiratory tract.
- **Eye:** Excessive exposure to high concentrations of metal dust may cause irritation to the eyes.
- **Skin:** Skin contact with metal dusts may cause irritation or sensitization, possibly leading to dermatitis. Skin contact with metallic fumes and dusts may cause physical abrasion.
- **Ingestion:** Ingestion of harmful amounts of this product as distributed is unlikely due to its solid insoluble form. Ingestion of metal dust may cause nausea or vomiting.

Acute Effects by component:

- **Titanium and titanium oxides:** Not Reported / Not Classified
- **Aluminum and aluminum oxides:** Inhalation may cause cough.
- **Vanadium and vanadium oxides:** Vanadium oxide is fatal if swallowed or inhaled, and may be harmful in contact with skin.
- **Molybdenum and molybdenum oxides:** Molybdenum causes skin and eye irritation. Molybdenum oxide is toxic if swallowed, and causes eye irritation.
- **Tin:** Not Reported/ Not Classified
- **Chromium, chromium oxides and hexavalent chrome:** Hexavalent chrome causes damage to gastrointestinal tract, lung, severe skin burns and eye damage, serious eye damage, skin contact may cause an allergic skin reaction. Inhalation may cause allergic or asthmatic symptoms or breathing difficulties.
- **Zirconium and zirconium oxides:** Zirconium *per se* has not been shown an irritant to skin and eyes but metal dust in eyes may result in a mechanical irritation. While no adverse toxicology has been reported at this time, respiration and eye contact of these dusts should be minimized by appropriate workplace measures.

Delayed (chronic) Effects by component:

- **Titanium and titanium oxides:** Titanium Oxide accumulates in the lungs – and over time mostly in alveoli and macrophages. Exposure by inhalation route should be reduced to lowest levels to reduce accumulation in lungs. This accumulation is apparently responsible for carcinogenesis in rats only (no such response in mouse or hamster).
- **Aluminum and aluminum oxides:** Considered to be an inert or nuisance dust.
- **Vanadium and Vanadium Pentoxide:** Vanadium is considered non-toxic. Excessive long term or repeated exposures to vanadium compounds, especially vanadium pentoxide, may result in chronic pulmonary changes such as emphysema or bronchitis. Vanadium pentoxide is suspected of damaging fertility or the unborn child. Vanadium pentoxide is fatal if swallowed or inhaled. It causes damage to lungs by single, repeated or prolonged exposure.
- **Molybdenum and molybdenum oxides:** Certain handling operations, such as burning and welding, may generate both insoluble molybdenum compounds (metal and molybdenum dioxide) and soluble molybdenum compounds (molybdenum trioxide). Molybdenum compounds generally exhibit a low order of toxicity with the trioxide the more toxic. However, some reports indicate that the dust of the molybdenum metal, molybdenum dioxide and molybdenum trioxide may cause eye, skin, nose and throat irritation in animals. Also, has been reported to cause induction of tumors in experimental animals, suspected of causing cancer. Molybdenum oxide is suspected of causing cancer in humans.
- **TIN:** No systemic effects have been reported from industrial exposure to tin. Occupational exposures to tin can cause a benign pneumoconiosis termed 'stannosis'. No cases of massive fibrosis from over-exposure to tin have been reported.

Section 11 - Toxicological Information (continued)

Delayed (chronic) Effects by component (continued):

- **Chromium, chromium oxides and hexavalent chromium:** The health hazards associated with exposure to chromium are dependent upon its oxidation state. The metal form (chromium as it exists in this product) is of very low toxicity. The hexavalent form is very toxic. Repeated or prolonged exposure to hexavalent chromium compounds may cause respiratory irritation, nosebleed, ulceration and perforation of the nasal septum. Industrial exposure to certain forms of hexavalent chromium has been related to an increased incidence of cancer. NTP (The National Toxicology Program) Fourth Annual report on Carcinogens cites "certain Chromium compounds" as human carcinogens. ACGIH has reviewed the toxicity data and concluded that chromium metal is not classifiable as a human carcinogen. Hexavalent chromium may cause genetic defects and is suspected of damaging the unborn child. Developmental toxicity in the mouse, suspected of damaging fertility or the unborn child.
- **Zirconium and zirconium oxides:** Zirconium metal dusts will accumulate in lungs on repeated dosing.

Section 12 - Ecological Information

12(a) Ecotoxicity (aquatic & terrestrial): No Data Available for **Titanium Scrap**. However, individual components of the product when processed have been found to be toxic to the environment. Metal dusts may migrate into soil and groundwater and be ingested by wildlife.

12(b) Persistence & Degradability: No Data Available

12(c) Bioaccumulative Potential: No Data Available

12(d) Mobility (in soil): No data available for **Titanium Scrap**. However, individual components of the product have been found to be absorbed by plants from soil.

12(e) Other adverse effects: None Known

Additional Information:

Hazard Category: Not Reported **Signal Word:** No Signal Word

Hazard Symbol: No Symbol

Hazard Statement: No Statement

Section 13 - Disposal Considerations

Disposal: Steel scrap should be recycled whenever possible. Product dusts 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.

Container Cleaning and Disposal: Follow applicable federal, state and local regulations. Observe safe handling precautions. European Waste Catalogue (EWC): 12-01-99 (wastes not otherwise specified), 16-03-04 (off specification batches and unused products), or 15-01-04 (metallic packaging).

Please note this information is for Titanium Scrap in its original form. Any alterations can void this information.

Section 14 - Transport Information

14 (a-g) Transportation Information:

US Department of Transportation (DOT) under 49 CFR 172.101 **does not** regulate **Titanium Scrap** 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: Not Applicable (NA) **Shipping Symbols:** NA **Hazard Class:** NA **UN No.:** NA **Packing Group:** NA **DOT/ IMO Label:** NA **Special Provisions (172.102):** NA	**Packaging Authorizations** **a) Exceptions:** NA **b) Group:** NA **c) Authorization:** NA	**Quantity Limitations** **a) Passenger, Aircraft, or Railcar:** NA **b) Cargo Aircraft Only:** NA **Vessel Stowage Requirements** **a) Vessel Stowage:** NA **b) Other:** NA **DOT Reportable Quantities**: NA

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 DOT Hazardous Materials Regulation.

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

Shipping Name: Not Applicable (NA) **Classification Code:** NA **UN No.:** NA **Packing Group:** NA **ADR Label:** NA **Special Provisions:** NA **Limited Quantities:** NA	**Packaging** **a) Packing Instructions:** NA **b) Special Packing Provisions:** NA **c) Mixed Packing Provisions:** NA	**Portable Tanks & Bulk Containers** **a) Instructions:** NA **b) Special Provisions:** NA

Section 14 - Transport Information (continued)

International Air Transport Association (IATA) does not regulate **Titanium Scrap** as a hazardous material.

	Passenger & Cargo Aircraft		Cargo Aircraft Only	Special Provisions:
Shipping Name: Not Applicable (NA) **Class/Division:** NA **Hazard Label (s):** NA **UN No.:** NA **Packing Group:** NA **Excepted Quantities (EQ):** NA	**Limited Quantity (EQ)**		**Pkg Inst:** NA **Max Net Qty/Pkg:** NA	NA **ERG Code:** NA
	Pkg Inst: NA **Max Net Qty/Pkg:** NA	**Pkg Inst:** NA **Max Net Qty/Pkg:** NA		

Pkg Inst – Packing Instructions Max Net Qty/Pkg – Maximum Net Quantity per Package ERG – Emergency Response Drill Code

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

Section 15 - Regulatory Information

Regulatory Information: *The following listing of regulations relating to a OmniSource Corporation may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.*

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

OSHA Regulations: Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-2, Z-3): The product, **Titanium Scrap** as a mixture is not listed. However, individual components of the product are listed: Refer to Section 8, Exposure Controls and Personal Protection.

EPA Regulations: The product, **Titanium Scrap** is not listed as a mixture. However, individual components of the product are listed:

Components	Regulations
Iron	SDWA
Chromium	CERCLA, SARA 313
Nickel	CERCLA, CWA, SARA 313, TSCA
Zinc	CERCLA, CWA, SARA 313, TSCA
Manganese	SARA 313, TSCA
Aluminum	SARA 313, TSCA, SDWA
Copper	CERCLA, CWA, SARA 313, TSCA, SDWA
Lead	CERCLA, CWA, SARA 313, TSCA SDWA

SARA 311/312 Potential Hazard Categories: Immediate Acute Health Hazard; Delayed Chronic Health Hazard

Section 313 Supplier Notification: The product, **Titanium Scrap** contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-to-Know Act and 40 CFR part 372:

CAS #	Chemical Name	Percent by Weight
7440-47-3	Chromium	12 max
7440-02-0	Nickel	10 max
7440-66-6	Zinc	10 max
7439-96-5	Manganese	2 max
7429-90-5	Aluminum	1.8 max
7440-50-8	Copper	0.7 max
7439-92-1	Lead	0.35 max

Regulations Key:

CAA	Clean Air Act (42 USC Sec. 7412; 40 CFR Part 61 [As of: 8/18/06])
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (42 USC Secs. 9601(14), 9603(a); 40 CFR Sec. 302.4, Table 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 8/2/06])
RCRA	Resource Conservation Recovery Act (42 USC Sec. 6921; 40 CFR Part 261 App VIII)
SARA	Superfund Amendments and Reauthorization Act of 1986 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 6/30/05])
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])

State Regulations: The product, **Titanium Scrap** as a mixture is not listed in any state regulations. However, individual components of the product are listed in various state regulations:

Pennsylvania Right to Know: Contains regulated material in the following categories:

- Hazardous Substances: Tungsten, Chromium, Nickel, Zinc, Silicon, Manganese, Aluminum, Molybdenum, Copper, Lead
- Environmental Hazards: Chromium, Nickel, Zinc, Manganese, Aluminum, Copper, Lead
- Special Hazardous Substance: Chromium, Nickel

California Prop 65 **WARNING:** This product can expose you to chemicals including lead and lead compounds, which is known to the State of California to cause cancer, and lead, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Section 15 - Regulatory Information (continued)

State Regulations (continued):

New Jersey: Contains regulated material in the following categories:

- Hazardous Substance: Tungsten, Chromium, Nickel, Zinc, Silicon, Manganese, Aluminum (dust or fume), Boron, Molybdenum, Copper, Lead
- Environmental Hazard: Chromium, Nickel, Zinc, Manganese, Copper, Lead
- Special Hazardous Substance: Tungsten, Chromium, Silicon, Manganese, Aluminum (dust or fume), Lead

Minnesota: Chromium, Nickel, Zinc, Manganese, Boron, Lead

Massachusetts: Chromium, Nickel (compounds) Zinc, Silicon, Manganese (compounds), Aluminum (dust and fume), Molybdenum, Copper (compounds), Lead

Other Regulations:

WHMIS Classification (Canadian): The product, **Titanium Scrap** is not listed as a mixture. However individual components are listed.

Ingredients	WHMIS Classification
Chromium	Combustible dusts
Nickel	Skin sensitization – Category 1; Carcinogenicity – Category 2; Specific target organ toxicity – repeated exposure - Category 1
Silicon	Flammable solids - Category 2, Combustible dusts
Manganese	Reproductive toxicity - Category 2; Specific target organ toxicity - repeated exposure - Category 1; Combustible dusts
Lead	Carcinogenicity - Category 2; Reproductive toxicity - Category 1; Toxic to the reproductive function Toxic to the development Specific target organ toxicity - repeated exposure - Category 1

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.

Section 16 - Other Information

Prepared By: OmniSource Corporation

Revision History:

06/13/2018 - update to comply w/ OSHA 2012 GHS & Canada WHMIS 2015 GHS
03/21/2013 – ANSI format to OSHA GHS
11/11/7011 – regulatory update
1/26/2010 – regulatory update

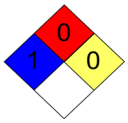
Expiration Date: 06/13/2021
8/07/2008 – regulatory update
10/06/2005 – regulatory update
7/19/2002 – regulatory update
7/08/1998 – Original

Hazardous Material Identification System (HMIS) Classification

Health Hazard	1
Fire Hazard	0
Physical Hazard	0

HEALTH= **1**, Denotes possible chronic hazard if airborne dusts or fumes are generated Irritation or minor reversible injury possible.
FIRE= **0**, Materials that will not burn.
PHYSICAL HAZARD= **0**, Materials that are normally stable, even under fire conditions, and will not react with water, polymerize, decompose, condense, or self-react. Non-explosives.

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.

ABBREVIATIONS/ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	**NIF**	No Information Found
BEIs	Biological Exposure Indices	**NIOSH**	National Institute for Occupational Safety and Health
CAS	Chemical Abstracts Service	**NTP**	National Toxicology Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	**ORC**	Organization Resources Counselors
CFR	Code of Federal Regulations	**OSHA**	Occupational Safety and Health Administration
CNS	Central Nervous System	**PEL**	Permissible Exposure Limit
GI, GIT	Gastro-Intestinal, Gastro-Intestinal Tract	**PNOR**	Particulate Not Otherwise Regulated
HMIS	Hazardous Materials Identification System	**PNOC**	Particulate Not Otherwise Classified
IARC	International Agency for Research on Cancer	**PPE**	Personal Protective Equipment
LC50	Median Lethal Concentration	**ppm**	parts per million
LD50	Median Lethal Dose	**RCRA**	Resource Conservation and Recovery Act
LD $_{Lo}$	Lowest Dose to have killed animals or humans	**RTECS**	Registry of Toxic Effects of Chemical Substances
LEL	Lower Explosive Limit	**SARA**	Superfund Amendment and Reauthorization Act

LOEL	Lowest Observed Effect Level		**SCBA**	Self-contained Breathing Apparatus
LOAEC	Lowest Observable Adverse Effect Concentration		**SDS**	Safety Data Sheet

Section 16 - Other Information (continued)

ABBREVIATIONS/ACRONYMS (continued):

µg/m^3	microgram per cubic meter of air		**STEL**	Short-term Exposure Limit
mg/m^3	milligram per cubic meter of air		**TLV**	Threshold Limit Value
mppcf	million particles per cubic foot		**TWA**	Time-weighted Average
MSHA	Mine Safety and Health Administration		**UEL**	Upper Explosive Limit
NFPA	National Fire Protection Association			

Disclaimer: This information is taken from sources or based upon data believed to be reliable. However, OmniSource, Inc. makes no warranty as to the absolute correctness or sufficiency of any of the foregoing or that additional or other measures may not be required under particular conditions.