

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Date of Issue: 08/15/2023

Version: 1.0

SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Mixture

Product Name: Titanium and Titanium Alloys

Synonyms: Alloy #200; Alloy #900; Alloy #STAGCG57; Alloy #342; Alloy #2SA

1.2. Intended Use of the Product

Use Of The Substance/Mixture: No use is specified.

1.3. Name, Address, and Telephone of the Responsible Party

Distributor

ThyssenKrupp Materials NA, Inc.

22355 W. Eleven Mile Road

Southfield, Michigan 48034

+1 248-233-5681

1.4. Emergency Telephone Number

Emergency Number : 248-233-5681

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the Substance or Mixture

GHS-CA Classification

Not classified

2.2. Label Elements

GHS-CA Labeling

No labeling applicable according to the Hazardous Products Regulations (HPR) SOR/2015-17.

2.3. Other Hazards

This product is physiologically inert in its massive form. However, user-generated dust and/or fumes may pose a physiological hazard if inhaled or ingested. Avoid inhalation of metal dusts and fumes. May cause an influenza-like illness. Avoid skin and eye contact with dusts to prevent mechanical irritation. User-generated dust is easily ignited and difficult to extinguish. Exposure may aggravate pre-existing eye, skin, or respiratory conditions.

2.4. Unknown Acute Toxicity (GHS-CA)

No additional information available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substance

Not applicable

3.2. Mixture

Name	Synonyms	Product Identifier	% *	GHS Ingredient Classification
Titanium	Titanium powder, dry / Titanium powder / Titanium powder, wetted / Titanium sponge powders / titanium	(CAS-No.) 7440-32-6	30 – 99	Flam. Sol. 1, H228 Comb. Dust
Vanadium	Ammonium trioxovanadate / vanadium / Vanadium metal / Vanadium, elemental	(CAS-No.) 7440-62-2	0 – 13	Comb. Dust
Molybdenum	Molybdenum, metallic / molybdenum / Molybdenum, metal / Molybdenum, elemental / Molybdenum metal	(CAS-No.) 7439-98-7	0 – 11.5	Comb. Dust
Chromium	Chromium metal / Chromium, elemental / Chromium, metal / Chromium, metallic / Chrome, metal / Chrome	(CAS-No.) 7440-47-3	0 – 11	Comb. Dust
Aluminum	Aluminium / Aluminium metal / Aluminium, metal / Aluminum metal / Aluminum, elemental / Aluminum, metal / C.I. 77000 / CI 77000 / Aluminium powder (stabilised) / Aluminium powder (stabilized) / Aluminium powder / Pigment Metal 1 / Aluminum powder / Aluminium metal, powder / aluminum	(CAS-No.) 7429-90-5	0 – 8	Flam. Sol. 1, H228 Water-react. 2, H261 Comb. Dust
Zirconium	Zirconium, elemental / Zirconium metal / Zirconium powder (pyrophoric) / Zirconium suspended in a flammable liquid / Zirconium powder, dry / Zirconium metallic	(CAS-No.) 7440-67-7	0 – 6	Flam. Sol. 1, H228 Comb. Dust

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Tin	Tin metal / Tin, elemental / Tin, metal / TIN / tin / Organometallic tin	(CAS-No.) 7440-31-5	0 – 4.5	Comb. Dust
Iron	Iron, elemental / Direct reduced Iron / Iron, reduced / Elemental iron / IRON POWDER / iron	(CAS-No.) 7439-89-6	0 – 2	Flam. Sol. 1, H228 Self-heat. 1, H251 Comb. Dust
Niobium	niobium	(CAS-No.) 7440-03-1	0 – 2	Comb. Dust Flam. Sol. 1, H228
Tantalum	Tantalum metal / Tantalum, elemental / Tantalum, metal / tantalum	(CAS-No.) 7440-25-7	0 – 1	Flam. Sol. 1, H228 Comb. Dust
Nickel	Nickel metal / Nickel, elemental / Nickel, metallic / Nickel, metal / C.I. 77775	(CAS-No.) 7440-02-0	0 – 0.8	Skin Sens. 1, H317 Carc. 2, H351 STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 3, H412 Comb. Dust

Full text of H- and EUH-statements: see section 16

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

SECTION 4: FIRST AID MEASURES

4.1. Description of First-aid Measures

General: Never give anything by mouth to an unconscious person. If medical advice is needed, have product container or label at hand. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

Skin Contact: *Normal handling:* Remove contaminated clothing. Drench affected area with water for at least 5 minutes. Obtain medical attention if irritation develops or persists. *In molten form:* Cool skin rapidly with cold water after contact with molten product. Removal of solidified molten material from skin requires medical assistance.

Eye Contact: *Contact with solid product or product dusts:* Immediately rinse with water for a prolonged period (at least 15 minutes) while holding the eyelids wide open. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists. Removal of solidified molten material from the eyes requires medical assistance.

Ingestion: Rinse mouth. Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting.

4.2. Most Important Symptoms and Effects Both Acute and Delayed

General: Risk of thermal burns on contact with molten product. Prolonged contact with large amounts of dust may cause mechanical irritation. This product contains nickel. Exposure to small chips, fine turnings, and dust from processing may cause cancer.

Inhalation: During processing, the most significant route of exposure is by the inhalation (breathing) of fumes. If fumes are inhaled, they can cause a condition commonly known as metal fume fever with symptoms which resemble influenza; Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur.

Skin Contact: Direct contact may cause irritation by mechanical abrasion. Contact with hot, molten metal will cause thermal burns.

Eye Contact: During metal processing. Dusts caused from milling and physical alteration will likely cause eye irritation. Fumes from thermal decomposition or molten material will likely be irritating to the eyes. Mechanical damage via flying particles and chipped slag is possible.

Ingestion: Ingestion may cause adverse effects.

Chronic Symptoms: None expected when handled in massive form. *In dust and/or fume form:* Vanadium: May cause gastrointestinal discomfort, renal damage, nervous system depression and irritation of the respiratory passages. May also cause cardiac palpitations and asthma. Molybdenum: Chronic exposure to molybdenum compounds is suspected of causing cancer. Compounds are also known to cause irritation to the skin, eyes, and respiratory tract. Chromium: Certain hexavalent chromium compounds have been demonstrated to be carcinogenic on the basis of epidemiological investigations on workers and experimental studies in animals. Increased incidences of respiratory cancer have been found in chromium (VI) workers. There is an increased incidence of lung cancer

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

in industrial workers exposed to chromium (VI) compounds. Please refer to IARC volume 23 for a more detailed discussion. Aluminum: Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Tin: Has been shown to increase incidence of sarcoma in animal tests. Chronic exposure to tin dusts and fume may result in "stannosis", a mild form of pneumoconiosis. Repeated inhalation of iron oxide dust can cause siderosis a benign condition. Tantalum: Repeated exposure to tantalum alloys may cause fibrosis, chronic rhinitis and "hard metal pneumoconiosis". Inhalation of Nickel compounds has been shown in studies to provide an increased incidence of cancer of the nasal cavity, lung and possibly larynx in nickel refinery workers.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

If you feel unwell, seek medical advice (show the label where possible). If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

5.1. Extinguishing Media

Suitable Extinguishing Media: Use Class D extinguishing agents on dusts, fines or molten metal. Use coarse water spray on chips and turnings.

Unsuitable Extinguishing Media: Do not use water when molten material is involved, as it may react violently or explosively on contact with water. Use of Halons may result in the product of toxic gases.

5.2. Special Hazards Arising From the Substance or Mixture

Fire Hazard: Dust, chips, or ribbons can be ignited more easily, by an ignition source, by improper machining, or by spontaneous combustion if finely divided and damp. Not considered flammable but may burn at high temperatures.

Explosion Hazard: Product itself is not explosive but if dust is generated, dust clouds suspended in air can be explosive.

Reactivity: Stable at ambient temperature and under normal conditions of use.

5.3. Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire. Under fire conditions, hazardous fumes will be present.

Firefighting Instructions: Do not breathe fumes from fires or vapours from decomposition. Use water spray or fog for cooling exposed containers.

Protection During Firefighting: Firefighters must use full bunker gear including NIOSH-approved positive-pressure self-contained breathing apparatus to protect against potential hazardous combustion and decomposition products. Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Metallic oxides.

Other Information: No additional information available.

5.4. Reference to Other Sections

Refer to Section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Where possible allow molten material to solidify naturally. Avoid breathing dust, fumes.

6.1.1. For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protective equipment (PPE).

Emergency Procedures: Avoid creating or spreading dust. Evacuate unnecessary personnel.

6.1.2. For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection. Wear suitable protective clothing, gloves and eye/face protection.

Emergency Procedures: Eliminate ignition sources. Evacuate unnecessary personnel, isolate, and ventilate area. Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit.

6.2. Environmental Precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and Materials for Containment and Cleaning Up

For Containment: Contain and collect as any solid. Avoid generation of dust during clean-up of spills. If metal is in molten form allow to cool and collect as a solid. If metal is in solid form collect for re-melting purposes. Contain solid spills with appropriate barriers and prevent migration and entry into sewers or streams.

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Methods for Cleaning Up: Clean up spills immediately and dispose of waste safely. *In molten form:* Cool molten material to limit spreading. *For dust spills:* Clean up immediately by sweeping or vacuum. Use explosion proof vacuum during cleanup, with appropriate filter. Contact competent authorities after a large spill.

6.4. Reference to Other Sections

See Section 8 for Exposure Controls and Personal Protection and Section 13 for Disposal Considerations. See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Additional Hazards When Processed: Product dust is combustible. Use care during processing to minimize generation of dust.

Precautions for Safe Handling: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Avoid prolonged contact with eyes, skin and clothing. Avoid breathing dust.

Hygiene Measures: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Do not eat, drink or smoke when using this product. Wash hands and forearms thoroughly after handling. Always wash your hands immediately after handling this product, and once again before leaving the workplace. Handle in accordance with good industrial hygiene and safety procedures.

7.2. Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations.

Storage Conditions: Store in original container. Store in dry protected location to prevent any moisture contact. Keep away from heat and flame. Keep container closed when not in use. Store in a dry, cool place. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Alkalis. Corrosive substances in contact with metals may produce flammable hydrogen gas. When molten: water. Strong acids, strong bases, strong oxidizers.

Special Rules on Packaging: Store in a closed container.

7.3. Specific End Use(s)

No use is specified.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control Parameters

For substances listed in section 3 that are not listed here, there are no established exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), or Canadian provincial governments.

Vanadium (7440-62-2)		
USA OSHA	OSHA PEL (Ceiling)	0.5 mg/m ³ (respirable dust) 0.1 mg/m ³ (fume)
USA NIOSH	NIOSH REL (TWA)	1 mg/m ³ (Ferrovanadium dust)
USA NIOSH	NIOSH REL (STEL)	3 mg/m ³ (Ferrovanadium dust)

Molybdenum (7439-98-7)		
	Internal OEL Value(s)	5 mg/m ³ (Molybdenum (as Mo), Soluble Compounds)
USA ACGIH	ACGIH OEL TWA	10 mg/m ³ (inhalable particulate matter) 3 mg/m ³ (respirable particulate matter)
USA OSHA	OSHA PEL (TWA) [1]	5 mg/m ³ (Molybdenum (as Mo), Soluble Compounds) 15 mg/m ³ (Molybdenum (as Mo), Insoluble Compounds (Total dust))
USA NIOSH	NIOSH REL (TWA)	5 mg/m ³ (Molybdenum (as Mo), Soluble Compounds)
USA IDLH	IDLH	5000 mg/m ³
Alberta	OEL TWA	10 mg/m ³ (total) 3 mg/m ³ (respirable)
British Columbia	OEL TWA	3 mg/m ³ (respirable) 10 mg/m ³ (inhalable)
Manitoba	OEL TWA	10 mg/m ³ (inhalable particulate matter) 3 mg/m ³ (respirable particulate matter)
Newfoundland & Labrador	OEL TWA	10 mg/m ³ (inhalable particulate matter) 3 mg/m ³ (respirable particulate matter)
Nova Scotia	OEL TWA	10 mg/m ³ (inhalable particulate matter) 3 mg/m ³ (respirable particulate matter)

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Nunavut	OEL STEL	20 mg/m ³ (metal-inhalable fraction) 6 mg/m ³ (metal-respirable fraction)
Nunavut	OEL TWA	10 mg/m ³ (metal-inhalable fraction) 3 mg/m ³ (metal-respirable fraction)
Northwest Territories	OEL STEL	20 mg/m ³ (metal-inhalable fraction) 6 mg/m ³ (metal-respirable fraction)
Northwest Territories	OEL TWA	10 mg/m ³ (metal-inhalable fraction) 3 mg/m ³ (metal-respirable fraction)
Ontario	OEL TWA	10 mg/m ³ (metal-inhalable particulate matter) 3 mg/m ³ (metal-respirable particulate matter)
Prince Edward Island	OEL TWA	10 mg/m ³ (inhalable particulate matter) 3 mg/m ³ (respirable particulate matter)
Québec	VEMP (OEL TWA)	10 mg/m ³ (inhalable dust) 3 mg/m ³ (respirable dust)
Saskatchewan	OEL STEL	20 mg/m ³ (inhalable fraction) 6 mg/m ³ (respirable fraction)
Saskatchewan	OEL TWA	10 mg/m ³ (inhalable fraction) 3 mg/m ³ (respirable fraction)
Chromium (7440-47-3)		
USA ACGIH	ACGIH OEL TWA	0.5 mg/m ³ (inhalable particulate matter)
USA ACGIH	BEI (BLV)	0.7 µg/l Parameter: Total chromium - Medium: urine - Sampling time: end of shift at end of workweek (population based)
USA OSHA	OSHA PEL (TWA) [1]	1 mg/m ³
USA NIOSH	NIOSH REL (TWA)	0.5 mg/m ³
USA IDLH	IDLH	250 mg/m ³
Alberta	OEL TWA	0.5 mg/m ³
British Columbia	OEL TWA	0.5 mg/m ³ (total)
Manitoba	OEL TWA	0.5 mg/m ³ (inhalable particulate matter)
New Brunswick	OEL TWA	0.5 mg/m ³
Newfoundland & Labrador	OEL TWA	0.5 mg/m ³ (inhalable particulate matter)
Nova Scotia	OEL TWA	0.5 mg/m ³ (inhalable particulate matter)
Nunavut	OEL STEL	1.5 mg/m ³ (metal)
Nunavut	OEL TWA	0.5 mg/m ³ (metal)
Northwest Territories	OEL STEL	1.5 mg/m ³ (metal)
Northwest Territories	OEL TWA	0.5 mg/m ³ (metal)
Ontario	OEL TWA	0.5 mg/m ³
Prince Edward Island	OEL TWA	0.5 mg/m ³ (inhalable particulate matter)
Québec	VEMP (OEL TWA)	0.5 mg/m ³
Saskatchewan	OEL STEL	1.5 mg/m ³
Saskatchewan	OEL TWA	0.5 mg/m ³
Yukon	OEL STEL	3 mg/m ³
Yukon	OEL TWA	0.1 mg/m ³
Aluminum (7429-90-5)		
USA ACGIH	ACGIH OEL TWA	1 mg/m ³ (respirable particulate matter)
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA) [1]	15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)
USA NIOSH	NIOSH REL (TWA)	10 mg/m ³ (total dust) 5 mg/m ³ (respirable dust)
Alberta	OEL TWA	10 mg/m ³ (dust)
British Columbia	OEL TWA	1 mg/m ³ (respirable)
Manitoba	OEL TWA	1 mg/m ³ (respirable particulate matter)
New Brunswick	OEL TWA	10 mg/m ³ (metal dust)
Newfoundland & Labrador	OEL TWA	1 mg/m ³ (respirable particulate matter)
Nova Scotia	OEL TWA	1 mg/m ³ (respirable particulate matter)
Nunavut	OEL STEL	20 mg/m ³ (metal-dust)
Nunavut	OEL TWA	10 mg/m ³ (metal-dust)

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Northwest Territories	OEL STEL	20 mg/m ³ (metal-dust)
Northwest Territories	OEL TWA	10 mg/m ³ (metal-dust)
Ontario	OEL TWA	1 mg/m ³ (respirable particulate matter)
Prince Edward Island	OEL TWA	1 mg/m ³ (respirable particulate matter)
Québec	VEMP (OEL TWA)	10 mg/m ³
Saskatchewan	OEL STEL	20 mg/m ³ (dust)
Saskatchewan	OEL TWA	10 mg/m ³ (dust)
Zirconium (7440-67-7)		
USA ACGIH	ACGIH OEL TWA	5 mg/m ³
USA ACGIH	ACGIH OEL STEL	10 mg/m ³
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA NIOSH	NIOSH REL (TWA)	5 mg/m ³
USA NIOSH	NIOSH REL (STEL)	10 mg/m ³
USA IDLH	IDLH	50 mg/m ³
Alberta	OEL STEL	10 mg/m ³
Alberta	OEL TWA	5 mg/m ³
British Columbia	OEL STEL	10 mg/m ³
British Columbia	OEL TWA	5 mg/m ³
Manitoba	OEL STEL	10 mg/m ³
Manitoba	OEL TWA	5 mg/m ³
New Brunswick	OEL STEL	10 mg/m ³
New Brunswick	OEL TWA	5 mg/m ³
Newfoundland & Labrador	OEL STEL	10 mg/m ³
Newfoundland & Labrador	OEL TWA	5 mg/m ³
Nova Scotia	OEL STEL	10 mg/m ³
Nova Scotia	OEL TWA	5 mg/m ³
Nunavut	OEL STEL	10 mg/m ³
Nunavut	OEL TWA	5 mg/m ³
Northwest Territories	OEL STEL	10 mg/m ³
Northwest Territories	OEL TWA	5 mg/m ³
Ontario	OEL STEL	10 mg/m ³
Ontario	OEL TWA	5 mg/m ³
Prince Edward Island	OEL STEL	10 mg/m ³
Prince Edward Island	OEL TWA	5 mg/m ³
Québec	VECD (OEL STEL)	10 mg/m ³
Québec	VEMP (OEL TWA)	5 mg/m ³
Saskatchewan	OEL STEL	10 mg/m ³
Saskatchewan	OEL TWA	5 mg/m ³
Tin (7440-31-5)		
USA ACGIH	ACGIH OEL TWA	2 mg/m ³ (inhalable particulate matter)
USA NIOSH	NIOSH REL (TWA)	2 mg/m ³
USA IDLH	IDLH	100 mg/m ³
Alberta	OEL TWA	2 mg/m ³
British Columbia	OEL TWA	2 mg/m ³
Manitoba	OEL TWA	2 mg/m ³ (inhalable particulate matter)
New Brunswick	OEL TWA	2 mg/m ³
Newfoundland & Labrador	OEL TWA	2 mg/m ³ (inhalable particulate matter)
Nova Scotia	OEL TWA	2 mg/m ³ (inhalable particulate matter)
Nunavut	OEL STEL	4 mg/m ³ (metal)
Nunavut	OEL TWA	2 mg/m ³ (metal)
Northwest Territories	OEL STEL	4 mg/m ³ (metal)
Northwest Territories	OEL TWA	2 mg/m ³ (metal)
Ontario	OEL TWA	2 mg/m ³
Prince Edward Island	OEL TWA	2 mg/m ³ (inhalable particulate matter)
Québec	VEMP (OEL TWA)	2 mg/m ³
Saskatchewan	OEL STEL	4 mg/m ³

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Saskatchewan	OEL TWA	2 mg/m ³
Tantalum (7440-25-7)		
USA OSHA	OSHA PEL (TWA) [1]	5 mg/m ³
USA NIOSH	NIOSH REL (TWA)	5 mg/m ³ (dust)
USA NIOSH	NIOSH REL (STEL)	10 mg/m ³ (dust)
USA IDLH	IDLH	2500 mg/m ³ (dust)
Alberta	OEL TWA	5 mg/m ³ (dust)
British Columbia	OEL TWA	5 mg/m ³
New Brunswick	OEL TWA	5 mg/m ³ (dust)
Nunavut	OEL STEL	10 mg/m ³ (metal)
Nunavut	OEL TWA	5 mg/m ³ (metal)
Northwest Territories	OEL STEL	10 mg/m ³ (metal)
Northwest Territories	OEL TWA	5 mg/m ³ (metal)
Québec	VEMP (OEL TWA)	5 mg/m ³ (dust)
Saskatchewan	OEL STEL	10 mg/m ³
Saskatchewan	OEL TWA	5 mg/m ³
Yukon	OEL STEL	10 mg/m ³
Yukon	OEL TWA	5 mg/m ³
Nickel (7440-02-0)		
USA ACGIH	ACGIH OEL TWA	1.5 mg/m ³ (inhalable particulate matter)
USA ACGIH	ACGIH chemical category	Not Suspected as a Human Carcinogen
USA ACGIH	BEI (BLV)	5 µg/l Parameter: Nickel - Medium: urine - Sampling time: post-shift at end of workweek (background)
USA OSHA	OSHA PEL (TWA) [1]	1 mg/m ³
USA NIOSH	NIOSH REL (TWA)	0.015 mg/m ³
USA IDLH	IDLH	10 mg/m ³
Alberta	OEL TWA	1.5 mg/m ³
British Columbia	OEL TWA	0.05 mg/m ³
Manitoba	OEL TWA	1.5 mg/m ³ (inhalable particulate matter)
New Brunswick	OEL TWA	1 mg/m ³
Newfoundland & Labrador	OEL TWA	1.5 mg/m ³ (inhalable particulate matter)
Nova Scotia	OEL TWA	1.5 mg/m ³ (inhalable particulate matter)
Nunavut	OEL STEL	3 mg/m ³ (inhalable fraction)
Nunavut	OEL TWA	1.5 mg/m ³ (inhalable fraction)
Northwest Territories	OEL STEL	3 mg/m ³ (inhalable fraction)
Northwest Territories	OEL TWA	1.5 mg/m ³ (inhalable fraction)
Ontario	OEL TWA	1 mg/m ³ (inhalable fraction)
Prince Edward Island	OEL TWA	1.5 mg/m ³ (inhalable particulate matter)
Québec	VEMP (OEL TWA)	1.5 mg/m ³ (inhalable dust)
Saskatchewan	OEL STEL	3 mg/m ³ (inhalable fraction)
Saskatchewan	OEL TWA	1.5 mg/m ³ (inhalable fraction)
Yukon	OEL STEL	3 mg/m ³
Yukon	OEL TWA	1 mg/m ³

8.2. Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Avoid dust production. Avoid creating or spreading dust. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e, there is no leakage from the equipment). Ensure all national/local regulations are observed.

Personal Protective Equipment: Safety glasses. Gloves. Insufficient ventilation: wear respiratory protection. Protective clothing. Protective goggles.



Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Materials for Protective Clothing: Chemically and mechanically resistant materials and fabrics. With molten material wear thermally protective clothing.

Hand Protection: Wear chemically and mechanically resistant protective gloves. If material is hot, wear thermally resistant protective gloves. Wear protective gloves.

Eye and Face Protection: Chemical goggles or face shield.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Thermal Hazard Protection: If material is hot, wear thermally resistant protective gloves.

Environmental Exposure Controls: Do not allow the product to be released into the environment.

Consumer Exposure Controls: Not applicable

Other Information: When using, do not eat, drink or smoke.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on Basic Physical and Chemical Properties

Physical State	: Solid
Appearance	: Metallic
Odor	: Odorless
Odor Threshold	: Not applicable
pH	: No data available
Evaporation Rate	: No data available
Melting Point	: 1537.8 – 1671.1 °C (2800.04 – 3039.98 °F)
Freezing Point	: No data available
Boiling Point	: No data available
Flash Point	: Not applicable
Auto-ignition Temperature	: No data available
Decomposition Temperature	: No data available
Flammability (solid, gas)	: No data available
Lower Flammable Limit	: No data available
Upper Flammable Limit	: No data available
Vapor Pressure	: No data available
Relative Vapor Density at 20°C	: No data available
Relative Density	: No data available
Specific Gravity	: 4.5 (Water = 1)
Solubility	: Insoluble in water.
Partition Coefficient: N-Octanol/Water	: No data available
Viscosity	: No data available

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity:

Stable at ambient temperature and under normal conditions of use.

10.2. Chemical Stability:

Stable under recommended handling and storage conditions (see section 7).

10.3. Possibility of Hazardous Reactions:

Hazardous polymerization will not occur.

10.4. Conditions to Avoid:

Incompatible materials. Direct sunlight, extremely high or low temperatures, and incompatible materials.

10.5. Incompatible Materials:

Strong acids, strong bases, strong oxidizers. Corrosive substances in contact with metals may produce flammable hydrogen gas. When molten: water.

10.6. Hazardous Decomposition Products:

None expected under normal conditions of use.

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on Toxicological Effects - Product

Acute Toxicity (Oral): Not classified

Acute Toxicity (Dermal): Not classified

Acute Toxicity (Inhalation): Not classified

LD50 and LC50 Data:

No additional information available

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Not classified.

Respiratory or Skin Sensitization: Not classified. Not classified.

Germ Cell Mutagenicity: Not classified

Carcinogenicity: Not classified.

Specific Target Organ Toxicity (Repeated Exposure): Not classified.

Reproductive Toxicity: Not classified.

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: During processing, the most significant route of exposure is by the inhalation (breathing) of fumes. If fumes are inhaled, they can cause a condition commonly known as metal fume fever with symptoms which resemble influenza; Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur.

Symptoms/Injuries After Skin Contact: Direct contact may cause irritation by mechanical abrasion. Contact with hot, molten metal will cause thermal burns.

Symptoms/Injuries After Eye Contact: *During metal processing:* Dusts caused from milling and physical alteration will likely cause eye irritation. Fumes from thermal decomposition or molten material will likely be irritating to the eyes. Mechanical damage via flying particles and chipped slag is possible.

Symptoms/Injuries After Ingestion: Ingestion may cause adverse effects.

Chronic Symptoms: None expected when handled in massive form. *In dust and/or fume form:* Vanadium: May cause gastrointestinal discomfort, renal damage, nervous system depression and irritation of the respiratory passages. May also cause cardiac palpitations and asthma. Molybdenum: Chronic exposure to molybdenum compounds is suspected of causing cancer. Compounds are also known to cause irritation to the skin, eyes, and respiratory tract. Chromium: Certain hexavalent chromium compounds have been demonstrated to be carcinogenic on the basis of epidemiological investigations on workers and experimental studies in animals. Increased incidences of respiratory cancer have been found in chromium(VI) workers. There is an increased incidence of lung cancer in industrial workers exposed to chromium(VI) compounds. Please refer to IARC volume 23 for a more detailed discussion. Aluminum: Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Tin: Has been shown to increase incidence of sarcoma in animal tests. Chronic exposure to tin dusts and fume may result in "stannosis", a mild form of pneumoconiosis. Repeated inhalation of iron oxide dust can cause siderosis a benign condition. Tantalum: Repeated exposure to tantalum alloys may cause fibrosis, chronic rhinitis and "hard metal pneumoconiosis". Inhalation of Nickel compounds has been shown in studies to provide an increased incidence of cancer of the nasal cavity, lung and possibly larynx in nickel refinery workers.

11.2. Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Vanadium (7440-62-2)	
LD50 Oral Rat	> 2000 mg/kg
Molybdenum (7439-98-7)	
LD50 Oral Rat	> 2000 mg/kg
LD50 Dermal Rat	> 2000 mg/kg
LC50 Inhalation Rat	> 3.92 mg/l/4h
Chromium (7440-47-3)	
LD50 Oral Rat	> 5000 mg/kg
LC50 Inhalation Rat	> 5.41 mg/l/4h

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Aluminum (7429-90-5)	
LD50 Oral Rat	> 15900 mg/kg
Tin (7440-31-5)	
LD50 Dermal Rat	> 2000 mg/kg
Iron (7439-89-6)	
LD50 Oral Rat	98.6 g/kg
Niobium (7440-03-1)	
LD50 Oral Rat	> 10 g/kg
LD50 Dermal Rat	> 2000 mg/kg
LC50 Inhalation Rat	> 5.45 mg/l/4h
Tantalum (7440-25-7)	
LD50 Oral Rat	> 2000 mg/kg
LD50 Dermal Rat	> 2000 mg/kg
LC50 Inhalation Rat	> 5.18 mg/l/4h
Nickel (7440-02-0)	
LD50 Oral Rat	> 9000 mg/kg
LC50 Inhalation Rat	> 10.2 mg/l (Exposure time: 1 h)
Chromium (7440-47-3)	
IARC Group	3
Nickel (7440-02-0)	
IARC Group	2B
National Toxicology Program (NTP) Status	Reasonably anticipated to be Human Carcinogen.
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecology - General: Not classified.

Molybdenum (7439-98-7)	
LC50 Fish 1	800 – 1320 mg/l
Nickel (7440-02-0)	
LC50 Fish 1	100 mg/l (Exposure time: 96 h - Species: Brachydanio rerio)
EC50 - Crustacea [1]	121.6 µg/l (Exposure time: 48h - Species: Ceriodaphnia dubia [static])
LC50 Fish 2	15.3 mg/l
EC50 - Crustacea [2]	1 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
EC50 Other Aquatic Organisms 2	0.174 (0.174 – 0.311) mg/l (Exposure time: 96 h - Species: Pseudokirchneriella subcapitata [static])

12.2. Persistence and Degradability

Titanium and Titanium Alloys	
Persistence and Degradability	Not established.

12.3. Bioaccumulative Potential

Titanium and Titanium Alloys	
Bioaccumulative Potential	Not established.

12.4. Mobility in Soil

No additional information available

12.5. Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste Treatment Methods: Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

Waste Disposal Recommendations: Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

Additional Information: Recycle the material as far as possible.

Ecology - Waste Materials: Avoid release to the environment.

SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

14.1. In Accordance with DOT

Not regulated for transport

14.2. In Accordance with IMDG

Not regulated for transport

14.3. In Accordance with IATA

Not regulated for transport

14.4. In Accordance with TDG

Not regulated for transport

SECTION 15: REGULATORY INFORMATION

15.1. Canadian Regulations

Titanium (7440-32-6)

Listed on the Canadian DSL (Domestic Substances List)

Vanadium (7440-62-2)

Listed on the Canadian DSL (Domestic Substances List)

Molybdenum (7439-98-7)

Listed on the Canadian DSL (Domestic Substances List)

Chromium (7440-47-3)

Listed on the Canadian DSL (Domestic Substances List)

Aluminum (7429-90-5)

Listed on the Canadian DSL (Domestic Substances List)

Zirconium (7440-67-7)

Listed on the Canadian DSL (Domestic Substances List)

Tin (7440-31-5)

Listed on the Canadian DSL (Domestic Substances List)

Iron (7439-89-6)

Listed on the Canadian DSL (Domestic Substances List)

Niobium (7440-03-1)

Listed on the Canadian DSL (Domestic Substances List)

Tantalum (7440-25-7)

Listed on the Canadian DSL (Domestic Substances List)

Nickel (7440-02-0)

Listed on the Canadian DSL (Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Date of Preparation or Latest Revision : 08/15/2023

Other Information : This document has been prepared in accordance with the SDS requirements of Canada's Hazardous Products Regulations (HPR) SOR/2015-17.

GHS Full Text Phrases:

H228	Flammable solid
H251	Self-heating; may catch fire
H261	In contact with water releases flammable gas
H317	May cause an allergic skin reaction

Titanium and Titanium Alloys

Safety Data Sheet

According To The Hazardous Products Regulation (February 11, 2015).

H351	Suspected of causing cancer
H372	Causes damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H412	Harmful to aquatic life with long lasting effects

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

CA GHS SDS