Safety Data Sheet

Section 1: Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product identifier

Product Name
- **Titanium Alloys**

Synonyms
- 30; CP + Pd; CP Ti; Stryker; Ti 10-2-3; Ti 1100; Ti 15-11-3; Ti 15-3; Ti 15-3-3-3; Ti 15Mo; Ti 17; Ti 2.5; Ti 3-2.5; Ti 38-644; Ti 40; Ti 425; Ti 48-53; Ti 5-2.5; Ti 55; Ti 550; Ti 551; Ti 5-5-2-2; Ti 5-5-5-3; Ti 5-6-2-1; Ti 6-2-1-1; Ti 6-2-2-2-2; Ti 6-2-4-2; Ti 6-2-4-2 Si; Ti 6-2-4-6; Ti 6-2s; Ti 6-4; Ti 6-4 ELI; Ti 6-6-2; Ti 6-7; Ti 679; Ti 685; Ti 70; Ti 7-4; Ti 8; Ti 8-1-1; Ti 829; Ti 834; Ti CP-1; Ti CP-2; Ti CP-3; Ti CP-4; Ti Grade 12; Ti Grade 7; Ti XT; TiOstalloy; TiOsteum; TMZF

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified use(s)
- Solid Cast, Forged and Fabricated Sheet, Plate, Bar, Wire, Tubing, Pipe, Fittings, Structural Shapes

1.3 Details of the supplier of the safety data sheet

Manufacturer
- Wyman-Gordon Company

  244 Worcester Street
  North Grafton, MA 01536-8001
  United States

Telephone (General)
- (508) 839-4441

1.4 Emergency telephone number

3E Company
- 1(866) 519-4752 (Contract Number: 334230)

Section 2: Hazards Identification

EU/EEC

According to Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 453/2010]
According to EU Directive 67/548/EEC (DSD) or 1999/45/EC (DPD)

2.1 Classification of the substance or mixture

CLP
- Classifications and hazards represented in this section may be representative of downstream processing of the solidified material in the event dusts, fumes or small fines are generated.
  Skin Irritation 2 - H315
  Eye Irritation 2 - H319
  Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation - H335
  Reproductive Toxicity 2 - H361
  Specific Target Organ Toxicity Repeated Exposure 2 - H373

DSD/DPD
- Irritant (Xi)
  Harmful (Xn)
  Substances Toxic To Reproduction - Category 3
  R36/37/38, R48/20, R63

2.2 Label Elements

CLP

WARNING

Hazard statements
- H315 - Causes skin irritation
  H319 - Causes serious eye irritation
  H335 - May cause respiratory irritation
  H361 - Suspected of damaging fertility or the unborn child.
  H372 - Causes damage to organs through prolonged or repeated exposure.
  H373 - May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

Prevention
- P201 - Obtain special instructions before use.
  P202 - Do not handle until all safety precautions have been read and understood.
  P260 - Do not breathe dust/fume.
  P264 - Wash thoroughly after handling.
  P271 - Use only outdoors or in a well-ventilated area.
  P280 - Wear protective gloves/protective clothing/eye protection/face protection.
  P281 - Use personal protective equipment as required.

Response
- P304+P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
  P312 - Call a POISON CENTER or doctor/physician if you feel unwell.
  P302+P352 - IF ON SKIN: Wash with plenty of soap and water.
  P321 - Specific treatment, see supplemental first aid information.
  P332+P313 - If skin irritation occurs: Get medical advice/attention.
  P362 - Take off contaminated clothing and wash before reuse.
  P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
  P337+P313 - If eye irritation persists: Get medical advice/attention.
  P314 - Get medical advice/attention if you feel unwell.
  P308+P313 - IF exposed or concerned: Get medical advice/attention.

Storage/Disposal
- P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
  P405 - Store locked up.
  P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

DSD/DPD

Risk phrases
- R36/37/38 - Irritating to eyes, respiratory system and skin.
  R48/20 - Harmful: danger of serious damage to health by prolonged exposure through inhalation.
  R63 - Possible risk of harm to the unborn child.

Safety phrases
- S26 - In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
  S37 - Wear suitable gloves.

2.3 Other Hazards

CLP
- May form combustible dust concentrations in air.
  According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.

DSD/DPD
- May form combustible dust concentrations in air.
  According to European Directive 1999/45/EC this preparation is considered dangerous.

United States (US)
According to OSHA 29 CFR 1910.1200 HCS

2.1 Classification of the substance or mixture

OSHA HCS 2012

- Classifications and hazards represented in this section may be representative of downstream processing of the solidified material in the event dusts, fumes or small fines are generated.

Skin Irritation 2 - H315
Skin Sensitization 1A - H317
Eye Irritation 2 - H319
Respiratory Sensitization 1A - H334
Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation - H335
Carcinogenicity 2 - H351
Reproductive Toxicity 2 - H361
Specific Target Organ Toxicity Repeated Exposure 1 - H372
Specific Target Organ Toxicity Repeated Exposure 2 - H373
Combustible Dust

2.2 Label elements

OSHA HCS 2012

DANGER

Hazard statements

- Causes skin irritation - H315
- May cause an allergic skin reaction - H317
- Causes serious eye irritation - H319
- May cause allergy or asthma symptoms or breathing difficulties if inhaled - H334
- May cause respiratory irritation - H335
- Suspected of causing cancer. - H351
- Suspected of damaging fertility or the unborn child. - H361
- Causes damage to organs through prolonged or repeated exposure. - H372
- May cause damage to organs through prolonged or repeated exposure. - H373
- May form combustible dust concentrations in air.

Precautionary statements

Prevention

- Do not handle until all safety precautions have been read and understood. - P202
- Obtain special instructions before use. - P201
- Do not breathe dust/fume. - P260
- Wash thoroughly after handling. - P264
- Do not eat, drink or smoke when using this product. - P270
- Use only outdoors or in a well-ventilated area. - P271
- Contaminated work clothing should not be allowed out of the workplace. - P272
- Wear protective gloves/protective clothing/eye protection/face protection. - P280
- In case of inadequate ventilation wear respiratory protection. - P285

Response

- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. - P304+P340
- If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician. - P342+P311
- Call a POISON CENTER or doctor/physician if you feel unwell. - P312
- If on skin: Wash with plenty of water .
- Specific treatment, see supplemental first aid information. - P321
- If skin irritation or rash occurs: Get medical advice/attention. - P333+P313
- Take off contaminated clothing and wash before reuse. - P362
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. - P305+P351+P338
- If eye irritation persists: Get medical advice/attention. - P337+P313
- IF exposed or concerned: Get medical advice/attention. - P308+P313

IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician. - P309+P311

Storage/Disposal
- Store in a well-ventilated place. Keep container tightly closed. - P403+P233
  Store locked up. - P405
  Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. - P501

2.3 Other hazards

OSHA HCS 2012
- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Canada
According to WHMIS

2.1 Classification of the substance or mixture

WHMIS
- Classifications and hazards represented in this section may be representative of downstream processing of the solidified material in the event dusts, fumes or small fines are generated.
  Other Toxic Effects - D2A
  Other Toxic Effects - D2B

2.2 Label elements

WHMIS

- Other Toxic Effects - D2A
  Other Toxic Effects - D2B

2.3 Other hazards

WHMIS
- May form combustible dust concentrations in air.
  In Canada, the product mentioned above is considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

See Section 12 for Ecological Information.

Section 3 - Composition/Information on Ingredients

3.1 Substances

- Material does not meet the criteria of a substance in accordance with Regulation (EC) No 1272/2008.

3.2 Mixtures

Composition					
Chemical Name	**Identifiers**	**%**	**LD50/LC50**	**Classifications According to Regulation/Directive**	**Comments**
Titanium	**CAS:**7440-32-6 **EINECS:**231-142-3	76% TO 99.7%	NDA	**EU DSD/DPD:** Self Classified: Repr. 3, R63 **EU CLP:** Self Classified: Repr. 2, H361 **OSHA HCS 2012:** Repr. 2	NDA
Aluminum	**CAS:**7429-90-5 **EC Number:**231-072-3	0% TO 10%	NDA	**EU DSD/DPD:** EU CLP, Annex VI, Table 3.2: F, R15, R17 **EU CLP:** Annex VI: Water-react. 2, H261; Pyr. Sol. 1, H250 **OSHA HCS 2012:** Not Classified - Criteria not met	NDA
Vanadium	**CAS:**7440-62-2	0% TO	NDA	**EU DSD/DPD:** Self Classified: Xi, R38	NDA

	EC Number:231-171-1	16%		**EU CLP:** Self Classified: Skin Irrit. 2, H319 **OSHA HCS 2012:** Skin Irrit. 2	
Iron	**CAS:**7439-89-6 **EC Number:**231-096-4	0% TO 5%	Ingestion/Oral-Rat LD50 • 30 g/kg	**EU DSD/DPD:** Self Classified: Xi, R37 **EU CLP:** Self Classified: STOT RE 3, H335 **OSHA HCS 2012:** STOT RE 3: Resp. Irrit.	NDA
Tin	**CAS:**7440-31-5 **EINECS:**231-141-8	0% TO 11%	NDA	**EU DSD/DPD:** Self Classified: Xi R36/38; Xn, R48/20 **EU CLP:** Self Classified: Eye Irrit, 2; H315; STOT SE 3: Resp. Irrit, H335; STOT RE 2 (Lungs, Inhalation), H373 **OSHA HCS 2012:** Eye Irrit. 2; STOT SE 3: Resp. Irrit.; STOT RE 2 (Lungs, Inhalation)	NDA
Zirconium	**CAS:**7440-67-7 **EC Number:**231-176-9	0% TO 10%	NDA	**EU DSD/DPD:** EU CLP, Annex VI, Table 3.2: F, R15, R17 **EU CLP:** Annex VI: Water-react. 1, H260; Pyr. Sol. 1, H250 **OSHA HCS 2012:** Not Classified - Criteria not met	NDA
Molybdenum	**CAS:**7439-98-7 **EC Number:**231-107-2	0% TO 15%	NDA	**EU DSD/DPD:** Self Classified: Xi, R36/37/38 **EU CLP:** Self Classified: Skin Irrit. 2, H319; Eye Irrit. 2, H315; STOT SE 3: Resp. Irrit., H335 **OSHA HCS 2012:** Skin Irrit. 2; Eye Irrit. 2; STOT SE 3: Resp. Irrit.	NDA
Chromium	**CAS:**7440-47-3 **EC Number:**231-157-5	0% TO 11%	NDA	**EU DSD/DPD:** Self Classified: Xi, R37 **EU CLP:** Self Classified: STOT SE 3: Resp. Irrit., H335 **OSHA HCS 2012:** STOT SE 3: Resp. Irrit.	NDA
Copper	**CAS:**7440-50-8 **EC Number:**231-159-6	0% TO 5%	NDA	**EU DSD/DPD:** Self Classified: Repr 3. R63; Xi, R36 **EU CLP:** Self Classified: Repr 2, H361; Eye Irrit. 2, H319 **OSHA HCS 2012:** Repr. 2, STOT SE 3: Resp. Irrit.; Eye Irrit. 2	NDA
Manganese	**CAS:**7439-96-5 **EC Number:**231-105-1	0% TO 5%	Ingestion/Oral-Rat LD50 • 9 g/kg	**EU DSD/DPD:** Self Classified: Repr. 3, R63 **EU CLP:** Self Classified: STOT RE 1 - CNS, H372; Repr. 2, H361 **OSHA HCS 2012:** Eye Irrit. 2B; Repr. 2; STOT RE 1 - CNS	NDA
Nickel	**CAS:**7440-02-0 **EC Number:**231-111-4	0% TO 0.8%	NDA	**EU DSD/DPD:** EU CLP, Annex VI, Table 3.2: Carc.Cat.3, R40; T, R48/23; R43 **EU CLP:** Self Classified: Carc. 2, H351; STOT RE 1, H372; Skin Sens. 1, H317 **OSHA HCS 2012:** Carc . 2; Skin Sens. 1A; Resp. Sens. 1A; STOT RE 2 (Lungs)	NDA
Tantalum	**CAS:**7440-25-7 **EC Number:**231-135-5	0% TO 1%	NDA	**EU DSD/DPD:** Not Classified - Criteria not met **EU CLP:** Not Classified - Criteria not met **OSHA HCS 2012:** Not Classified - Criteria not met	NDA
Cobalt	**CAS:**7440-48-4 **EC Number:**231-158-0	< 0.1%	Ingestion/Oral-Rat LD50 • 6171 mg/kg	**EU DSD/DPD:** EU CLP, Annex VI, Table 3.2: R42/43; R53 **EU CLP:** Annex VI: Resp. Sens. 1, H334; Skin Sens. 1, H317; Aquatic Chronic 4, H413 **OSHA HCS 2012:** Resp. Sens. 1; Skin Sens. 1	NDA
Tungsten	**CAS:**7440-33-7 **EC Number:**231-143-9	< 0.1%	NDA	**EU DSD/DPD:** Self Classified: Xi, R36/38 **EU CLP:** Self Classified: Skin Irrit. 2, H319; Eye Irrit. 2, H315 **OSHA HCS 2012:** Skin Irrit. 2; Eye Irrit. 2	NDA
Palladium	**CAS:**7440-05-3 **EINECS:**231-115-6	0% TO 0.2%	NDA	**EU DSD/DPD:** Self Classified: R43 **EU CLP:** Self Classified: Skin Sens. 1, H317 **OSHA HCS 2012:** Skin Sens. 1	NDA

See Section 11 for Toxicological Information.

Section 4 - First Aid Measures

4.1 Description of first aid measures

Inhalation

- Move victim to fresh air. Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing. Get medical attention immediately.

Skin
- Removal of solidified molten material from skin requires medical assistance. Wash skin with soap and water. Remove and isolate contaminated clothing. If irritation develops and persists, get medical attention.

Eye
- In case of contact with substance, immediately flush eyes with running water for at least 20 minutes. If eye irritation persists: Get medical advice/attention.

Ingestion
- Get medical attention immediately. Never give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to Physician
- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5 - Firefighting Measures

5.1 Extinguishing media

Suitable Extinguishing Media
- Dry sodium chloride is most effective for containing particulate fires. Flux (KCl, MgCl2, CaF2) is effective in reducing the oxygen supply of the fire.

Unsuitable Extinguishing Media
- Do Not Use Water or Carbon Dioxide Extinguishers.

5.2 Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards
- No fire or explosion hazard with solid metal alloys. A severe fire hazard may exist when fine turnings or chips are produced and during disposal of scrap containing chips or fines. Dry titanium alloy powder under 48 mesh (NFPA 481, Appendix B) can be ignited by a match or small spark.
  Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Hazardous Combustion Products
- Toxic metal fumes of titanium, aluminum, vanadium, iron, tin, zirconium, molybdenum, and chromium may be emitted.

5.3 Advice for firefighters

- Wear positive pressure self-contained breathing apparatus (SCBA).
  Structural firefighters' protective clothing will only provide limited protection.

Section 6 - Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal Precautions
- Ventilate the area before entry. Do not walk through spilled material. Wear appropriate personal protective equipment, avoid direct contact. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Emergency Procedures
- As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Keep out of low areas. Keep unauthorized personnel away. Stay upwind. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

6.2 Environmental precautions

- Prevent entry into waterways, sewers, basements or confined areas.

6.3 Methods and material for containment and cleaning up

Containment/Clean-up Measures
- Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air).
  Use clean nonsparking tools to collect material.

Carefully shovel or sweep up spilled material and place in suitable container.
All equipment used when handling the product must be grounded.

6.4 Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

Section 7 - Handling and Storage

7.1 Precautions for safe handling

Handling

- Use only in well ventilated areas. Keep away from heat, sparks, and flame. Keep material dry. Minimize dust generation and accumulation. Take precautionary measures against static charges. All equipment used when handling the product must be grounded. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Wear appropriate personal protective equipment, avoid direct contact. Do not breathe dust. Avoid contact with skin, eyes, and clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

7.2 Conditions for safe storage, including any incompatibilities

Storage

- Keep container tightly closed. Protect from physical damage and contact with water. Store in a cool, dry, well-ventilated place.

7.3 Specific end use(s)

- Refer to Section 1.2 - Relevant identified uses.

Section 8 - Exposure Controls/Personal Protection

8.1 Control parameters

Exposure Limits/Guidelines						
	Result	**ACGIH**	**Canada Ontario**	**Canada Quebec**	**China**	**Europe**
Chromium (7440-47-3)	TWAs	0.5 mg/m3 TWA	0.5 mg/m3 TWA	0.5 mg/m3 TWAEV	0.05 mg/m3 TWA	2 mg/m3 TWA
	STELs	Not established	Not established	Not established	0.15 mg/m3 STEL	Not established
Copper (7440-50-8)	STELs	Not established	Not established	Not established	2.5 mg/m3 STEL (dust); 0.6 mg/m3 STEL (fume)	Not established
	TWAs	0.2 mg/m3 TWA (fume)	0.2 mg/m3 TWA (fume); 1 mg/m3 TWA (dust and mist)	0.2 mg/m3 TWAEV (fume); 1 mg/m3 TWAEV (dust and mist)	1 mg/m3 TWA (dust); 0.2 mg/m3 TWA (fume)	Not established
Manganese (7439-96-5)	STELs	Not established	Not established	3 mg/m3 STEV (fume)	0.45 mg/m3 STEL	Not established
	TWAs	0.02 mg/m3 TWA (respirable fraction); 0.1 mg/m3 TWA (inhalable fraction)	0.2 mg/m3 TWA	5 mg/m3 TWAEV (dust); 1 mg/m3 TWAEV (fume)	0.15 mg/m3 TWA	Not established
Tantalum (7440-25-7)	STELs	Not established	Not established	Not established	12.5 mg/m3 STEL	Not established
	TWAs	Not established	Not established	5 mg/m3 TWAEV (dust)	5 mg/m3 TWA	Not established
Zirconium (7440-67-7)	STELs	10 mg/m3 STEL	10 mg/m3 STEL	10 mg/m3 STEV	10 mg/m3 STEL	Not established
	TWAs	5 mg/m3 TWA	5 mg/m3 TWA	5 mg/m3 TWAEV	5 mg/m3 TWA	Not established
Aluminum (7429-90-5)	STELs	Not established	Not established	Not established	6 mg/m3 STEL (total dust)	Not established
	TWAs	1 mg/m3 TWA (respirable fraction)	1 mg/m3 TWA (respirable)	10 mg/m3 TWAEV	3 mg/m3 TWA (total dust)	Not established
Molybdenum (7439-98-7)	STELs	Not established	Not established	Not established	15 mg/m3 STEL	Not established
	TWAs	10 mg/m3 TWA (inhalable fraction); 3 mg/m3 TWA (respirable fraction)	10 mg/m3 TWA (metal, inhalable); 3 mg/m3 TWA (metal, respirable)	Not established	6 mg/m3 TWA	Not established

Nickel (7440-02-0)	STELs	Not established	Not established	Not established	2.5 mg/m3 STEL	Not established
	TWAs	1.5 mg/m3 TWA (inhalable fraction)	1 mg/m3 TWA (inhalable)	1 mg/m3 TWAEV	1 mg/m3 TWA	Not established
Tin (7440-31-5)	TWAs	2 mg/m3 TWA	2 mg/m3 TWA	2 mg/m3 TWAEV	Not established	Not established
Cobalt (7440-48-4)	STELs	Not established	Not established	Not established	0.1 mg/m3 STEL	Not established
	TWAs	0.02 mg/m3 TWA	0.02 mg/m3 TWA	0.02 mg/m3 TWAEV	0.05 mg/m3 TWA	Not established
Tungsten (7440-33-7)	STELs	10 mg/m3 STEL	10 mg/m3 STEL	Not established	10 mg/m3 STEL	Not established
	TWAs	5 mg/m3 TWA	5 mg/m3 TWA	Not established	5 mg/m3 TWA	Not established

Exposure Limits/Guidelines (Con't.)

	Result	France	Germany DFG	Germany TRGS	Italy	NIOSH
Chromium (7440-47-3)	TWAs	2 mg/m3 TWA [VME] (indicative limit)	Not established	2 mg/m3 TWA AGW (inhalable fraction, exposure factor 1)	0.5 mg/m3 TWA	0.5 mg/m3 TWA
Copper (7440-50-8)	STELs	2 mg/m3 STEL [VLCT] (dust, as Cu)	Not established	Not established	Not established	Not established
	TWAs	0.2 mg/m3 TWA [VME] (fume); 1 mg/m3 TWA [VME] (dust, as Cu)	Not established	Not established	Not established	1 mg/m3 TWA (dust and mist); 0.1 mg/m3 TWA (fume)
	Ceilings	Not established	0.2 mg/m3 Peak (inhalable fraction)	Not established	Not established	Not established
	MAKs	Not established	0.1 mg/m3 TWA MAK (inhalable fraction)	Not established	Not established	Not established
Manganese (7439-96-5)	TWAs	1 mg/m3 TWA [VME] (fume, as Mn)	Not established	0.5 mg/m3 TWA AGW (The risk of damage to the embryo or fetus can be excluded when AGW and BGW values are observed, inhalable fraction)	Not established	1 mg/m3 TWA (fume)
	STELs	Not established	Not established	Not established	Not established	3 mg/m3 STEL
	Ceilings	Not established	1.6 mg/m3 Peak (Ceiling factor 1 for Permanganates, inhalable fraction); 0.16 mg/m3 Peak (Ceiling factor 1 for Permanganates, respirable fraction)	Not established	Not established	Not established
	MAKs	Not established	0.2 mg/m3 TWA MAK (inhalable fraction); 0.02 mg/m3 TWA MAK (respirable fraction)	Not established	Not established	Not established
Tantalum (7440-25-7)	TWAs	5 mg/m3 TWA [VME]	Not established	Not established	Not established	5 mg/m3 TWA (dust)
	STELs	Not established	Not established	Not established	Not established	10 mg/m3 STEL (dust)
	MAKs	Not established	4 mg/m3 TWA MAK (inhalable fraction); 1.5 mg/m3 TWA MAK (respirable fraction)	Not established	Not established	Not established
Zirconium (7440-67-7)	STELs	Not established	Not established	Not established	Not established	10 mg/m3 STEL
	TWAs	Not established	Not established	1 mg/m3 TWA AGW (including Zirconium compounds, insoluble in water, inhalable fraction, exposure factor 1)	Not established	5 mg/m3 TWA

	Ceilings	Not established	1 mg/m3 Peak (inhalable fraction)	Not established	Not established	Not established
	MAKs	Not established	1 mg/m3 TWA MAK (inhalable fraction)	Not established	Not established	Not established
Aluminum (7429-90-5)	TWAs	10 mg/m3 TWA [VME] (metal); 5 mg/m3 TWA [VME] (dust)	Not established	Not established	Not established	10 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable dust)
	MAKs	Not established	4 mg/m3 TWA MAK (dust, inhalable fraction); 1.5 mg/m3 TWA MAK (dust, respirable fraction)	Not established	Not established	Not established
Nickel (7440-02-0)	TWAs	1 mg/m3 TWA [VME]; 1 mg/m3 TWA [VME] (metal gratings)	Not established	Not established	Not established	0.015 mg/m3 TWA
Tin (7440-31-5)	TWAs	Not established	Not established	Not established	Not established	2 mg/m3 TWA
Vanadium (7440-62-2)	STELs	Not established	Not established	Not established	Not established	3 mg/m3 STEL (listed under Ferrovanadium dust)
	TWAs	Not established	Not established	Not established	Not established	1 mg/m3 TWA (listed under Ferrovanadium dust)
Cobalt (7440-48-4)	TWAs	Not established	Not established	Not established	Not established	0.05 mg/m3 TWA (dust and fume)
Tungsten (7440-33-7)	STELs	Not established	Not established	Not established	Not established	10 mg/m3 STEL
	TWAs	Not established	Not established	Not established	Not established	5 mg/m3 TWA

Exposure Limits/Guidelines (Con't.)

	Result	OSHA	Taiwan
Chromium (7440-47-3)	TWAs	1 mg/m3 TWA	1 mg/m3 TWA
Copper (7440-50-8)	TWAs	0.1 mg/m3 TWA (fume); 1 mg/m3 TWA (dust and mist)	0.2 mg/m3 TWA (fume); 1 mg/m3 TWA (dust and mist)
Manganese (7439-96-5)	TWAs	Not established	1 mg/m3 TWA (fume)
	Ceilings	5 mg/m3 Ceiling (fume)	Not established
Tantalum (7440-25-7)	TWAs	5 mg/m3 TWA	5 mg/m3 TWA (dust)
Aluminum (7429-90-5)	TWAs	15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)	Not established
Nickel (7440-02-0)	TWAs	1 mg/m3 TWA	1 mg/m3 TWA
Tin (7440-31-5)	TWAs	Not established	2 mg/m3 TWA
Vanadium (7440-62-2)	Ceilings	0.5 mg/m3 Ceiling (respirable dust, as V2O5); 0.1 mg/m3 Ceiling (fume, as V2O5)	Not established
Cobalt (7440-48-4)	TWAs	0.1 mg/m3 TWA (dust and fume)	0.05 mg/m3 TWA (dust and fume)

Exposure Control Notations

Italy

•Nickel (7440-02-0): **Carcinogens:** (Category 3 Carcinogen)

France

•Vanadium (7440-62-2): **Mutagens:** (Mutagen categories 1,2,3) | **Reproductive Toxins:** (Reproductive Toxin categories 1,2,3)

•Nickel (7440-02-0): **Carcinogens:** (Carcinogen category 3)

Germany TRGS

•Zirconium (7440-67-7): **Skin:** (skin notation)

•Cobalt (7440-48-4): **Carcinogens:** (Category 3 (bioavailable, as inhalable dust/aerosol, except hard metals, cobalt containing spinels and organic cobalt desiccants)) | **Developmental Toxins:** (Based on current data, this substance cannot be classified in categories 1-3 (bioavailable, as inhalable dust/aerosol, except hard metals, cobalt containing spinels and organic cobalt desiccants)) | **Reproductive Toxins:** (Based on current data, this substance cannot be classified in categories 1-3 (bioavailable, as inhalable dust/aerosol, except hard metals, cobalt containing spinels and organic cobalt desiccants)) | **Germ Cell Mutagens:** (Based on current data, this substance cannot be classified in categories 1-3 (bioavailable, as inhalable dust/aerosol, except hard metals, cobalt containing spinels and organic cobalt desiccants))

Germany DFG

•Aluminum (7429-90-5): **Pregnancy:** (classification not yet possible (respirable, inhalable, dust))

•Vanadium (7440-62-2): **Carcinogens:** (Category 2 (considered to be carcinogenic for man))

•Zirconium (7440-67-7): **Pregnancy:** (classification not yet possible) | **Sensitizers:** (respiratory and skin sensitizer)

•Copper (7440-50-8): **Pregnancy:** (no risk to embryo/fetus if exposure limits adhered to)

•Manganese (7439-96-5): **Pregnancy:** (no risk to embryo/fetus if exposure limits adhered to (inhalable fraction, respirable fraction))

•Nickel (7440-02-0): **Carcinogens:** (Category 1 (causes cancer in man)) | **Sensitizers:** (respiratory and skin sensitizer (inhalable fraction, respiratory sensitization confirmed for water soluble Nickel compounds only))

•Nickel as Nickel Compounds: **Carcinogens:** (Category 1 (causes cancer in man)) | **Sensitizers:** (respiratory and skin sensitizer (inhalable fraction, respiratory sensitization confirmed for water soluble Nickel compounds only))

•Tantalum (7440-25-7): **Pregnancy:** (no risk to embryo/fetus if exposure limits adhered to (inhalable fraction); no risk to embryo/fetus if exposure limits adhered to (respirable fraction))

•Cobalt (7440-48-4): **Carcinogens:** (Category 2 (considered to be carcinogenic for man)) | **Sensitizers:** (respiratory and skin sensitizer) | **Skin:** (skin notation)

8.2 Exposure controls

Engineering Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. It is recommended that dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion supression system or an oxygen-deficient environment. 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 not leakage from the equipment). Use only appropriately classified electrical equipment.

Personal Protective Equipment

Respiratory

- For limited exposure use an N95 dust mask. For prolonged exposure use an air-purifying respirator with high efficiency particulate air (HEPA) filters.

Eye/Face

- Wear safety goggles.

Skin/Body

- Wear appropriate gloves. Wear protective clothing

Environmental Exposure Controls

- Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways. Follow best practice for site management and disposal of waste.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene

MAK = Maximale Arbeitsplatz Konzentration is the maximum permissible concentration

NIOSH = National Institute of Occupational Safety and Health

OSHA = Occupational Safety and Health Administration

STEL = Short Term Exposure Limits are based on 15-minute exposures

TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Section 9 - Physical and Chemical Properties

9.1 Information on Physical and Chemical Properties

Material Description			
Physical Form	Solid	Appearance/Description	Odorless Silver or gray solid at room temperature.

Color	Silver or Gray.	Odor	No odor.
Odor Threshold	Data lacking		
General Properties			
Boiling Point	Data lacking	Melting Point	1675 C(3047 F) Titanium
Decomposition Temperature	Data lacking	pH	Data lacking
Specific Gravity/Relative Density	4.35 to 4.4 Water=1	Water Solubility	Insoluble
Viscosity	Data lacking	Explosive Properties	Not Explosive.
Oxidizing Properties:	Not an Oxidizer.		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	Data lacking
Evaporation Rate	Data lacking		
Flammability			
Flash Point	Data lacking	UEL	Data lacking
LEL	Data lacking	Autoignition	Data lacking
Flammability (solid, gas)	Not Flammable.		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

9.2 Other Information

- No additional physical and chemical parameters noted.

Section 10: Stability and Reactivity

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under normal temperatures and pressures.

10.3 Possibility of hazardous reactions

- Hazardous polymerization not indicated.

10.4 Conditions to avoid

- Avoid creating dusty airborne conditions. Violent explosion can occur when water comes in contact with molten metal.

10.5 Incompatible materials

- Avoid contact with red fuming nitric acid. Reacts violently with cupric or lead oxide when heated. Reacts with fluorine, dry chlorine, potassium chlorate, potassium nitrate, and potassium permanganate.

10.6 Hazardous decomposition products

- Toxic metal oxide fumes.

Section 11 - Toxicological Information

11.1 Information on toxicological effects

Components		
Titanium (76% TO 99.7%)	7440-32-6	**Reproductive:** Ingestion/Oral-Rat TDLo • 158 mg/kg (multigeneration); *Reproductive Effects:Effects on Embryo or Fetus*:**Fetotoxicity (except death, e.g., stunted fetus)**; *Reproductive Effects:Effects on Embryo or Fetus*:**Fetal death**
Molybdenum (0% TO 15%)	7439-98-7	**Reproductive:** Ingestion/Oral-Rat TDLo • 5800 µg/kg (30W pre/1-20D preg); *Reproductive Effects:Specific Developmental Abnormalities*:**Musculoskeletal system**
Copper (0% TO 5%)	7440-50-8	**Reproductive:** Ingestion/Oral-Rat TDLo • 152 mg/kg (22W pre); *Reproductive Effects:Effects on Embryo or Fetus*:**Fetotoxicity (except death, e.g., stunted fetus)**; *Reproductive Effects:Specific Developmental Abnormalities*:**Central nervous system**
Manganese (0% TO 5%)	7439-96-5	**Acute Toxicity:** Ingestion/Oral-Rat LD50 • 9 g/kg; **Irritation:** Eye-Rabbit • 500 mg 24 Hour(s) • Mild irritation; Skin-Rabbit • 500 mg 24 Hour(s) • Mild irritation; **Reproductive:** Ingestion/Oral-Rat TDLo • 90 mg/kg (18D post); *Reproductive Effects:Effects on Newborn*:**Growth statistics (e.g., reduced weight gain)**; *Reproductive Effects:Effects on Newborn*:**Biochemical and metabolic**;

		Reproductive Effects:Effects on Newborn:**Other postnatal measures or effects**

GHS Properties	Classification
Acute toxicity	**EU/CLP**•Data lacking **OSHA HCS 2012**•Data lacking
Aspiration Hazard	**EU/CLP**•Data lacking **OSHA HCS 2012**•Data lacking
Carcinogenicity	**EU/CLP**•Data lacking **OSHA HCS 2012**•Carcinogenicity 2
Germ Cell Mutagenicity	**EU/CLP**•Data lacking **OSHA HCS 2012**•Data lacking
Skin corrosion/Irritation	**EU/CLP**•Skin Irritation 2 **OSHA HCS 2012**•Skin Irritation 2
Skin sensitization	**EU/CLP**•Data lacking **OSHA HCS 2012**•Skin Sensitizer 1A
STOT-RE	**EU/CLP**•Specific Target Organ Toxicity Repeated Exposure 2 **OSHA HCS 2012**•Specific Target Organ Toxicity Repeated Exposure 1; Specific Target Organ Toxicity Repeated Exposure 2
STOT-SE	**EU/CLP**•Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation **OSHA HCS 2012**•Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation
Toxicity for Reproduction	**EU/CLP**•H361d - Suspected of damaging the unborn child; H361f - Suspected of damaging fertility; Toxic to Reproduction 2 **OSHA HCS 2012**•Toxic to Reproduction 2
Respiratory sensitization	**EU/CLP**•Data lacking **OSHA HCS 2012**•Respiratory Sensitizer 1A
Serious eye damage/Irritation	**EU/CLP**•Eye Irritation 2 **OSHA HCS 2012**•Eye Irritation 2

Potential Health Effects

Inhalation

Acute (Immediate)
- May cause respiratory irritation. Processes such as cutting, grinding, crushing, or impact may result in generation of excessive amounts of airborne dusts in the workplace. Nuisance dust may affect the lungs but reactions are typically reversible.

Chronic (Delayed)
- May cause allergy or asthma symptoms or breathing difficulties if inhaled. Inhalation of dusts or fumes can cause severe pulmonary reactions including fibrosis, ephysema and pneumothorax. Inhalation of dusts from this product may cause lung problems.

Skin

Acute (Immediate)
- May cause skin sensitization. Symptoms include redness, and skin rash. Causes skin irritation.

Chronic (Delayed)
- No data available

Eye

Acute (Immediate)
- Causes serious eye irritation.

Chronic (Delayed)
- No data available

Ingestion

Acute (Immediate)
- Excessive concentrations of nuisance dust in the workplace may cause mechanical irritation to mucous membranes.

Chronic (Delayed) • No data available

Other

Chronic (Delayed) • Repeated and prolonged exposure may affect the central nervous system.

Carcinogenic Effects • Repeated and prolonged exposure may cause cancer.

Carcinogenic Effects			
	CAS	IARC	NTP
Nickel	7440-02-0	Group 2B-Possible Carcinogen	Reasonably Anticipated to be Human Carcinogen
Cobalt	7440-48-4	Group 2B-Possible Carcinogen	Not Listed

Reproductive Effects • Animal tests for components have shown adverse reproductive effects.

Key to abbreviations

LC = Lethal Concentration
LD = Lethal Dose
TC = Toxic Concentration
TD = Toxic Dose

Section 12 - Ecological Information

12.1 Toxicity

- Material Data Lacking.

12.2 Persistence and degradability

- Material Data Lacking.

12.3 Bioaccumulative potential

- There is little tendency for bioaccumulation along food chain.

12.4 Mobility in Soil

- Material Data Lacking.

12.5 Results of PBT and vPvB assessment

- The PBT and vPvB assessment has not been conducted.

12.6 Other adverse effects

- No studies have been found.

Section 13 - Disposal Considerations

13.1 Waste treatment methods

Product waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	14.1 UN number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing group	14.5 Environmental hazards
DOT	NDA	Not regulated	NDA	NDA	NDA
TDG	NDA	Not regulated	NDA	NDA	NDA
IMO/IMDG	NDA	Not regulated	NDA	NDA	NDA

IATA/ICAO	NDA	Not regulated	NDA	NDA	NDA

14.6 Special precautions for user
- None known.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
- Not relevant.

Section 15 - Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications
- Acute, Chronic, Pressure(Sudden Release of)

State Right To Know				
Component	**CAS**	**MA**	**NJ**	**PA**
Aluminum	7429-90-5	Yes	Yes	Yes
Chromium	7440-47-3	Yes	Yes	Yes
Cobalt	7440-48-4	Yes	Yes	Yes
Copper	7440-50-8	Yes	Yes	Yes
Iron	7439-89-6	No	No	No
Manganese	7439-96-5	Yes	Yes	Yes
Molybdenum	7439-98-7	Yes	Yes	Yes
Nickel	7440-02-0	Yes	Yes	Yes
Palladium	7440-05-3	No	No	No
Tantalum	7440-25-7	Yes	Yes	Yes
Tin	7440-31-5	Yes	Yes	Yes
Titanium	7440-32-6	No	Yes	No
Tungsten	7440-33-7	Yes	Yes	Yes
Vanadium	7440-62-2	Yes	Yes	Yes
Zirconium	7440-67-7	Yes	Yes	Yes

Inventory						
Component	**CAS**	**Canada DSL**	**Canada NDSL**	**China**	**EU EINECS**	**EU ELNICS**
Aluminum	7429-90-5	Yes	No	Yes	Yes	No
Chromium	7440-47-3	Yes	No	Yes	Yes	No
Cobalt	7440-48-4	Yes	No	Yes	Yes	No
Copper	7440-50-8	Yes	No	Yes	Yes	No
Iron	7439-89-6	Yes	No	Yes	Yes	No
Manganese	7439-96-5	Yes	No	Yes	Yes	No
Molybdenum	7439-98-7	Yes	No	Yes	Yes	No
Nickel	7440-02-0	Yes	No	Yes	Yes	No
Palladium	7440-05-3	Yes	No	Yes	Yes	No
Tantalum	7440-25-7	Yes	No	Yes	Yes	No
Tin	7440-31-5	Yes	No	Yes	Yes	No
Titanium	7440-32-6	Yes	No	Yes	Yes	No
Tungsten	7440-33-7	Yes	No	Yes	Yes	No
Vanadium	7440-62-2	Yes	No	Yes	Yes	No
Zirconium	7440-67-7	Yes	No	Yes	Yes	No

Inventory (Con't.)				
Component	**CAS**	**Japan ENCS**	**Korea KECL**	**TSCA**
Aluminum	7429-90-5	No	Yes	Yes
Chromium	7440-47-3	No	Yes	Yes
Cobalt	7440-48-4	No	Yes	Yes
Copper	7440-50-8	No	Yes	Yes
Iron	7439-89-6	No	Yes	Yes
Manganese	7439-96-5	No	Yes	Yes

Molybdenum	7439-98-7	No	Yes	Yes
Nickel	7440-02-0	No	Yes	Yes
Palladium	7440-05-3	No	Yes	Yes
Tantalum	7440-25-7	No	Yes	Yes
Tin	7440-31-5	No	Yes	Yes
Titanium	7440-32-6	No	Yes	Yes
Tungsten	7440-33-7	No	Yes	Yes
Vanadium	7440-62-2	No	Yes	Yes
Zirconium	7440-67-7	No	Yes	Yes

Australia

Labor

Australia - Work Health and Safety Regulations - Hazardous Substances Requiring Health Monitoring

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Australia - List of Designated Hazardous Substances - Classification

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Self classification required (dust, fume and mist)
•Chromium	7440-47-3	Self classification required
•Manganese	7439-96-5	Self classification required (dust)
•Tantalum	7440-25-7	Self classification required (metal and oxide dusts)
•Tin	7440-31-5	Self classification required
•Zirconium	7440-67-7	F R15 (powder, non pyrophoric); F R15, R17 (powder, pyrophoric)
•Cobalt	7440-48-4	R42/43, R53 (including dust and fume)
•Aluminum	7429-90-5	F R11, R15 (powder, stabilised)
•Molybdenum	7439-98-7	Self classification required
•Nickel	7440-02-0	T Carc.Cat.3 R40, R48/23, R43; T Carc.Cat.3 R40, R48/23, R43, R52, R53 (powder, particle diameter <1 mm)
•Tungsten	7440-33-7	Self classification required
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Environment

Australia - National Pollutant Inventory (NPI) Substance List

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	10 tonne/yr Threshold category 1 (Copper and compounds); 2000 tonne/yr Threshold category 2b

		(Copper and compounds); 60000 MWH Threshold category 2b (Copper and compounds); 20 MW Threshold category 2b (Copper and compounds)
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	10 tonne/yr Threshold category 1 (Manganese and compounds)
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	10 tonne/yr Threshold category 1 (Cobalt and compounds)
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	10 tonne/yr Threshold category 1 (Nickel and compounds); 2000 tonne/yr Threshold category 2b (Nickel and compounds); 60000 MWH Threshold category 2b (Nickel and compounds); 20 MW Threshold category 2b (Nickel and compounds)
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
Australia - Ozone Protection Act - Scheduled Substances		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
Australia - Priority Existing Chemical Program		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Standby chemical
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Canada

Labor

Canada - WHMIS - Classifications of Substances

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Uncontrolled product according to WHMIS classification criteria
•Chromium	7440-47-3	Uncontrolled product according to WHMIS classification criteria
•Manganese	7439-96-5	D2A (including powder)
•Tantalum	7440-25-7	Uncontrolled product according to WHMIS classification criteria
•Tin	7440-31-5	Uncontrolled product according to WHMIS classification criteria
•Zirconium	7440-67-7	Uncontrolled product according to WHMIS classification criteria
•Cobalt	7440-48-4	D2A, D2B
•Aluminum	7429-90-5	B6 (powder); Uncontrolled product according to WHMIS classification criteria
•Molybdenum	7439-98-7	Uncontrolled product according to WHMIS classification criteria
•Nickel	7440-02-0	D2A, D2B; B6, D2A (Raney)
•Tungsten	7440-33-7	Uncontrolled product according to WHMIS classification criteria
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Uncontrolled product according to WHMIS classification criteria
•Titanium	7440-32-6	Not Listed

Canada - WHMIS - Ingredient Disclosure List

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	1 %
•Chromium	7440-47-3	0.1 %
•Manganese	7439-96-5	1 %
•Tantalum	7440-25-7	1 %
•Tin	7440-31-5	1 %
•Zirconium	7440-67-7	1 %
•Cobalt	7440-48-4	0.1 %
•Aluminum	7429-90-5	1 %
•Molybdenum	7439-98-7	1 %
•Nickel	7440-02-0	0.1 %
•Tungsten	7440-33-7	1 %
•Vanadium	7440-62-2	1 %
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Environment

Canada - 2004 NPRI (National Pollutant Release Inventory)

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Part 1, Group 1 Substance
•Chromium	7440-47-3	Part 1, Group 1 Substance
•Manganese	7439-96-5	Part 1, Group 1 Substance
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Part 1, Group 1 Substance
•Aluminum	7429-90-5	Part 1, Group 1 Substance (dust or fume)
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Part 1, Group 1 Substance

•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Part 1, Group 1 Substance (except when in an alloy)
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
Canada - 2005 NPRI (National Pollutant Release Inventory)		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Part 1, Group 1 Substance
•Chromium	7440-47-3	Part 1, Group 1 Substance
•Manganese	7439-96-5	Part 1, Group 1 Substance
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Part 1, Group 1 Substance
•Aluminum	7429-90-5	Part 1, Group 1 Substance (dust or fume)
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Part 1, Group 1 Substance
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Part 1, Group 1 Substance
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
Canada - CEPA - Greenhouse Gases Subject to Mandatory Reporting		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
Canada - CEPA - Priority Substances List		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
Canada - DWQ (Drinking Water Quality) - IMACs		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed

•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Other

Canada - Accelerated Reduction/Elimination of Toxics (ARET)

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Canada New Brunswick

Environment

Canada - New Brunswick - Ozone Depleting Substances - Schedule A

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Canada - New Brunswick - Ozone Depleting Substances - Schedule B

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Europe

Other

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Classification

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	F; R15-17
•Cobalt	7440-48-4	R42/43 R53
•Aluminum	7429-90-5	F; R11 R15
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Carc.Cat.3; R40 R43 T; R48/23
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
EU - CLP (1272/2008) - Annex VI - Table 3.2 - Concentration Limits		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
EU - CLP (1272/2008) - Annex VI - Table 3.2 - Labelling		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	F R:15-17 S:(2)-7/8-43
•Cobalt	7440-48-4	Xn R:42/43-53 S:(2)-22-24-37-61
•Aluminum	7429-90-5	F R:11-15 S:(2)-7/8-43
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	T R:40-43-48/23 S:(2)-36/37/39-45
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
EU - CLP (1272/2008) - Annex VI - Table 3.2 - Notes - Substances and Preparations		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	T
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	S, 7
•Tungsten	7440-33-7	Not Listed

•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Safety Phrases

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	S:(2)-7/8-43
•Cobalt	7440-48-4	S:(2)-22-24-37-61
•Aluminum	7429-90-5	S:(2)-7/8-43
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	S:(2)-36/37/39-45
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Germany

Environment

Germany - Water Classification (VwVwS) - Annex 1

•Palladium	7440-05-3	ID Number 1443, not considered hazardous to water
•Copper	7440-50-8	ID Number 1443, not considered hazardous to water
•Chromium	7440-47-3	ID Number 1443, not considered hazardous to water
•Manganese	7439-96-5	ID Number 1443, not considered hazardous to water
•Tantalum	7440-25-7	ID Number 1443, not considered hazardous to water
•Tin	7440-31-5	ID Number 1443, not considered hazardous to water
•Zirconium	7440-67-7	ID Number 1443, not considered hazardous to water
•Cobalt	7440-48-4	ID Number 1443, not considered hazardous to water
•Aluminum	7429-90-5	ID Number 1443, not considered hazardous to water
•Molybdenum	7439-98-7	ID Number 1443, not considered hazardous to water
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	ID Number 1443, not considered hazardous to water
•Vanadium	7440-62-2	ID Number 1443, not considered hazardous to water
•Iron	7439-89-6	ID Number 748, not considered hazardous to water
•Titanium	7440-32-6	ID Number 1443, not considered hazardous to water

Germany - Water Classification (VwVwS) - Annex 2 - Water Hazard Classes

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	ID Number 7182, hazard class 2 - hazard to waters (footnote 47)
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Germany - Water Classification (VwVwS) - Annex 3

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	ID Number 7616, hazard class 2 - hazard to waters (particle size <0.1 mm)
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

United States

Labor

U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed

•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

Environment

U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm); 2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)
•Chromium	7440-47-3	5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm); 2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	100 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm); 45.4 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)

•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - CERCLA/SARA - Section 313 - Emission Reporting		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	1.0 % de minimis concentration
•Chromium	7440-47-3	1.0 % de minimis concentration
•Manganese	7439-96-5	1.0 % de minimis concentration
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	0.1 % de minimis

		concentration
•Aluminum	7429-90-5	1.0 % de minimis concentration (dust or fume only)
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	0.1 % de minimis concentration
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	1.0 % de minimis concentration (except when contained in an alloy)
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - Basis for Listing - Appendix VII		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Included in waste streams: F032, F034, F035, F037, F038, F039
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Included in waste streams: F006, F039
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Included in waste stream: F039
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - Constituents for Detection Monitoring		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	(total)
•Chromium	7440-47-3	(total)
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	(total)
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	(total)
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	(total)
•Iron	7439-89-6	Not Listed

•Titanium	7440-32-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - D Series Wastes - Max Conc of Contaminants for the Tox Characteristic		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	5.0 mg/L regulatory level
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	hazardous constituent - no waste number
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	hazardous constituent - no waste number
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - List for Hazardous Constituents		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	(total)
•Chromium	7440-47-3	(total)
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	(total)
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	(total)
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	(total)
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	(total)
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	2.77 mg/L (total, wastewater); 0.60 mg/L TCLP (total, nonwastewater)
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed

•Nickel	7440-02-0	3.98 mg/L (wastewater); 11.0 mg/L TCLP (nonwastewater)
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	4.3 mg/L (wastewater); 1.6 mg/L TCLP (nonwastewater)
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - RCRA (Resource Conservation & Recovery Act) - TSD Facilities Ground Water Monitoring		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	(total)
•Chromium	7440-47-3	(total)
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	(total)
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	(total)
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	(total)
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	(total)
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	carcinogen, initial date 7/1/92 (powder)
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	carcinogen, initial date 10/1/89 (metallic)
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - California - Proposition 65 - Developmental Toxicity		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed

•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Female		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Male		
•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	Not Listed
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	Not Listed
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

United States - Pennsylvania

Labor

U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	(dust and fume)
•Chromium	7440-47-3	
•Manganese	7439-96-5	
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	
•Aluminum	7429-90-5	
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	(dust or fume)
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

•Palladium	7440-05-3	Not Listed
•Copper	7440-50-8	Not Listed
•Chromium	7440-47-3	
•Manganese	7439-96-5	Not Listed
•Tantalum	7440-25-7	Not Listed
•Tin	7440-31-5	Not Listed
•Zirconium	7440-67-7	Not Listed
•Cobalt	7440-48-4	Not Listed
•Aluminum	7429-90-5	Not Listed
•Molybdenum	7439-98-7	Not Listed
•Nickel	7440-02-0	
•Tungsten	7440-33-7	Not Listed
•Vanadium	7440-62-2	Not Listed
•Iron	7439-89-6	Not Listed
•Titanium	7440-32-6	Not Listed

15.2 Chemical Safety Assessment

- No Chemical Safety Assessment has been carried out.

15.3 Other Information

- WARNING: This product contains a chemical known to the State of California to cause cancer.

Section 16 - Other Information

Relevant Phrases (code & full text)

- H250 - Catches fire spontaneously if exposed to air
  H260 - In contact with water releases flammable gases which may ignite spontaneously
  H261 - In contact with water releases flammable gas
  H317 - May cause an allergic skin reaction
  H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
  H351 - Suspected of causing cancer.
  H413 - May cause long lasting harmful effects to aquatic life

  R15 - Contact with water liberates extremely flammable gases.
  R17 - Spontaneously flammable in air.
  R36 - Irritating to eyes.
  R36/38 - Irritating to eyes and skin.
  R37 - Irritating to respiratory system.
  R40 - Limited evidence of a carcinogenic effect.
  R42/43 - May cause sensitisation by inhalation and skin contact.
  R43 - May cause sensitisation by skin contact.
  R48/23 - Toxic: danger of serious damage to health by prolonged exposure through

	inhalation. R53 - May cause long-term adverse effects in the aquatic environment.
Last Revision Date	• 17/December/2014
Preparation Date	• 01/October/2009
Disclaimer/Statement of Liability	• The information herein is given in good faith but no warranty, expressed or implied, is made.

Key to abbreviations

NDA = No data available