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# Safety data sheet



BASF Safety data sheet according to Regulation (EC) No. 1907/2006 as amended from time to time.
Date / Revised: 04.12.2017 Version: 8.3
Product: **Catamold 316L A**
(ID no. 10205096/SDS_GEN_EU/EN)
Date of print 20.12.2018

## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1. Product identifier

# Catamold 316L A

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

Recommended use: Intermediate, see separate brochures

### 1.3. Details of the supplier of the safety data sheet

Company:
BASF SE
67056 Ludwigshafen
GERMANY

Telephone: +49 621 60-0
E-mail address: global.info@basf.com

### 1.4. Emergency telephone number

International emergency number:
Telephone: +49 180 2273-112

## SECTION 2: Hazards Identification

### 2.1. Classification of the substance or mixture

According to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

### 2.2. Label elements

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria. The dangerous ingredients are fixed in a polymer matrix.

Labeling of special preparations (GHS):
Product contains the following components and may cause an allergic skin reaction: nickel

### 2.3. Other hazards

According to Regulation (EC) No 1272/2008 [CLP]

Upon mechanical treatment like e.g. cutting, grinding and/or polishing the product can release hazardous substances. Upon thermal and/or chemical treatment the product can release hazardous substances. The product is under certain conditions capable of dust explosion. If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

## SECTION 3: Composition/Information on Ingredients

### 3.1. Substances

Not applicable

### 3.2. Mixtures

Chemical nature

polymer blend based on: Alloy, metal powder
encapsulated, in a polymer matrix

Hazardous ingredients (GHS)
according to Regulation (EC) No. 1272/2008

nickel

| | |
|---|---|
| Content (W/W): >= 7 % - < 12.5 % | Skin Sens. 1 |
| CAS Number: 7440-02-0 | Carc. 2 |
| EC-Number: 231-111-4 | STOT RE 1 |
| REACH registration number: 01-2119438727-29 | Aquatic Chronic 3 |
| | H317, H351, H372, H412 |

Chromium

| | |
|---|---|
| Content (W/W): >= 15 % - < 18.5 %<br>CAS Number: 7440-47-3<br>EC-Number: 231-157-5<br>REACH registration number: 01-2119485652-31 | Aquatic Chronic 4<br>H413 |

For the classifications not written out in full in this section, including the hazard classes and the hazard statements, the full text is listed in section 16.

## SECTION 4: First-Aid Measures

### 4.1. Description of first aid measures

If inhaled:
If formaldehyde vapour is inhaled, remove person to fresh air and keep warm, if necessary summon physician.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water.

### 4.2. Most important symptoms and effects, both acute and delayed

Symptoms: No significant symptoms are expected due to the non-classification of the product.

Hazards: No hazard is expected under intended use and appropriate handling.

### 4.3. Indication of any immediate medical attention and special treatment needed

Treatment: Treat symptomatically.

## SECTION 5: Fire-Fighting Measures

### 5.1. Extinguishing media

Suitable extinguishing media:
dry powder, water spray, foam, carbon dioxide

Additional information:
Water spray for suppression (heat dissipation) of incipient fires as long as the product has not yet ignited.

### 5.2. Special hazards arising from the substance or mixture

At temperatures of > 200 °C can be emitted: formaldehyde...%, harmful vapours

### 5.3. Advice for fire-fighters
Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:
The degree of risk is governed by the burning substance and the fire conditions. Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.

## SECTION 6: Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures
Avoid dust formation.

### 6.2. Environmental precautions
Suppress gases/vapours/mists with water spray jet. Wet down dust with water spray jet.

### 6.3. Methods and material for containment and cleaning up
For small amounts: Pick up with suitable appliance and dispose of.
For large amounts: Pick up with suitable appliance and dispose of.

### 6.4. Reference to other sections
Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

## SECTION 7: Handling and Storage

### 7.1. Precautions for safe handling
Avoid dust formation. Upon mechanical load the product can release sensitizing substances.

Protection against fire and explosion:
Accumulation of fine dust may entail the risk of a dust explosion in the presence of air.

### 7.2. Conditions for safe storage, including any incompatibilities

Suitable materials for containers: Low density polyethylene (LDPE), Stainless steel 1.4301 (V2), Stainless steel 1.4401, High density polyethylene (HDPE), Carbon steel (Iron)
Further information on storage conditions: Keep container dry.

The packed product is not damaged by low temperatures or by frost.
Protect from temperatures above: 200 °C
Changes in the properties of the product may occur if substance/product is stored above indicated temperature for extended periods of time.

### 7.3. Specific end use(s)
For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

## SECTION 8: Exposure Controls/Personal Protection

### 8.1. Control parameters

Components with occupational exposure limits

7439-89-6: Iron
7439-98-7: Molybdenum
7440-47-3: Chromium
TWA value 2 mg/m3 (OEL (EU))
indicative
7440-02-0: nickel powder [particle diameter < 1 mm]

Components with PNEC

7439-89-6: Iron
A PNEC could not be derived as no studies have been performed. The product is a naturally occuring substance, whose molecular structure is not supposed to have harmful effects.

7440-02-0: nickel
freshwater: 0.0036 mg/l
marine water: 0.0086 mg/l
STP: 0.33 mg/l
sediment (marine water):
No PNEC value available.
sediment (freshwater):
No PNEC value available.

7440-47-3: Chromium
sediment (freshwater): 205.7 mg/kg
freshwater: 0.0065 mg/l
soil: 21.1 mg/kg

Components with DNEL

7439-89-6: Iron
worker: Long-term exposure - local effects, Inhalation: 3 mg/m3
consumer: Long-term exposure- systemic effects, oral: 0.71 mg/kg
consumer: Long-term exposure - local effects, Inhalation: 1.5 mg/m3

7440-02-0: nickel
worker: Long-term exposure - systemic and local effects, Inhalation: 0.05 mg/m3
worker: Short-term exposure - systemic effects, Inhalation: 680 mg/m3
worker: Short-term exposure - local effects, Inhalation: 4 mg/m3
worker: Long-term exposure - local effects, dermal: 0.07 mg/cm2

consumer: Short-term exposure - systemic effects, Inhalation: 408 mg/m3
consumer: Short-term exposure - systemic effects, oral: 0.012 mg/kg
consumer: Short-term exposure - local effects, Inhalation: 2.4 mg/m3
consumer: Long-term exposure - systemic and local effects, Inhalation: 0.00002 mg/m3
consumer: Long-term exposure- systemic effects, oral: 0.02 mg/kg
consumer: Long-term exposure - local effects, dermal: 0.07 mg/cm2

7440-47-3: Chromium
worker: Long-term exposure - local effects, Inhalation: 0.5 mg/m3
consumer: Long-term exposure - local effects, Inhalation: 0.027 mg/m3

### 8.2. Exposure controls

Personal protective equipment

Respiratory protection:
Breathing protection if gases/vapours are formed. Gas filter for gases/vapours of inorganic compounds (e.g. EN 14387 Type B) Breathing protection if dusts are formed. Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:
Wear chemical resistant protective gloves.
Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:
Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:
Body protection must be chosen depending on activity and possible exposure, e.g. apron, protecting boots, chemical-protection suit (according to EN 14605 in case of splashes or EN ISO 13982 in case of dust).

General safety and hygiene measures
Wearing of closed work clothing is recommended. No eating, drinking, smoking or tobacco use at the place of work. Handle in accordance with good industrial hygiene and safety practice.

## SECTION 9: Physical and Chemical Properties

### 9.1. Information on basic physical and chemical properties

| | |
|---|---|
| Form: | granules |
| Colour: | grey |
| Odour: | odourless |
| pH value: | not applicable, not soluble |
| Melting point: | 165 °C |
| : | The product is a non-volatile solid. |

| | |
|---|---|
| Evaporation rate: | |
| | negligible, not applicable |
| Flammability: | not self-igniting |
| Lower explosion limit: | |
| | No data available., For solids not relevant for classification and labelling. |
| Upper explosion limit: | |
| | No data available., For solids not relevant for classification and labelling. |
| Ignition temperature: | 450 °C |
| Vapour pressure: | |
| | negligible, not applicable |
| Density: | 5.3 - 5.8 g/cm3 |
| | (20 °C) |
| Solubility in water: | insoluble |
| Partitioning coefficient n-octanol/water (log Kow): | |
| | not applicable for mixtures |
| Self ignition: | not self-igniting |
| Thermal decomposition: | > 200 °C |
| Viscosity, dynamic: | |
| | not applicable, the product is a solid |
| Viscosity, kinematic: | |
| | not applicable, the product is a solid |
| Explosion hazard: | Product is not explosive, however a dust explosion could result from an air / dust mixture. |
| Fire promoting properties: | not fire-propagating |

### 9.2. Other information

| | |
|---|---|
| Self heating ability: | It is not a substance capable of spontaneous heating. |
| Radioactivity: | |
| | not radioactive for transport purposes |
| Bulk density: | 2,800 - 3,200 kg/m3 |
| Hygroscopy: | Non-hygroscopic |
| Solids content: | > 90 % |

## SECTION 10: Stability and Reactivity

### 10.1. Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

| | | |
|---|---|---|
| Corrosion to metals: | not applicable Corrosive effects to metal are not anticipated. | |
| Reactions with water/air: | Reaction with: | air |
| | Flammable gases: | no |
| | Toxic gases: | no |
| | Corrosive gases: | no |
| | Smoke or fog: | no |
| | Peroxides: | no |
| | Reaction with: | water |
| | Flammable gases: | no |
| | Toxic gases: | no |
| | Corrosive gases: | no |
| | Smoke or fog: | no |
| | Peroxides: | no |
| Formation of flammable gases: | Remarks: | Forms no flammable gases in the presence of water. |

### 10.2. Chemical stability
The product is stable if stored and handled as prescribed/indicated.
depolymerizes at elevated temperatures

### 10.3. Possibility of hazardous reactions
Strong exothermic reaction with acids. May decompose violently.

### 10.4. Conditions to avoid
Avoid all sources of ignition: heat, sparks, open flame. Avoid prolonged exposure to extreme heat.

### 10.5. Incompatible materials

Substances to avoid:
inorganic acids, plastics containing halogenated flame retardants

### 10.6. Hazardous decomposition products

Hazardous decomposition products:
formaldehyde...%

## SECTION 11: Toxicological Information

### 11.1. Information on toxicological effects

Acute toxicity

Assessment of acute toxicity:
Virtually nontoxic after a single ingestion.

Irritation

Assessment of irritating effects:
May cause mechanical irritation.

*Information on: Iron*
*Assessment of irritating effects:*
*Not irritating to the skin. Not irritating to the eyes. The product has not been tested. The statement has been derived from substances/products of a similar structure or composition.*
---

Respiratory/Skin sensitization

Assessment of sensitization:
Study not necessary due to exposure considerations.

*Information on: nickel*
*Assessment of sensitization:*
*Sensitization after skin contact possible.*
---

Germ cell mutagenicity

*Information on: Iron*
*Assessment of mutagenicity:*
*Most of the results from the available studies show no evidence of a mutagenic effect.*
---

Carcinogenicity

*Information on: nickel*
*Assessment of carcinogenicity:*
*The results of various animal studies gave no indication of a carcinogenic effect. IARC (International Agency for Research on Cancer) has classified this substance as group 2B (The agent is possibly carcinogenic to humans).*
---

Reproductive toxicity

*Information on: Iron*
*Assessment of reproduction toxicity:*
*No data available. The chemical structure does not suggest a specific alert for such an effect.*
---

Developmental toxicity

*Information on: Iron*
*Assessment of teratogenicity:*
*No data available. The chemical structure does not suggest a specific alert for such an effect.*
---

Specific target organ toxicity (single exposure)

Remarks: Based on available Data, the classification criteria are not met.

Repeated dose toxicity and Specific target organ toxicity (repeated exposure)

*Information on: nickel*
*Assessment of repeated dose toxicity:*
*The substance may cause damage to the lung after repeated inhalation.*
---

Aspiration hazard

Not relevant.

Other relevant toxicity information

The product has not been tested. The statement has been derived from the properties of the individual components. The product has been assessed on the basis of the components' available data. To some extent data gaps exist for individual components. According to our present knowledge and experience dangers which are not covered by the current labeling are not to be expected. Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses.

## SECTION 12: Ecological Information

### 12.1. Toxicity

Assessment of aquatic toxicity:
There is a high probability that the product is not acutely harmful to aquatic organisms. The product has not been tested. The statement has been derived from substances/products of a similar structure or composition.

*Information on: Chromium*
*Assessment of aquatic toxicity:*
*There is a high probability that the product is not acutely harmful to aquatic organisms.*
*No toxic effects occur within the range of solubility.*
---

### 12.2. Persistence and degradability

Assessment biodegradation and elimination (H2O):
The product is not very soluble in water and can thus be removed from water mechanically in suitable effluent treatment plants.

*Information on: Chromium*
*Assessment biodegradation and elimination (H2O):*
*Not applicable for inorganic substances.*

---

## 12.3. Bioaccumulative potential

Bioaccumulation potential:
The product has not been tested. Because of the product's consistency and low water solubility, bioavailability is improbable.

*Information on: Chromium*
*Assessment bioaccumulation potential:*
*May be accumulated in organisms.*
---

## 12.4. Mobility in soil

Assessment transport between environmental compartments:
Adsorption in soil: Adsorption to solid soil phase is possible.

## 12.5. Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): Not fulfilling PBT (persistent/bioaccumulative/toxic) criteria.

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): Not fulfilling vPvB (very persistent/very bioaccummulative) criteria.

## 12.6. Other adverse effects

The product does not contain substances that are listed in Regulation (EC) 1005/2009 on substances that deplete the ozone layer.

## 12.7. Additional information

The product contains:
The product contains the heavy metals listed in Section 3 and/or Section 8, which are fixed in a polymer matrix.

Add. remarks environm. fate & pathway:
The product has not been tested. The statements on environmental fate and pathway have been derived from the properties of the individual components.

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from the properties of the individual components. The product has been assessed on the basis of the components' available data. To some extent data gaps exist for individual components. According to our present knowledge and experience dangers which are not covered by the current labeling are not to be expected.

## SECTION 13: Disposal Considerations

### 13.1. Waste treatment methods

Check for possible recycling.
Must be disposed of by special means, e.g. suitable dumping after chemical/physical pretreatment (consolidation).

Contaminated packaging:
Contaminated packaging should be emptied as far as possible; then it can be passed on for recycling after being thoroughly cleaned.
Uncleaned empties should be disposed of in the same manner as the contents.

## SECTION 14: Transport Information

**Land transport**

ADR

| | |
|---|---|
| | Not classified as a dangerous good under transport regulations |
| UN number: | Not applicable |
| UN proper shipping name: | Not applicable |
| Transport hazard class(es): | Not applicable |
| Packing group: | Not applicable |
| Environmental hazards: | Not applicable |
| Special precautions for user | None known |

RID

| | |
|---|---|
| | Not classified as a dangerous good under transport regulations |
| UN number: | Not applicable |
| UN proper shipping name: | Not applicable |
| Transport hazard class(es): | Not applicable |
| Packing group: | Not applicable |
| Environmental hazards: | Not applicable |
| Special precautions for user | None known |

**Inland waterway transport**
ADN

| | |
|---|---|
| | Not classified as a dangerous good under transport regulations |
| UN number: | Not applicable |
| UN proper shipping name: | Not applicable |
| Transport hazard class(es): | Not applicable |
| Packing group: | Not applicable |

| | |
|---|---|
| Environmental hazards: | Not applicable |
| Special precautions for user: | None known |

Transport in inland waterway vessel
Not evaluated

**Sea transport**

IMDG

| | |
|---|---|
| | Not classified as a dangerous good under transport regulations |
| UN number: | Not applicable |
| UN proper shipping name: | Not applicable |
| Transport hazard class(es): | Not applicable |
| Packing group: | Not applicable |
| Environmental hazards: | Not applicable |
| Special precautions for user | None known |

**Air transport**

IATA/ICAO

| | |
|---|---|
| | Not classified as a dangerous good under transport regulations |
| UN number: | Not applicable |
| UN proper shipping name: | Not applicable |
| Transport hazard class(es): | Not applicable |
| Packing group: | Not applicable |
| Environmental hazards: | Not applicable |
| Special precautions for user | None known |

### 14.1. UN number
See corresponding entries for “UN number” for the respective regulations in the tables above.

### 14.2. UN proper shipping name
See corresponding entries for “UN proper shipping name” for the respective regulations in the tables above.

### 14.3. Transport hazard class(es)
See corresponding entries for “Transport hazard class(es)” for the respective regulations in the tables above.

### 14.4. Packing group

See corresponding entries for “Packing group” for the respective regulations in the tables above.

### 14.5. Environmental hazards

See corresponding entries for “Environmental hazards” for the respective regulations in the tables above.

### 14.6. Special precautions for user

See corresponding entries for “Special precautions for user” for the respective regulations in the tables above.

### 14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

| | |
|---|---|
| Regulation: | Not evaluated |
| Shipment approved: | Not evaluated |
| Pollution name: | Not evaluated |
| Pollution category: | Not evaluated |
| Ship Type: | Not evaluated |

## SECTION 15: Regulatory Information

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

Prohibitions, Restrictions and Authorizations

Annex XVII of Regulation (EC) No 1907/2006: Number on List: 27

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

### 15.2. Chemical Safety Assessment

Advice on product handling can be found in sections 7 and 8 of this safety data sheet.

## SECTION 16: Other Information

Full text of the classifications, including the hazard classes and the hazard statements, if mentioned in section 2 or 3:

| | |
|---|---|
| Skin Sens. | Skin sensitization |
| Carc. | Carcinogenicity |
| STOT RE | Specific target organ toxicity — repeated exposure |
| Aquatic Chronic | Hazardous to the aquatic environment - chronic |
| H317 | May cause an allergic skin reaction. |
| H351 | Suspected of causing cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |
| H412 | Harmful to aquatic life with long lasting effects. |
| H413 | May cause long lasting harmful effects to aquatic life. |

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. This safety data sheet is neither a Certificate of Analysis (CoA) nor technical data sheet and shall not be mistaken for a specification agreement. Identified uses in this safety data sheet do neither represent an agreement on the corresponding contractual quality of the substance/mixture nor a contractually designated use. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Vertical lines in the left hand margin indicate an amendment from the previous version.

| FORT WAYNE METALS<br>Turning knowledge into solutions. | Environmental Management System<br>Environmental Form |
|---|---|
| Form: F-09-09 Rev. January 21, 2013<br><br>Subject: Safety Data Sheet | Issued By: Lance Weirick<br><br>Approved By: Kay L. Haggard |

## 1. Product and Company Identification

**Product Name:** Titanium and Titanium Alloys SDS

CP Ti Gr1, CP Ti Gr2, CP Ti Gr3, CP Ti Gr4 contain: Ti@99-100%, Fe, C, O,
Ti Gr5, CP Ti Gr5 Eli contains generally: Ti@89.5, Al@6.1, Fe@0.2, V@4.0
Ti Gr6 contains generally: Ti@92.1, Al@5, Fe@0.3, Sn@2.5
Ti Gr7 contains generally: Ti@99.5, Fe@0.2, Pd@0.2
Ti Gr9, Ti Gr 9 Eli contains generally: Ti@94.2, Al@3, Fe@0.1, V@2.5
Ti Gr11, TiGr12, Ti Gr13, Ti Gr14, Ti Gr15, Ti Gr16, Ti Gr17
Ti Gr18 contains generally: Ti@94.2, V@8.0, Fe@0.1, Al@3, Mo@4, Pd@0.1, V@2.5
Ti Gr19 (Ti Beta C) contains generally: Ti@78.2, V@8.0, Fe@0.2, Al@3.5, Mo@4
Ti Beta 3 contains generally: Ti@83.4, V@8.0, Fe@0.1, Mo@11.9, Sn@4.5
Ti 6Al-7Nb contains generally: Ti@86.5, V@8.0, Al@6.0, Fe@0.1, Nb@7.0,Ta@0.3
Ti 13.5V-11Cr-3Al contains generally: Ti@72.2, V@13.5, Al@3.0, Cr@11.0, Fe@0.2
Ti 3Al-2.5V contains generally: Ti@94.2, V@2.5, Al@3.0, Cr@11.0, Fe@0.2
Ti 3Al-8V-6Cr-4Mo-4Zr contains generally: Ti@74.2, Al@3.5, Cr@6, Fe@0.2, Mo@4, V@8
Ti 44.5Cb contains generally: Ti@55.3, Co@44.5
Ti 5Al-2.5 Sn contains generally: Ti@92, Al@5, Fe@0.3, Sn@2.5
Ti 6Al-2Sn-4Zr-2Mo contains generally: Ti@85.7, Al@6, Fe@0.1, Mo@2, Sn@2, Zr@4
Ti 6Al-2Sn-4Zr-6Mo contains generally: Ti@81.8, Al@6, Fe@0.1, Mo@6, Sn@2, Zr@4
Ti 6Al-4V, Ti6Al-4V Eli contains generally: Ti@89.5, V@8.0, Al@6.1, Fe@0.2
Ti6Al-6V-2Sn contains generally: Ti@85.5, V@5.5, Al@5.5, Fe@0.7, Sn@2
Ti7Al-4Mo contains generally: Ti@88.8, Al@6.9, Fe@0.2, Mo@4
Ti8Al-1Mo-1V contains generally: Ti@89.9, Al@7.9, Fe@0.2, Mo@1, V@1

**Other Identification:** SDS# 032

**Recommended Use:** Research & Development and/or in the manufacturing of end use articles.

**Restrictions on Use:** See "Section 10. Stability and Reactivity"

**Manufacturer Name:** Fort Wayne Metals
**Manufacturer Address:** 9609 Ardmore Avenue, Fort Wayne, Indiana 46809, USA
**Business Phone:** 260-747-4154
**Emergency Phone:** 260-747-4154 ask for EHS department

**Revision Date:** August 12, 2017

## 2. Hazards Identification

**GHS Classification:** In its present form, the material is not classified according to the Globally Harmonized System (GHS) and is not considered hazardous according to the OSHA Hazard Communication Standard 2012 (29 CFR 1910.1200). "Massive" metal products are generally classified as "articles" and do not constitute hazardous materials in solid form. See **Hazards Not Otherwise Classified (HNOC).**

**GHS Signal Word:** None

| GHS HAZARD PICTOGRAMS | GHS HAZARD | GHS CLASSIFICATION | GHS HAZARD STATEMENTS |
|---|---|---|---|
| None | None | None | None |

**Hazards Not Otherwise Classified (HNOC):** Processes such as burning, melting, welding, cutting, sawing, brazing, grinding, machining, milling, etching, oxidizing, electro polishing, etc. can generate hazardous metal powders, fumes, and/or ions. The powders, fumes, and/or ions can present hazards such as acute and chronic toxicity, flammability, pyrophoricity, self-heating capabilities, carcinogenicity, and water reactivity.

For potential hazards of individual constituents see:
"Section 3. Composition/Information on Ingredients"
"Section 10. Stability & Reactivity",
"Section 11. Toxicological Information",
"Section 12. Ecological Information".

**GHS Prevention Precautionary Statements during processing of solid form.**
**(See Section #3 for additional GHS precautionary codes for specific elements)**
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/gas/mist/vapors/spray.
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 - Wash contacted skin thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P271 - Use only outdoors or in a well-ventilated area – if releasing dust, fumes or particulate.
P280 - Wear protective gloves/protective clothing/eye protection/face protection if dust, or fume particulate.
P284 = [In case of inadequate ventilation] wear respiratory protection.

**GHS Response Precautionary Statements during processing of solid form:**
**(See Section #3 for additional GHS precautionary codes for specific elements)**
P301+P330+P331 – If SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P333+P313 - If skin irritation or a rash occurs: Get medical advice/attention.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.
P304+P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P314 - Get medical advice/attention if you feel unwell.
P335 - Brush off loose particles from skin.
(Especially if particles are potentially water-reactive, but less so, if a respiratory hazard).
P337+P313 - If eye irritation persists get medical advice/attention.
P363 - Wash contaminated clothing before reuse.
P370+P378 – In case of fire: Use $CO_2$, sand, or Class D metal fire extinguisher to extinguish
P381 - Eliminate all ignition sources if safe to do so.
For primarily water-reactive alloy compositions:
P335

**GHS Storage Precautionary Statements:**
**(See Section #3 for additional GHS precautionary codes for specific elements)**
P401 STORE: Away from incompatible materials described in "Section 10. Stability & Reactivity",. In accordance with federal/provincial/state or local regulations.

**GHS Disposal Precautionary Statements:**
**(See Section #3 for additional GHS precautionary codes for specific elements)**

P501 - Dispose of contents/container in accordance with local, regional, national and international regulations.
P502 - Refer to manufacturer/supplier for information on recovery/recycling. Metal scrap should be recycled whenever possible.

**Other Information:**

Additional precautionary codes for alloys composed significantly of flammable solid elements include:
P210 = Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Additional precautionary codes for alloys composed significantly of toxic (acute, chronic, reproductive, etc), carcinogenic, and/or mutagenic include:
P272 = Contaminated work clothing should not be allowed out of the workplace.

## 3. Composition/Information on Ingredients

| CHEMICAL | CAS / EC NUMBER | WT% | (GHS Hazard Codes. Abbreviations listed in "Section#16 Other Information") |
|---|---|---|---|
| Aluminum, Al | 7429-90-5<br>231-072-3 | 0-8 |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>Water-reactive = Cat#2, H261 (dust)<br> GHS09<br>Aquatic Acute Hazard = Cat#1, H400<br>HNOS Combustible Dust |
| Aluminum Oxide, $Al_2O_3$ | 1344-28-1<br>215-691-6 | 0-trace |  GHS08<br>STOT RE = Cat#2, H334 (lungs) |
| Carbon, C | 7440-44-0<br>231-153-3 | 0-trace | HNOS Combustible Dust |
| Chromium, Cr | 7440-47-3<br>231-157-5 | 0-12 | HNOS Combustible Dust |
| Chromium (hexavalent), Cr+6 | various | 0 |  GHS07<br>Skin Sensitizer = Cat#1, H317<br> GHS08<br>Respiratory Sens.= Cat#1, H334<br>Mutagenic = Cat#1B, H340 Carcinogen = Cat#1A, H350<br>Reproductive Toxicity= Cat#1A, H360 |
| Iron, Fe | 7439-89-6<br>231-096-4 | 0-0.3 | none |
| Iron Oxide, $Fe_2O_3$ | 1309-37-1<br>215-168-2 | 0-trace | none |
| Molybdenum, | 7439-98-7 | 0-12 | HNOS Combustible Dust |

| | | | |
|---|---|---|---|
| Mo | 231-107-2 | | |
| Nickel, Ni | 7440-02-0<br>231-111-4 | 0-trace |  GHS07<br>Skin Sensitizer = Cat#1, H317<br> GHS08<br>Carcinogen = Cat#2, H351<br>STOT RE = Cat#1, H372 (inhalation)<br>(lung, kidneys, liver)<br> GHS09<br>Aquatic Acute Hazard = Cat#1, H400<br>Aquatic Chronic Hazard = Cat#3, H412 |
| Niobium, Nb | 7440-03-1<br>231-113-5 | 0-7 |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>HNOS Combustible Dust |
| Oxygen, O | 7782-44-7<br>231-956-9 | 0-trace | none |
| Palladium, Pd | 7740-05-3<br>231-115-6 | 0-0.2 | none |
| Silicon, Si | 7440-21-3<br>231-130-8 | 0-5 | HNOS Combustible Dust |
| Silicon Dioxide, $SiO_2$ | 14808-60-7<br>238-878-4 | 0-trace |  GHS08<br>Carcinogenicity = Cat#1B, H350 (inhalation)(lungs) |
| Tantalum, Ta | 7440-25-7<br>231-135-5 | 0-trace |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>HNOS Combustible Dust |
| Tin, Sn | 7440-31-5<br>231-141-8 | 0-trace | HNOS Combustible Dust |
| Titanium, Ti | 7440-32-6<br>231-142-3 | 70-100 |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>HNOS Combustible Dust |
| Titanium Dioxide, TiO2 | 13463-67-7<br>236-675-5 | trace |  GHS08 (warning)<br>Carcinogenicity = Cat#2, H351 |
| Vanadium, V | 7440-62-2<br>231-171-1 | 0-8 |  GHS02<br>Flammable Solid = Cat#2, H228 (dust)<br>HNOS Combustible Dust |
| Vanadium Oxide, $V_2O_5$ | 1314-62-1<br>215-239-8 | 0-trace |  GHS07,<br>Acute Toxicity(Oral)= Cat#4, H302<br>Acute Toxicity(Inhalative) = Cat#4, H332<br>STOT SE (Inhalative) = Cat#3, H335 (respiratory) |

| | | | |
|---|---|---|---|
| | | |  GHS08,<br>Mutagenicity = Cat#2, H341<br>Reproductive Toxicity = Cat#2, H361<br>STOT RE = Cat#1, H372 (Inhalative) (lung, liver, heart, blood, brain, endocrine system) |
| Zirconium, Zr | 7440-67-7<br>231-176-9 | 0-4 |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>HNOS Combustible Dust |

Components may be regulated, have exposure limits, and/or other regulatory requirements.

## 4. First Aid Measures

**Eye Contact:** Gently flush particulate with copious amounts of water for 15 minutes to ensure that no articles remain in eye. Avoid rubbing that might scratch the eye. Seek medical attention if irritation persists.

**Skin Contact:** If irritation develops, wash skin thoroughly with soap and water. Seek medical attention if necessary.

**Inhalation:** Remove from exposure to fresh air. If discomfort persists, consult physician.

**Ingestion:** If significant amounts of dust are ingested consult a physician. Do not induce vomiting.

**Most Important Symptoms/Effects (acute and delayed):**
Can cause allergic skin reactions. Can cause gastrointestinal effects if swallowed. During processing (cutting, milling, grinding, melting, or welding), emitted byproducts can cause irritations, difficulty in breathing, coughing, or wheezing.

**Indication of Immediate Medical Attention and Special Treatment:**
Notes to physician: May cause sensitization by skin contact or inhalation. Treat symptomatically.

## 5. Fire Fighting Measures

Not flammable in the product form as distributed, but processing can create dust and/or finely divided particles that are flammable.

**Suitable Extinguishing Media:**
Treat as a Class D Combustible metal fire or smother with sodium chloride salt.
Do not use water on molten metals as an explosive characteristic is caused by the hydrogen and steam generated by the reaction of water with the burning material.

**Specific Hazards Arising From the Material:**
Intense heat. Very fine, high surface area material resulting from grinding, buffing polishing, or similar processes of this product may ignite spontaneously at room temperature and/or form combustible dust-air mixtures. Keep particles away from all ignition sources; including heat, sparks, and flames. Prevent dust

accumulations to minimize combustible dust hazard. See "Section 2. Hazards Identification".

**Hazardous Combustion Products:**
Toxic metal and metallic oxide fumes may be evolved from fires involving finely divided alloy. Particle size and dispersion in air determine reactivity.

**Special Firefighting Instructions:**
Firefighters should wear self-contained MSHA/NIOSH-approved (or equivalent) breathing apparatus and full protective gear.

## 6. Accidental Release

**Environmental Precautions:** Prevent entry of material into soil, waterways, drains and sewers. Prevent exposure of material to weather (snow, rain) to avoid leaching dissolved metals and/or residuals into the environment. See "Section 12. Ecological Information" for additional information.

**Cleanup:** Collect by vacuuming, by sweeping or by wet mopping to prevent spreading of dust. Avoid inhalation of dusts. Do not allow entry to sewers.

See "Section 7. Handling and Storage" for information on safe handling.
See "Section 8. Exposure Controls/Personal Protection" for information on personal protective
See "Section 13. Disposal Considerations" for disposal information.

## 7. Handling and Storage

**Handling:** Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes. Avoid contact with skin and clothing for long periods of time. See "Section 8. Exposure Controls/Personal Protection" for recommended personal protective equipment. Wash and rinse after handling and before eating, drinking, chewing gum, or using tobacco. Remove and wash contaminated clothing before reuse; particularly after processing.

**Storage:** Keep dust and/or small particles away from heat, sparks, and flame that are capable of ignition. Close containers and/or maintain adequate distance from all ignition sources. Depending on particle size, ignition sources can include pilot lights, electric motors, and static electricity. Prevent dust accumulation to minimize combustible dust hazard. Properly label container.

**Incompatible Materials:** See "Section 10. Stability and Reactivity".

## 8. Exposure Controls/Personal Protection

**EXPOSURE LIMITS FOR INDIVIDUAL COMPONENTS**

| Chemical | CAS Number | OSHA PEL 8hr TWA ($mg/m^3$) | NIOSH ($mg/m^3$) | | ACGIH TLV 8hr TWA ($mg/m^3$) |
|---|---|---|---|---|---|
| | | | REL 8hr TWA | IDLH | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Aluminum, Al | 7429-90-5 | - | Dust=10<br>Resp.=5<br>Fume=5<br>Soluble Salt=2 | - | Dust=10<br>Fume=5<br>Soluble Salt=2 |
| | Aluminum Oxide, $Al_2O_3$ | 1344-28-1 | Total=15<br>Respirable=5 | - | - | - |
| | Carbon, C | 7440-44-0 | Total=15<br>Respirable=5 | - | - | - |
| | Chromium, Cr | 7440-47-3 | Cr Metal=1<br>Insoluble Cr salts=1<br>$Cr^{+2}$ compounds=0.5,<br>$Cr^{+3}$ compounds=0.5,<br>$Cr^{+6}$ comp. =0.005<br>$Cr^{+6}$ action level=0.0025 | 0.5 | $Cr^{+2}$=250<br>Cr =250<br>$Cr^{+3}$ =25 | Cr Metal = 0.5<br>$Cr^{+3}$ =0.5<br>Soluble $Cr^{+6}$ =0.05<br>Insol. $Cr^{+6}$ =0.01 |
| | Chromium (hexavalent), $Cr^{+6}$ | various | Cr Metal=1<br>Insoluble Cr salts=1<br>$Cr^{+2}$ compounds=0.5,<br>$Cr^{+3}$ compounds=0.5,<br>$Cr^{+6}$ comp. =0.005<br>$Cr^{+6}$ action level=0.0025 | 0.5 | $Cr^{+2}$=250<br>Cr =250<br>$Cr^{+3}$ =25 | Cr Metal = 0.5<br>$Cr^{+3}$ =0.5<br>Soluble $Cr^{+6}$ =0.05<br>Insol. $Cr^{+6}$ =0.01 |
| | Iron, Fe | 7439-89-6 | - | Fe salts=1 | - | - |
| | Iron Oxide, $Fe_2O_3$ | 1309-37-1 | Dust & Fume=10 | Dust & Fume=5 | 2500 | Dust & Fume=5 |
| | Molybdenum, Mo | 7439-98-7 | Soluble = 5<br>Insoluble=15 | 10 | 5000 (Soluble comp= 1000) | Inhalable=10<br>Respirable=3<br>Soluble=5<br>Insoluble=10 |
| | Nickel, Ni & Ni inorganic compounds | 7440-02-0 | Metal & Insoluble = 1<br>Soluble=0.1(proposed) | 0.015 | 10 | Metal=1.5<br>Soluble=0.1<br>Insoluble=0.2 |
| | Niobium, Nb | 7440-03-1 | - | - | - | - |
| | Oxygen, O | 7782-44-7 | - | - | - | - |
| | Palladium, Pd | 7740-05-3 | - | - | - | - |
| | Silicon, Si | 7440-21-3 | Total Dust=15<br>Respirable dust=5 | Dust: Total=10 | - | Total Dust=10 |
| | Silicon Dioxide, $SiO_2$ | 14808-60-7 | - | - | - | - |
| | Tantalum, Ta | 7440-25-7 | 5 | 5 (ST=10) | 2500 | 5 |
| | Tin, Sn | 7440-31-5 | 2 | 2 | 100 | |
| | Titanium, Ti | 7440-32-6 | - | - | - | - |
| | Titanium Dioxide, $TiO_2$ | 13463-67-7 | 15 | - | 5000 | 10 |
| | Vanadium, V | 7440-62-2 | $V_2O_5$ only=0.5 (Respirable) | compounds only=0.05 | comp=35 as V | |

| | | | | | |
|---|---|---|---|---|---|
| Vanadium Oxide, $V_2O_5$ | 1314-62-1 | Respirable=0.5 | 0.05 | 35 as V | Respirable 0.05 as $V_2O_5$ |
| Zirconium, Zr | 7440-67-7 | 5<br>STEL=10 | 5<br>STEL=10 | Comp=25<br>as Zr | 5<br>STEL=10 |

**Exposure Guidelines:** Follow all applicable exposure limits. Keep formation of airborne particulate and fumes to a minimum. Exposure controls and personal protection can vary depending on process and/or application.

**Engineering Controls:** Local and or general exhaust ventilation should be used to keep worker exposure below applicable exposure limits during welding, burning, grinding, melting, sawing, brazing, buffing, polishing, or other similar heat-generating processes which may generate airborne contaminants. Prevent accumulation of small particulate that might ignite. Collect chips and grinds for recycling where feasible.

**Personal Protective Equipment:** Processes performed on material should be evaluated (risk assessment) to establish need for suitable equipment to protect worker from exposure to hazards above stated limits.

**Skin & Body Protection:** Suitable for protection against physical injury and skin contact during handling and processing. For example, fire resistant clothing may be appropriate during hot work with product. Cut resistant gloves and/or protective clothing may be appropriate when sharp surfaces are present. Chemical-resistant, impervious gloves may be appropriate if material is wet.

**Eye/Face Protection:** Safety glasses or goggles should be worn when there is a probability of airborne particles and/or elevated levels of dust or fume.

**Respiratory Protection:** Use NIOSH/MSHA approved respirators when particulates, fumes, and/or gasses are generated and if exposure limits are exceeded or irritation is experienced.

**Pictograms for Personal Protective Equipment:**




**General Hygiene Considerations:** Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

## 9. Physical and Chemical Properties

**Physical State:** Solid
**Color:** Metallic gray or silver gray
**Appearance:** Various product forms (wire, billet, rod, cores, ingot, etc.)
**Odor:** Odorless
**Solubility in water:** Not water soluble
**pH:** Not applicable
**Boiling Point** (°C @760 mm Hg): Not applicable
**Melting Point** (varies with composition) Not applicable

**Decomposition Temp** (°C): Not applicable
**Evaporation Rate:** Not applicable
**Vapor Density** (air=1, @20 °C): Not applicable
**Vapor Pressure** (mm HG @20 °C): Not applicable
**Density** (varies with composition) Not applicable
**Percent Volatile Organic Compound** (VOC): None

## 10. Stability and Reactivity

**Stability:** Stable under ordinary conditions of storage and transport.

**Conditions to Avoid:** Dust formation and dust accumulation during various processing.

**Hazardous Decomposition Products:** Reacts with mineral acid, inorganic acids and oxidizers to form hydrogen gas (flammable) and to form dissolved metal ions that are to be prohibited from waterways. Melting and/or burning can produce toxic metal fumes. See "Section 3 Composition / Information on Ingredients", and "Section 8 Exposure Controls / Personal Protection", and "Section 11 Toxicological Information" for additional information.

**Hazardous Polymerization:** Will not occur.

**Incompatible Materials:** May react with acids like hydrofluoric acid and oxidizers. Reaction will vary with specific alloy composition when in the presence of chlorine, bromine, halocarbons, carbon tetrachloride, and Freon when heated above 200-deg.

## 11. Toxicological Information

**Likely Routes of Exposure:**

**Eyes:** High concentration of dust may cause irritation to the eyes.
**Skin:** Prolonged skin contact with dust may cause skin irritation to sensitive individuals.
**Inhalation:** Inhalation of metal particulate or elemental oxide fumes generated during welding, burning, grinding, machining, melting, sawing, brazing, buffing, polishing, or sweeping may pose acute or chronic health effects.
**Ingestion:** Ingestion of metal particulate may cause acute gastrointestinal effects.

**LETHAL DOSE TOXICITY BY INDIVIDUAL COMPONENT**
(Oral & Inhalation tests prefer rat. Dermal test prefer rat or rabbit.)

| Chemical | CAS Number | $LD_{50}$ Oral (mg/Kg bw) | $LD_{50}$ Dermal (mg/Kg bw) | $LC_{50}$ Inhalation (mg/l) |
|---|---|---|---|---|
| Aluminum, Al | 7429-90-5 | - | - | - |
| Aluminum Oxide, $Al_2O_3$ | 1344-28-1 | >5000 (rat) (OECD Guideline 401) | - | >2.3 (4h) (OECD Guideline 403) |
| Carbon, C | 7440-44-0 | - | - | - |
| Chromium, Cr | 7440-47-3 | - | - | - |

| | | | | |
|---|---|---|---|---|
| Chromium (hexavalent), Cr+6 | various | Potassium dichromate=25 (rat) | Potassium dichromate=14 (rabbit) | - |
| Iron, Fe | 7439-89-6 | 98,600 | - | > 0.25 |
| Iron Oxide, $Fe_2O_3$ | 1309-37-1 | Ferric oxide black=10000 (rat) | - | - |
| Molybdenum, Mo | 7439-98-7 | - | - | - |
| Nickel & compounds (inorganic Ni) | 7440-02-0 | Both values found > 9000 (rat) or 105 (rat) | - | - |
| Niobium, Nb | 7440-03-1 | - | > 2000 | - |
| Oxygen, O | 7782-44-7 | - | - | - |
| Palladium, Pd | 7740-05-3 | - | - | - |
| Silicon, Si | 7440-21-3 | 3160 (rat) | - | - |
| Silicon Dioxide, $SiO_2$ | 14808-60-7 | - | - | - |
| Tantalum, Ta | 7440-25-7 | - | - | - |
| Tin, Sn | 7440-31-5 | - | - | - |
| Titanium, Ti | 7440-32-6 | > 5000 | - | - |
| Titanium Dioxide, $TiO_2$ | 13463-67-7 | >10,000 (rat) | > 10000 (rabbit) | > 6.8 (rat@4hr) |
| Vanadium, V | 7440-62-2 | > 2000 | - | - |
| Vanadium Oxide, $O_5V_2$ | 1314-62-1 | - | - | - |
| Zirconium, Zr | 7440-67-7 | - | - | - |

**HAZARD INFORMATION (Carcinogen, Specific Target Organ Toxicity - Repeat & Single Exposure, Reproductive Toxicity, Germ Cell Mutagenic, Skin Sensitizer, etc.)**

| Chemical | Carcinogenicity | | | | GHS Classifications (Hazard Codes & abbreviations given in "Section #16 Other Info") |
|---|---|---|---|---|---|
| | ACGIH | IARC | NIOSH | NTP | |
| Aluminum, Al<br>CAS#7429-90-5<br>EC#231-072-3 | - | - | - | - |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>Water-reactive = Cat#2, H261 (dust)<br> GHS09<br>Aquatic Acute Hazard = Cat#1, H400<br>HNOS Combustible Dust |
| Aluminum Oxide, $Al_2O_3$<br>CAS#1344-28-1<br>EC#215-691-6 | - | - | - | - |  GHS08<br>STOT RE = Cat#2, H334 (lungs) |
| Carbon, C<br>CAS#7440-44-0<br>EC#231-153-3 | - | - | - | - | HNOS Combustible Dust |
| Cerium, Ce<br>CAS#7440-45-1 | - | - | - | - |  GHS02 |

| | | | | | |
|---|---|---|---|---|---|
| EC#231-154-9 | | | | | Flammable Solid = Cat#1, H228 (dust)<br>Water-reactive = Cat#1, H260 |
| Cerium Oxide, $CeO_2$<br>CAS#1306-38-3<br>EC#215-150-4 | - | - | - | - | none |
| Chromium, Cr<br>CAS#7440-47-3<br>EC#231-157-5 | - | Metal & $Cr^{+3}$ =**3** | - | - | HNOS Combustible Dust |
| Chromium (Hexavalent), $Cr^{+6}$<br>CAS# various<br>EC# various | **A1** | **1** | **Yes** | **K** |  GHS07<br>Skin Sensitizer = Cat#1, H317<br> GHS08<br>Respiratory Sens.= Cat#1, H334<br>Mutagenic = Cat#1B, H340 Carcinogen = Cat#1A, H350<br>Reproductive Toxicity= Cat#1A, H360 |
| Iron, Fe<br>CAS#7439-89-6<br>EC#231-096-4 | - | - | - | - | none |
| Iron Oxide, $Fe_2O_3$<br>CAS#1309-37-1<br>EC#215-168-2 | - | - | - | - | none |
| Molybdenum, Mo<br>CAS#7439-98-7<br>EC#231-107-2 | - | - | - | | HNOS Combustible Dust |
| Nickel, Ni<br>CAS#7440-02-0<br>EC#231-111-4 | Insoluble compounds, as Ni = **A1** | Metal &Alloys =**2B** Compounds= **1** | Metallic, Soluble, Insoluble, Inorganic =**Yes** | Metal, Alloys, Compounds, & Hydroxides=**R** |  GHS07<br>Skin Sensitizer = Cat#1, H317<br> GHS08<br>Carcinogen = Cat#2, H351<br>STOT RE = Cat#1, H372 (inhalation) (lung, kidneys, liver)<br> GHS09<br>Aquatic Acute Hazard = Cat#1, H400<br>Aquatic Chronic Hazard = Cat#3, H412 |
| Niobium, Nb<br>CAS#7440-03-1<br>EC#231-113-5 | - | - | - | - |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>HNOS Combustible Dust |
| Oxygen, O<br>CAS#7782-44-7<br>EC#231-956-9 | - | - | - | - | none |
| Palladium, Pd<br>CAS#7740-05-3<br>EC#231-115-6 | - | - | - | - | none |
| Silicon, Si | - | - | - | - | HNOS Combustible Dust |

| | | | | | |
|---|---|---|---|---|---|
| CAS#7440-21-3<br>EC#231-130-8 | | | | | |
| Silicon Dioxide, $SiO_2$<br>CAS#14808-60-7<br>EC#238-878-4 | - | - | - | - |  GHS08<br>Carcinogenicity = Cat#1B, H350 (inhalation)(lungs) |
| Tantalum, Ta<br>CAS#7440-25-7<br>EC#231-135-5 | - | - | - | - |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>HNOS Combustible Dust |
| Tin, Sn<br>CAS#7440-31-5<br>EC#231-141-8 | **A4** | - | - | **-** | HNOS Combustible Dust |
| Titanium, Ti<br>CAS#7440-32-6<br>EC#231-142-3 | - | - | - | - |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>HNOS Combustible Dust |
| Titanium Dioxide, $TiO_2$<br>CAS#13463-67-7<br>EC#236-675-5 | **A4** | **2B** | **Yes** | **-** |  GHS08 (warning)<br>Carcinogenicity = Cat#2, H351 |
| Vanadium, V<br>CAS#7440-62-2<br>EC#231-171-1 | - | **-** | - | - |  GHS02<br>Flammable Solid = Cat#2, H228 (dust)<br>HNOS Combustible Dust |
| Vanadium Oxide, $V_2O_5$<br>CAS#1314-62-1<br>EC#215-239-8 | - | **-** | - | - |  GHS07,<br>Acute Toxicity(Oral)= Cat#4, H302<br>Acute Toxicity(Inhalative) = Cat#4, H332<br>STOT SE (Inhalative) = Cat#3, H335 (respiratory)<br> GHS08,<br>Mutagenicity = Cat#2, H341<br>Reproductive Toxicity = Cat#2, H361<br>STOT RE = Cat#1, H372 (Inhalative) (lung, liver, heart, blood, brain, endocrine system) |
| Zirconium, Zr<br>CAS#7440-67-7<br>EC#231-176-9 | Zr & compounds =**A4** | **-** | - | - |  GHS02<br>Flammable Solid = Cat#1, H228 (dust)<br>HNOS Combustible Dust |

**ACGIH Carcinogen:** **A1**=confirmed in humans **A2**=suspected in humans
**A3**=confirmed in animals with unknown relevance to humans
**A4**=Not classifiable in humans **A5**=Not suspected
**IARC Human Carcinogen:** **1**=Yes **2**=Probably **2B**=Possibly **3**=Not classifiable in humans
**NIOSH Carcinogen:** **Entry in box**=yes is potential occupational carcinogen
**NTP Carcinogen:** **K**=Known to be **R**=Reasonably anticipated
**OSHA:** **Yes**=OSHA regulated as carcinogen (29 CFR part 1910 Subpart Z)

**Mutagenicity of Material:** See Specific Health Effects of Individual Components below.
**Reproductive Effects:** See Specific Health Effects of Individual Components below.

**Teratogenicity of Material:** See Specific Health Effects of Individual Components below.
**Synergistic Materials:** See Specific Health Effects of Individual Components below.
**Aspiration Hazard:** See Specific Health Effects of Individual Components below.
**Sensitization of Material:** See Specific Health Effects of Individual Components below.

**Symptoms Related to the Physical, Chemical & Toxicological Characteristics**:
Are shown below for several potential individual components. Also see "Section 2. Hazards Identification" and "Section 4. First Aid Measures"

## SPECIFIC HEALTH EFFECTS & OTHER HAZARDS OF INDIVIDUAL COMPONENTS

**Aluminum (Al):** Can irritate eyes, skin, and/or respiratory system. Concentrations of 5000 mg/$m^3$ of 5 micron in size have reportedly caused fibrosis. Finely divided dust may easily ignite and may cause explosions. Reacts with acid, other metals, halogens, carbon disulfide, or methyl chloride. See aluminum oxide.

**Aluminum Oxide ($Al_2O_3$):** Can irritate eyes, skin, and/or respiratory system. Noncombustible solid, but dusts may form explosive mixtures in air. Reacts with chlorine trifluoride, hot chlorinated rubber, acids, and oxidizers.

**Carbon (C):** Nuisance dust. Powder or granular dust can mix with air to spontaneously ignite and/or explode. Dry dust can be charged electrostatically by swirling, pouring, moving, etc. Reactions can form carbon monoxide. As a strong reducing agent, it can react violently with oxidants such as bromates, chlorates and nitrates.

**Chromium (Cr, $Cr^{+3}$, $Cr^{+6}$):** The toxicity of chromium is dependent on its oxidation state. IARC lists certain hexavalent chromium compounds under its Group 1 category "confirmed carcinogenicity to humans" and metallic chromium under its Group 3 category "not classifiable as to their carcinogenicity to humans." Chromium metal is classified as carcinogenic by NTP. Dermatitis may result from exposure to chromium fumes. If metal is heated to high temperatures, as in welding, fumes produced may be toxic to the lungs. Under high temperatures, hexavalent chromium may be produced, if in the insoluble form it is designated a confirmed human carcinogen. Other health effects include nasal irritation and possible kidney and liver damage. Chromite dust may also cause skin ulceration, dermatitis and allergic skin reaction.

**Iron (Fe):** Iron salts can irritate eyes, skin, and mucous membrane. Other targets are the respiratory system and gastrointestinal tract. Exposure can cause abdominal pain, diarrhea, vomiting, and possible liver damage. See iron oxide.

**Iron Oxide ($Fe_2O_3$):** Repeated inhalation of iron oxide fume or dust causes benign pneumoconiosis (siderosis), but generally does not cause symptoms in the exposed person. Available toxicology data contain no evidence that an acute exposure to a high concentration of iron oxide dust and fume would impede escape or cause any irreversible health effects within 30 minutes.

**Molybdenum (Mo):** Available toxicology data contain no evidence that an acute exposure to a high concentration of molybdenum would impede escape or cause any irreversible health effects within 30 minutes. Mining and metallurgy workers chronically exposed to 60 to 600 mg Mo/m3 reported an increased incidence of nonspecific symptoms that included weakness, fatigue, headache, anorexia, and joint and muscle pain. Animal studies involving ingestion (6000 mg Mo/kg) and inhalation (30,000 mg Mo/m3 for 4 weeks or 12,000 mg $MoO_2$/m3 for 1 hour) showed no changes and/or fatalities. Molybdenum

trioxide is an irritant to the eyes and mucous membranes. Fine particles can mix with air to explode. Reacts violently with oxidants, halogens and concentrated nitric acid causing fire.

**Nickel (Ni) & Nickel Compounds:** Short-term exposure may cause mechanical irritation, and the inhalation of fumes may cause pneumonitis. Long-term exposure may cause skin sensitization, asthma, and/or affect lungs. Nickel oxide fumes form at high temperatures and exposure can cause symptoms of asthma after a few hours have passed and physical effort initiated. Nickel compounds produce a variety of toxic effects. Soluble nickel salts cause contact dermatitis in sensitized individuals and eye irritation. Asthmatic lung disease has been reported among nickel-plating workers. Relatively short durations cause pathological changes in the lungs of experimental animals. Nickel and nickel compounds are potential carcinogens. Nickel refining and specific compounds are considered respiratory carcinogens to humans. The American Conference on Governmental Industrial Hygienists recommends that nickel compounds be differentiated according to solubility for their carcinogenic effects.

**Niobium (Nb):** Acute effects include eye or skin irritation. Chronic effects include kidney damage. Also called Columbian. Incompatible with acids, oxidizing agents, fluorine, chlorine, bromine, halocarbons, carbon tetrachloride, and Freon.

**Oxygen (O):** Interstitial oxygen and/or metal oxides are outside the scope of this SDS.

**Palladium (Pd):** No information found.

**Silicon (Si):** Irritates eyes (redness), skin (redness, roughness), and respiratory tract (cough). Reactive with halogens, oxidants, calcium, alkaline/metal carbonates, metal acetylides and cesium carbide. See silicon carbide.

**Silicon Dioxide ($SiO_2$):** Silicon dioxide is chemically and biologically inert when ingested. Heavy exposure to freshly formed silica fume may cause an acute reaction similar to metal fume fever. Respirable quartz dust particles can be inhaled and deposited in the lung. Silicosis, lung cancer and pulmonary tuberculosis are associated with occupational exposure to quartz dust. There is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica in the form of quartz or cristobalite dusts from occupational sources. Because amorphous silica is less fibrogenic than crystalline silica, silicosis has rarely been observed after exposure to pure amorphous silica.

**Tantalum (Ta):** Short-term exposure can irritate eyes (redness), skin, and respiratory system (cough), and can cause pulmonary irritation in animals. Considered to have a low order of toxicity. As surgical implant material, it has demonstrated its physiological inertness. Reactive with strong oxidizers, bromine trifluoride, and fluorine. Dry fine particles can ignite spontaneously and/or form explosive mixtures on contact with air.

**Tin (Sn):** Irritates eye (redness, pain), skin, and respiratory system (cough). Animal testing revealed vomiting, diarrhea, paralysis with muscle twitching, and cancerous lung tumors. Reactive with chlorine, turpentine, acids, and alkalis. Dry fine particles can ignite spontaneously and/or form explosive mixtures on contact with air.

**Titanium (Ti):** A mild pulmonary irritant generally regarded as a nuisance dust. See titanium dioxide.

**Titanium Dioxide ($TiO_2$):** potential respiratory carcinogen. Available toxicology data contain no evidence that an acute exposure to a high concentration of titanium dioxide dust would impede escape

or cause any irreversible health effects within 30 minutes.

**Vanadium (V):** No information found. See vanadium oxide and ferrovanadium dust.

**Vanadium Pentoxide ($V_2O_5$):** Short term exposure can irritate eyes (redness), skin (redness), respiratory tract (sore throat, cough, metallic taste), and/or stomach (nausea, abdominal pain. Long term exposure can cause greenish-black discoloration of the tongue, fine rales, rhinitisand, and/or bronchitis with wheezing and chest pain. Possible human carcinogen. Non-combustible solid, but may increase intensity of fire when in contact with combustible materials; giving off toxic fumes and/or gases. Reacts with lithium and chlorine trifluoride.

**Zirconium (Zr):** Short term exposure may cause mechanical irritation to eyes. Long term exposure might affect lungs. Considered to have a low order of toxicity. Skin rash has been associated with exposure to deodorants containing zirconium. Reacts with borax, carbon tetrachloride when heated, and explosively when heated with alkali metal hydroxides.

## 12. Ecological Information

**Environmental Ecotoxicity:** No data available on this material in its solid state, however, individual components of the material have been found to be toxic to the environment.

**Physical:** No information found.

**Persistence and Degradability:** No data available
**Bio accumulative Potential:** No data available
**Mobility in Soil:** No data available
**Other Adverse Effects:** Dissolved metals can be dangerous to drinking water aquifer even in small quantities.

**Ecotoxicity Effects** listed below by individual component.

| Chemical | AQUATIC PLANTS | FISH | MICRO ORGANISMS | OTHER (Crustacea, Water Flea) |
|---|---|---|---|---|
| Aluminum, Al | - | LC50 (Rainbow trout, 96h)=0.12mg/l Mortality | - | LC50 (Water flea, 24h)=3.5mg/l Mortality |
| Aluminum Oxide, $Al_2O_3$ | - | - | - | - |
| Carbon, C | | | | |
| Chromium, Cr | | LC 50 (Goldfish (Carassius auratus), 7 d): 0.66 mg/l Mortality<br>LC 50 (Carp (Cyprinus carpio), 96 h): 14.3 mg/l Mortality<br>LC 50 (Fathead minnow (Pimephales promelas), 96 h): 37 mg/l Mortality | | EC 50 (Water flea (Daphnia magna), 72 h): 5.2 mg/l Intoxication<br>LC 50 (Water flea (Daphnia pulex), 96 h): |

| | | | | | |
|---|---|---|---|---|---|
| | | | LC 50 (Carp (Cyprinus carpio), 96 h): 93.6 mg/l Mortality | | 90.4 mg/l Mortality<br>LC 50 (Water flea (Daphnia magna), 48 h): 0.022 mg/l Mortality<br>LC 50 (Opossum shrimp (Americamysis bahia), 96 h): 1.56 - 2.45 mg/l Mortality |
| | Chromium (hexavalent), Cr+6 | | 96h LC50: > 139 mg/L (Cyprinus carpio) 96h LC50: 113.6 - 155.7 mg/L (Lepomis macrochirus) 96h LC50: = 320 mg/L (Lepomis macrochirus) 96h LC50: 65.6 - 137.6 mg/L (Lepomis macrochirus) 96h LC50: = 12.3 mg/L (Oncorhynchus mykiss) 96h LC50: 21.209 - 30.046 mg/L (Oryzias latipes) 96h LC50: 15.41 - 30.36 mg/L (Pimephales promelas) 96h LC50: 14 - 20.9 mg/L (Pimephales promelas) 96h LC50: 24.81 - 34.55 mg/L (Poecilia reticulata) 96h LC50: 23 - 41.2 mg/L (Poecilia reticulata) 96h LC50: = 26 mg/L (Morone saxatilis) | | |
| | Iron, Fe | | LC50 96 h: = 0.56 mg/L semi-static (Cyprinus carpio) LC50 96 h: = 13.6 mg/L static (Morone saxatilis) | - | - |
| | Iron Oxide, $Fe_2O_3$ | | The 96 h LC50 of 50% iron oxide black in water to Danio rerio was greater than 10,000 mg/L. | The 3 h EC50 of iron oxide for activated sludge > 10,000 mg/L | The 48 h EC50 of iron oxide to Daphnia magna > 100 mg/L. |
| | Molybdenum, Mo | | | | |
| | Nickel, Ni | EC50 96 h: 0.174 - 0.311 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 0.18 mg/L | LC50 96 h: = 0.56 mg/L semi-static (Cyprinus carpio) LC50 96 h: = 13.6 mg/L static (Morone saxatilis)<br><br>The 96h LC50s values range from 0.4 mg Ni/L for Pimephales promelas to 320 | - The 30 min EC50 of nickel for activated sludge was 33mg Ni/L.<br><br>EC50 Freshwater | C50 48 h: = 1 mg/L Static (Daphnia magna) EC50 48 h: > 100 mg/L (Daphnia magna |

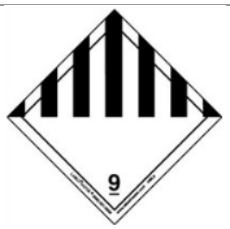
| | | | | |
|---|---|---|---|---|
| | (Pseudokirchneriella subcapitata)<br><br>NOEC/EC10 values range from 12.3 µg/l for Scenedesmus accuminatus to 425 µg/l for Pseudokirchneriella subcapitata. | mg Ni/L for Brachydanio rerio. | Algae 72hr-0.18mg/l | The 48h LC50s values range from 0.013 mg Ni/L for Ceriodaphnia dubia to 4970 mg Ni/L for Daphnia magna. |
| Niobium, Nb | - | - | - | - |
| Oxygen, O | | | | |
| Palladium, Pd | | | | |
| Silicon, Si | | | | |
| Tantalum, Ta | | | | |
| Tin, Sn | | | | |
| Titanium, Ti | | | | |
| Titanium Dioxide, $TiO_2$ | The 72 h EC50 of titanium dioxide to Pseudokirchnerella subcapitata was 61 mg of TiO2/L. | The 96 h LC50 of titanium dioxide to Cyprinodon variegatus >10,000 mg of TiO2/L.<br>The 96 h LC50 of titanium dioxide to Pimephales promelas > 1,000 mg of TiO2/L . | The 3 h EC50 of titanium dioxide for activated sludge > 1000 mg/L. | The 48 h EC50 of titanium dioxide to Daphnia Magna > 1000 mg of TiO2/L. |
| Vanadium, V | The 72 h EC50 of vanadium pentoxide to Desmodesmus subspicatus was 2,907 ug of V/L. | The 96 h LC50 of vanadium pentoxide to Pimephales promelas was 1,850 ug of V/L . | The 3 h EC50 of sodium metavanadate for activated sludge >100 mg/L. | The 48 h EC50 of sodium vanadate to Daphnia magna was 2,661 ug of V/L. |
| Vanadium Oxide, $O_5V_2$ | | | | |
| Zirconium, Zr | | | | |

## 13. Disposal Considerations

**Waste Disposal Methods:** Recycle when possible. When disposed of as a waste, it would be considered hazardous waste when chromium constituent is present. Wastes must be tested using methods described in 40 CFR Part 261. It is the generator's responsibility to determine if the waste meets applicable definitions of hazardous wastes. Dispose of waste material according to Local, State, Federal and Provincial Environmental Regulations.

**Packaging Disposal:** Dispose of containers in compliance with local, state, and federal regulations. When possible, use metal containers and recycle along with metal material.

## 14. Transport Information

| SHIPPING INFORMATION | AS MATERIAL PRODUCT OR RECYCLABLE | AS DISPOSED WASTE, IT COULD BECOME (when chromium present): |
|---|---|---|
| **Regulated** | Not regulated by DOT or RCRA | Regulated by DOT and RCRA |
| **Proper Shipping Name & Description** | Not applicable | Environmentally hazardous substances, solid, n.o.s |
| **UN Number** | Not applicable | UN3077 |
| **Hazard Class** | Not applicable | 9 |
| **Packing/Risk Group** | Not applicable | PG III |
| **ERG Response #** | Not applicable | ERG# 171 |
| **Labels** | Not applicable |  Miscellaneous Dangerous Good Label |

## 15. Regulatory Information

The Clean Air Act, the Clean Water Act and Resource Conservation & Recovery Act may apply to the processing of metal particulates and air emissions. The following lists of regulation may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.

| < Regulation | Aluminum, Al | Aluminum Oxide, AlO2 | Chromium, Cr | Chromium, Hexavalent, Cr+6 | Iron, Fe | Iron Oxide, Fe2O3 | Molybdenum, Mo | Nickel, Ni | Niobium, Nb | Palladium, Pd | Silicon, Si | Tantalum, Ta | Tin, Sn | Titanium, Ti | Titanium Dioxide, TiO2 | Vanadium, V | Zirconium, Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EPCRA SARA 302 EHS TPQ (40 CFR 355 App. A)** | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | na |
| **EPCRA SARA 304 EHS RQ (40 CFR Table 302.4)** | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | na |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EPCRA SARA 311/312** | Chronic | Acute, Chronic | | Chronic | | | | | | | | | | | | | |
| **EPCRA SARA 313 (40 CFR 372.65) Mfg=25,000# Other= 10,000#** | Fume & Dust only | Fibrous Form only | Yes | Yes | No | No | No | Yes | No | No | No | No | No | No | No | Yes, Except when in alloy | No |
| **EPCRA SARA 313 Threshold Value %** | 1.0 Fume &Dust only | 1.0 Fiber Form only | 1.0 | 0.1 | n/a | n/a | n/a | 0.1 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 1.0, Except in alloy | na |
| **TSCA** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **CAA Section 112(r) TQ (pounds)** | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| **CWA Toxic Pollutant** | No | No | Yes | Yes | No | No | No | Yes | No | No | No | No | No | No | No | No | No |
| **CWA Priority Pollutant (40 CFR part 423 app A)** | No | No | Yes | Yes | No | No | No | Yes | No | No | No | No | No | No | No | No | No |
| **CWA Hazardous Substance (Section 311(b)(4))** | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No | No |
| **CERCLA RQ (pounds)** | n/a | n/a | 5000 | Yes | n/a | n/a | n/a | 100 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | na |
| **REACH SVHC** | - | - | - | Yes | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **REACH Authorize Use (Annex XIV)** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **REACH Cond of Restriction (Annex XVII)** | - | - | - | - | - | - | - | Yes (jewelry) | - | - | - | - | - | - | - | - | - |

| Regulation > | Aluminum, Al | Aluminum Oxide, AlO2 | Chromium, Cr | Chromium, Hexavalent, Cr+6 | Iron, Fe | Iron Oxide, Fe2O3 | Molybdenum, Mo | Nickel, Ni | Niobium, Nb | Palladium, Pd | Silicon, Si | Tantalum, Ta | Tin, Sn | Titanium, Ti | Titanium Dioxide, TiO2 | Vanadium, V | Zirconium, Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Prop 65 known to cause cancer** | No | No | No | Yes | No | No | No | Yes | No | No | No | No | No | No | Yes, Dust only | No | No |
| **California Prop 65 Developmental Toxicity** | No | No | No | Yes | No | No | No | Yes | No | No | No | No | No | No | No | No | No |
| **California Prop 65 Male Reprod Toxicity** | No | No | No | Yes | No | No | No | Yes | No | No | No | No | No | No | No | No | No |
| **California Prop 65 Female Reprod Toxicity** | No | No | No | Yes | No | No | No | Yes | No | No | No | No | No | No | No | No | No |

## 16. Other Information

**Key/Legend:**
ACGIH = American Conference of Governmental Industrial Hygienists
Action Level = 8-hour time-weighted average concentration that initiates certain required activities such as exposure monitoring and medical surveillance.
CAA = Clean Air Act
CAT# = Category Code Number for GHS Hazard
CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
CFR = Code of Federal Regulations
CWA = Clean Water Act
EHS = Extremely Hazardous Substance
EPA = Environmental Protection Agency
EPCRA = Emergency Planning and Community Right-To-Know Act

**Hazard Codes for GHS that are applicable if used in SDS sections above:**
H228 = Flammable solid.
H252 = Self-heating in large quantities; may catch fire.

H260 = In contact with water releases flammable gases which may ignite spontaneously.
H261 = In contact with water releases flammable gases.
H300 = Fatal if swallowed.
H301 = Toxic if swallowed.
H302 = Harmful if swallowed.
H310 = Fatal in contact with skin.
H314 = Causes severe skin burns and eye damage.
H315 = Causes skin irritation.
H317 = May cause an allergic skin reaction.
H318 = Causes serious eye damage.
H319 = Causes serious eye damage.
H330 = Fatal if inhaled.
H331 = Toxic if inhaled.
H332 = Harmful if inhaled.
H334 = May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335 = May cause respiratory irritation.
H340 = May cause genetic defects.
H341 = Suspected of causing genetic defects
H350 = May cause cancer.
H351 = Suspected of causing cancer.
H360 = May damage fertility or the unborn child.
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.
H400 = Very toxic to aquatic life.
H410 = Very toxic to aquatic life with long lasting effects.
H412 = Harmful to aquatic life with long lasting effects.

HMIS = Hazardous Material Identification System
HNOC = Hazards Not Otherwise Classified
IARC = International Agency for Research on Cancer
IDLH = Immediately Dangerous to Life or Health
$LD_{50}$ = LD stands for "Lethal Dose". $LD_{50}$ is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. The $LD_{50}$ is one way to measure the short-term poisoning potential (acute toxicity) of a material.
$LC_{50}$ = LC stands for "Lethal Concentration". LC values usually refer to the concentration of a chemical in air but in environmental studies it can also mean the concentration of a chemical in water.
MSHA = Mine Safety and Health Administration
n/a = Not applicable.
NFPA = National Fire Protection Association
NIOSH = National Institute for Occupational Safety and Health
NTP = National Toxicology Program
PEL = Permissible Exposure Limit based on an 8-hour time weighted average.
OSHA = Occupational Safety and Health Administration (United States of America)
REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals (European Union)
RQ = Reportable Quantity
SARA = Superfund Amendments and Reauthorization Act
ST = Short Term Exposure Limit (15-minute TWA exposure that should not be exceeded).
STEL = Short Term Exposure Limit (15-minute TWA exposure that should not be exceeded).
STOT RE= Specific Target Organ Toxicity (Repeat Exposure)
STOT SE= Specific Target Organ Toxicity (Short Term Exposure)

SVHC = Substance of Very High Concern
TPQ = Threshold Planning Quantity
TLV = Threshold Limit Value
TSCA = Toxic Substance Control Act
TWA = Time Weighted Average
WT% = Weight percent

**Disclaimer**

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. All information provided on this Safety Data Sheet is based upon data obtained from the manufacturer and/or recognized technical sources. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.