SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier
Product Name
Stainless Steel

Other means of identification
Product Code
FRP008

Synonyms
Stainless Steel: ATI 20 ™, ATI 20-20+Nb ™, ATI 201 ™, ATI 219 ™, 21-6-9, AL40, XM-11,
ATI 301 ™, ATI 302 ™, ATI 303 ™, ATI 304 ™, ATI 305 ™, ATI 309 ™, ATI 310 ™, ATI 316 ™,
ATI 317 ™, ATI 321 ™, ATI 255 ™ DUPLEX, ATI 332 ™, ATI 334 ™, ATI 347 ™, ATI 348 ™,
AM 350®, AM 355 ™, ATI 403 ™, ATI Ohmaloy® 30, ATI Ohmaloy® 40, ATI Ohmaloy®, ATI
409 HP ™, ATI 409Cb ™, ATI 410 ™, ATI 412 ™, Type 415, ATI 416 ™, ATI 420 ™, ATI
430 ™, ATI 433 ™, Type 434, Type 436, ATI 439 ™, ATI 439 HP ™, XM-8, Type 441, 18-0,
AL 18CrCb, ATI 441 HP ™, ATI 444 ™, 18-2, ATI 468 ™, ATI 15-5 ™, ATI 17-4 ™, ATI
17-7 ™, ATI 15-7 ™, ATI JS700® ALLOY, ATI 800 ™ ALLOY, ATI 825 ™ ALLOY, Type 840,
ATI E-BRITE® 26-1, ASTM XM 27, ATI 2205 ™ DUPLEX; 318, ATI 2205 ™ DUPLEX; 322,
ATI 201LN ™, Type 301L, ATI 304 DA ™, Type 304H, ATI 304L ™, 374L, Type 304LN, Type
304N, Type 309H, ATI 309S ™, 398, Type 309Si, Type 310Cb, Type 310H, Type 310L, ATI
310S ™, Type 310Si, ATI 316L ™, 376, ATI 316LN ™, ATI 316Ti ™, ATI 317 ™, ATI
317LMN ™, 317 LX, 317 LNX, 317 XN, Type 321H, Type 410 MOD, Type 410HC, ATI
410S ™, ATI 418 SPL ™, Type 420HC, ALLEGHENY Type 425 Modified, ATI 436S ™, ATI
440A ™, ATI 440C ™, ATI 800 AT ™ ALLOY, ATI 800 H ™ ALLOY, ATI 904L ™, ATI 610 ™,
ATI 611 ™, ATI 13-8Mo ™, ATI 13-8 SuperTough®, AL 13-8 STAINLESS STEEL, ASTM
Type XM-13, ATI 2003® DUPLEX, AL 20-25+Nb alloy, AL 29-4C®, AL 332Mo® alloy, AL
334Mo® alloy, ATI 201H ™, AL33, XM-29, ATI 4565 ™, ATI 50 ™, 22-13-5, XM-19, AL60,
21800, AL-6XN® ALLOY, AL-6XN Plus® ALLOY, A286 Altemp®, PC1017, Sea Cure ®
26-3-3, Zeron® 100, 22-4-9, 21-11N, HOLDER BLOCK STEEL, MAXEL 400 SUPER,
AL-6X, AL 404, Type 405, Type 446, AL 29-4C®, AL 29-4, AL 29-4-2, 14-4 FERRITIC,
AL 453, AL 466, ALTEMP ® ALLOY STEEL, 19-9-DL, Type 302B, ATI 409Cb ™, Type 409Ni,
ATI 430Ti ™, ALLEGHENY EDRO 441MOD1, ALLEGHENY CRUCIBLE 441M0D2, TOOL
STEEL D2T, CSM-21 STAINLESS STEEL, ULTRACHEM STAINLESS STEEL, RA85H
STEEL, 385, ZeCor ™, RA 330 ™, ATI304B7 P/M ™ BOR7

Recommended Use of the chemical and restrictions on use
Recommended Use
Stainless steel product manufacture.

Uses advised against

Details of the supplier of the safety data sheet
Manufacturer Address
ATI, 1000 Six PPG Place, Pittsburgh, PA
15222 USA

Emergency telephone number
Emergency Telephone
Chemtrec: 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200). This product is
an article and, as such, does not present a hazard to human health by inhalation or ingestion.

Skin sensitization
Category 1

Carcinogenicity
Category 2

Specific target organ toxicity (repeated exposure)
Category 1
Emergency Overview

Danger

Hazard statements
Suspected of causing cancer
May cause an allergic skin reaction
Causes damage to respiratory track prolonged or repeated exposure if inhaled.

Appearance Various massive product
Physical state Solid
Odor Odorless

Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wear protective gloves

If skin irritation or rash occurs: Get medical advice/attention

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
Not applicable

Other Information
When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: Zinc, copper, magnesium, or cadmium fumes may cause metal fumes fever, Titanium dioxide an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer, Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms
Stainless Steel: ATI 20™, ATI 20-20+Nb™, ATI 201™, ATI 219™, 21-6-9, AL40, XM-11, ATI 301™, ATI 302™, ATI 303™, ATI 304™, ATI 305™, ATI 309™, ATI 310™, ATI 316™, ATI 317™, ATI 321™, ATI 255™ DUPLEX, ATI 332™, ATI 334™, ATI 347™, ATI 348™, AM 350®, AM 355™, ATI 403™, ATI Ohmaloy® 30, ATI Ohmaloy® 40, ATI Ohmaloy®, ATI 409 HP™, ATI 409 Cb™, ATI 410™, ATI 412™, Type 415, ATI 416™, ATI 420™, ATI 430™, ATI 433™, Type 434, Type 436, ATI 439™, ATI 439 HP™, XM-8, Type 441, 18-0, AL 18CrCb, ATI 441 HP™, ATI 444™, 18-2, ATI 468™, ATI 15-5™, ATI 17-4™, ATI 17-7™, ATI 15-7™, ATI JS700® ALLOY, ATI 800™ ALLOY, ATI 825™ ALLOY, Type 840, ATI E-BRITE® 26-1, ASTM XM 27, ATI 2205™ DUPLEX; 318, ATI 2205™ DUPLEX; 322, ATI 201LN™, Type 301L, ATI 304 DA™, Type 304H, ATI 304L™, 374L, Type 304LN, Type 304N, Type 309H, ATI 309S™, 398, Type 309Si, Type 310Cb, Type 310H, Type 310L, ATI 310S™, Type 310Si, ATI 316L™, 376, ATI 316LN™, ATI 316Ti™, ATI 317L™, ATI 317LMN™, 317 LX, 317 LXM, 317 XN, Type 321H, Type 410 MOD, Type 410HC, ATI 410S™, ATI 418 SPL™, Type 420HC, ALLEGHENY Type 425 Modified, ATI 436S™, ATI 440A™, ATI 440C™, ATI 800 AT™ ALLOY, ATI 800 H™ ALLOY, ATI 904L™, ATI 610™,
4. FIRST AID MEASURES

First aid measures

Eye contact
In the case of particles coming in contact with eyes during processing, treat as with any foreign object.

Skin Contact
In the case of skin irritation or allergic reactions see a physician.

Inhalation
If excessive amounts of vapors, smoke, fume, or particles are inhaled during processing, remove to fresh air and consult a qualified health professional.

Ingestion
Not an expected route of exposure.

Most important symptoms and effects, both acute and delayed

Symptoms
May cause allergic skin reaction.

Indication of any immediate medical attention and special treatment needed

Note to physicians
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Not flammable in the form of this product as distributed, flammable as finely divided particles or pieces resulting from processing of this product. Smother with salt (NaCl) or class D dry powder fire extinguisher.

Unsuitable extinguishing media
Do not spray water on burning metal as an explosion may occur. This explosive characteristic is caused by the hydrogen and steam generated by the reaction of water with the burning material.

Specific hazards arising from the chemical
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. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimize combustible dust hazard.

**Hazardous combustion products**
Titanium dioxide an IARC Group 2B carcinogen. Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system. Zinc, copper, magnesium, or cadmium fumes may cause metal fumes fever. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

**Explosion data**
- Sensitivity to Mechanical Impact: None.
- Sensitivity to Static Discharge: None.

**Protective equipment and precautions for firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH approved (or equivalent) respirator and full protective gear.

### 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions, protective equipment and emergency procedures**

**Personal precautions**
Use personal protective equipment as required.

**For emergency responders**
Use personal protective equipment as required.

**Environmental precautions**

**Environmental precautions**
Not applicable to massive product.

**Methods and material for containment and cleaning up**

**Methods for containment**
Not applicable to massive product.

**Methods for cleaning up**
Not applicable to massive product.

### 7. HANDLING AND STORAGE

**Precautions for safe handling**

**Advice on safe handling**
Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimize combustible dust hazard.

**Conditions for safe storage, including any incompatibilities**

**Storage Conditions**
Keep chips, turnings, dust, and other small particles away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity).

**Incompatible materials**
Dissolves in hydrofluoric acid. Ignites in the presence of fluorine. When heated above 200°C, reacts exothermically with the following: Chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, and freon.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Control parameters**

**Exposure Guidelines**
### Chemical Name

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>TWA: 1.5 mg/m³ inhalable fraction</td>
<td>TWA: 1 mg/m³</td>
</tr>
<tr>
<td>Nickel</td>
<td>TWA: 0.5 mg/m³</td>
<td>TWA: 1 mg/m³</td>
</tr>
<tr>
<td>Chromium</td>
<td>(vacated) STEL: 3 mg/m³ fume Ceiling: 5 mg/m³ TWA: 1 mg/m³ Mn</td>
<td></td>
</tr>
<tr>
<td>Manganese</td>
<td>TWA: 0.02 mg/m³ respirable fraction TWA: 0.1 mg/m³ inhalable fraction TWA: 0.02 mg/m³ Mn TWA: 0.1 mg/m³ Mn</td>
<td>(vacated) Ceiling: 5 mg/m³ fume Ceiling: 5 mg/m³ Mn</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>TWA: 10 mg/m³ inhalable fraction TWA: 3 mg/m³ respirable fraction</td>
<td>-</td>
</tr>
<tr>
<td>Silicon</td>
<td>TWA: 0.2 mg/m³ fume TWA: 1 mg/m³ Cu dust and mist TWA: 0.1 mg/m³ fume TWA: 1 mg/m³ dust and mist</td>
<td>TWA: 15 mg/m³ total dust TWA: 5 mg/m³ respirable fraction</td>
</tr>
<tr>
<td>Aluminum</td>
<td>TWA: 1 mg/m³ respirable fraction TWA: 5 mg/m³ total dust TWA: 5 mg/m³ respirable fraction</td>
<td>-</td>
</tr>
<tr>
<td>Copper</td>
<td>STEL: 10 mg/m³ STEL: 10 mg/m³ W TWA: 5 mg/m³ TWA: 5 mg/m³ W</td>
<td>(vacated) STEL: 10 mg/m³ (vacated) STEL: 10 mg/m³ W</td>
</tr>
<tr>
<td>Titanium</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Boron</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vanadium</td>
<td>Ceiling: 0.5 mg/m³ V2O5 respirable dust Ceiling: 0.1 mg/m³ V2O5 fume</td>
<td>-</td>
</tr>
<tr>
<td>Tantalum</td>
<td>TWA: 5 mg/m³</td>
<td>TWA: 5 mg/m³</td>
</tr>
<tr>
<td>Niobium (Columbium)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Appropriate engineering controls

#### Engineering Controls
Avoid generation of uncontrolled particles.

#### Individual protection measures, such as personal protective equipment

- **Eye/face protection**
  When airborne particles may be present, appropriate eye protection is recommended. For example, tight-fitting goggles, foam-lined safety glasses or other protective equipment that shield the eyes from particles.

- **Skin and body protection**
  Fire/flame resistant/retardant clothing may be appropriate during hot work with the product. Cut-resistant gloves and/or protective clothing may be appropriate when sharp surfaces are present.

- **Respiratory protection**
  When particulates/fumes/gases are generated and if exposure limits are exceeded or irritation is experienced, proper approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

#### General Hygiene Considerations
Handle in accordance with good industrial hygiene and safety practice.

---

### 9. PHYSICAL AND CHEMICAL PROPERTIES

#### Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks • Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
<td>-</td>
</tr>
<tr>
<td>Appearance</td>
<td>Various massive product forms</td>
<td>-</td>
</tr>
<tr>
<td>Color</td>
<td>metallic, gray</td>
<td>-</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
<td>-</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Not applicable</td>
<td>-</td>
</tr>
<tr>
<td>pH</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>1430-1540 °C / 2600-2800 °F</td>
<td>-</td>
</tr>
</tbody>
</table>
Boiling point / boiling range
Flash point
Evaporation rate
Flammability (solid, gas)

Flammability Limit in Air
   Upper flammability limit:
   Lower flammability limit:

Vapor pressure
Vapor density
Specific Gravity
Water solubility
Solubility in other solvents
Partition coefficient
Autoignition temperature
Decomposition temperature
Kinematic viscosity
Dynamic viscosity

Explosive properties
Oxidizing properties

Other Information
Softening point
Molecular weight
VOC Content (%)
Density
Bulk density

10. STABILITY AND REACTIVITY

Reactivity
Not applicable

Chemical stability
Stable under normal conditions.

Possibility of Hazardous Reactions
None under normal processing.

   Hazardous polymerization
   Hazardous polymerization does not occur.

Conditions to avoid
Dust formation and dust accumulation;

Incompatible materials
Dissolves in hydrofluoric acid. Ignites in the presence of fluorine. When heated above 200°C, reacts exothermically with the following: Chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, and freon.

Hazardous Decomposition Products
When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: Titanium dioxide an IARC Group 2B carcinogen. Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure
Product Information

**Inhalation**
Not an expected route of exposure for product in massive form.

**Eye contact**
Not an expected route of exposure for product in massive form.

**Skin Contact**
May cause sensitization by skin contact.

**Ingestion**
Not an expected route of exposure for product in massive form.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron 7439-89-6</td>
<td>98,600 mg/kg bw</td>
<td>-</td>
<td>&gt; 0.25 mg/L</td>
</tr>
<tr>
<td>Nickel 7440-02-0</td>
<td>&gt; 9000 mg/kg bw</td>
<td>-</td>
<td>&gt; 10.2 mg/L</td>
</tr>
<tr>
<td>Chromium 7440-47-3</td>
<td>&gt; 3400 mg/kg bw</td>
<td>-</td>
<td>&gt; 5.41 mg/L</td>
</tr>
<tr>
<td>Manganese 7439-96-5</td>
<td>&gt; 2000 mg/kg bw</td>
<td>-</td>
<td>&gt; 5.14 mg/L</td>
</tr>
<tr>
<td>Molybdenum 7439-98-7</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 5.10 mg/L</td>
</tr>
<tr>
<td>Silicon 7440-21-3</td>
<td>&gt; 5000 mg/kg bw</td>
<td>&gt; 5000 mg/kg bw</td>
<td>&gt; 2.08 mg/L</td>
</tr>
<tr>
<td>Copper 7440-50-8</td>
<td>481 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 5.11 mg/L</td>
</tr>
<tr>
<td>Aluminum 7429-90-5</td>
<td>15,900 mg/kg bw</td>
<td>-</td>
<td>&gt; 1 mg/L</td>
</tr>
<tr>
<td>Tungsten 7440-33-7</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 5.4 mg/L</td>
</tr>
<tr>
<td>Titanium 7440-32-6</td>
<td>&gt; 5000 mg/kg bw</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Boron 19287-88-8</td>
<td>&gt; 2000 mg/kg bw</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vanadium 7440-62-2</td>
<td>&gt; 2000 mg/kg bw</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tantalum 7440-25-7</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 5.18 mg/L</td>
</tr>
<tr>
<td>Niobium (Columbium) 7440-03-1</td>
<td>&gt; 10,000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
<td>-</td>
</tr>
</tbody>
</table>

**Information on toxicological effects**

**Symptoms**
May cause sensitization by skin contact.

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Acute toxicity**
Product not classified.

**Skin corrosion/irritation**
Product not classified.

**Serious eye damage/eye irritation**
Product not classified.

**Sensitization**
May cause sensitization by skin contact.

**Germ cell mutagenicity**
Product not classified.

**Carcinogenicity**
May cause cancer by inhalation.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel 7440-02-0</td>
<td>Group 1</td>
<td>Group 1B</td>
<td>Known</td>
<td>X</td>
</tr>
<tr>
<td>Chromium 7440-47-3</td>
<td>Group 3</td>
<td></td>
<td>Reasonably Anticipated</td>
<td></td>
</tr>
</tbody>
</table>

**Reproductive toxicity**
Product not classified.

**STOT - single exposure**
Product not classified.

**STOT - repeated exposure**
Causes disorder and damage to the: Respiratory System.

**Aspiration hazard**
Product not classified.
### 12. ECOLOGICAL INFORMATION

**Ecotoxicity**

This product as shipped is not classified for aquatic toxicity. This product contains a chemical which is listed as a severe marine pollutant according to IMDG/IMO

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Algae/aquatic plants</th>
<th>Fish</th>
<th>Toxicity to microorganisms</th>
<th>Crustacea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron 7439-89-6</td>
<td>-</td>
<td>The 96 h LC50 of 50% iron oxide black in water to Danio rerio was greater than 10,000 mg/L.</td>
<td>The 3 h EC50 of iron oxide for activated sludge was greater than 10,000 mg/L.</td>
<td>The 48 h EC50 of iron oxide to Daphnia magna was greater than 100 mg/L.</td>
</tr>
<tr>
<td>Nickel 7440-02-0</td>
<td>NOEC/EC10 values range from 12.3 µg/l for Scenedesmus accumulatus to 425 µg/l for Pseudokirchneriella subcapitata.</td>
<td>The 96h LC50s values range from 0.4 mg Ni/L for Pimephales promelas to 320 mg Ni/L for Brachydanio rerio.</td>
<td>The 30 min EC50 of nickel for activated sludge was 33 mg Ni/L.</td>
<td>The 48h LC50s values range from 0.013 mg Ni/L for Ceriodaphnia dubia to 4970 mg Ni/L for Daphnia magna.</td>
</tr>
<tr>
<td>Chromium 7440-47-3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Manganese 7439-96-5</td>
<td>-</td>
<td>The 72 h EC50 of manganese to Desmodesmus subspicatus was 2.8 mg of Mn/l.</td>
<td>The 96 h LC50 of manganese to Oncorhynchus mykiss was greater than 3.6 mg of Mn/L.</td>
<td>The 48 h EC50 of manganese to Daphnia magna was greater than 1.6 mg/L.</td>
</tr>
<tr>
<td>Molybdenum 7439-98-7</td>
<td>-</td>
<td>The 72 h EC50 of sodium molybdate dihydrate to Pseudokirchneriella subcapitata was 362.9 mg of Mo/L.</td>
<td>The 96 h LC50 of sodium molybdate dihydrate to Pimephales promelas was 644.2 mg/L.</td>
<td>The 48 h LC50 of sodium molybdate dihydrate to Ceriodaphnia dubia was 1,015 mg/L.</td>
</tr>
<tr>
<td>Silicon 7440-21-3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Aluminum 7429-90-5</td>
<td>The 96 h LC50 of sodium molybdate dihydrate to Pseudokirchneriella subcapitata ranged between 30 µg/L (pH 7.02, hardness 250 mg/L CaCO3, DOC 1.95 mg/L) and 824 µg/L (pH 6.22, hardness 100 mg/L CaCO3, DOC 15.8 mg/L).</td>
<td>The 96 h LC50 of aluminum to Oncorhynchus mykiss was 7.4 mg of A/l at pH 6.5 and 14.6 mg of A/l at pH 7.5</td>
<td>-</td>
<td>The 48-hr LC50 for Ceriodaphnia dubia exposed to Aluminum chloride increased from 0.72 to greater than 99.6 mg/L with water hardness increasing from 25 to 200 mg/L.</td>
</tr>
<tr>
<td>Copper 7440-50-8</td>
<td>The 72 h EC50 values of copper chloride to Pseudokirchneriella subcapitata ranged between 30 µg/L (pH 7.02, hardness 250 mg/L CaCO3, DOC 1.95 mg/L) and 824 µg/L (pH 6.22, hardness 100 mg/L CaCO3, DOC 15.8 mg/L).</td>
<td>The 96-hr LC50 for Pimephales promelas exposed to Copper sulfate ranged from 256.2 to 38.4 µg/L with water hardness increasing from 45 to 255.7 mg/L.</td>
<td>The 24 h NOEC of copper chloride for activated sludge ranged from 0.32 to 0.64 µg of Cu/L.</td>
<td>The 48 h LC50 values for Daphnia magna exposed to copper in natural water ranged between 33.8 µg/L (pH 6.1, hardness 12.4 mg/L CaCO3, DOC 2.34 mg/L) and 792 µg/L (pH 7.35, hardness 139.7 mg/L CaCO3, DOC 22.8 mg/L).</td>
</tr>
<tr>
<td>Tungsten 7440-33-7</td>
<td>The 72 h EC50 of sodium tungstate to Pseudokirchneriella subcapitata was 31.0 mg of W/L.</td>
<td>The 96 h LC50 of sodium tungstate to Danio rerio was greater than 106 mg of W/L.</td>
<td>The 30 min EC50 of sodium tungstate for activated sludge were greater than 1000 mg/L.</td>
<td>The 48 h EC50 of sodium tungstate to Daphnia magna was greater than 96 mg of W/L.</td>
</tr>
<tr>
<td>Titanium 7440-32-6</td>
<td>The 72 h EC50 of titanium dioxide to Pseudokirchneriella subcapitata was 61 mg of TiO2/L.</td>
<td>The 96 h LC50 of titanium dioxide to Cyprinodon variegatus was greater than 10,000 mg of TiO2/L.</td>
<td>The 3 h EC50 of titanium dioxide for activated sludge were greater than 1000 mg/L.</td>
<td>The 48 h EC50 of titanium dioxide to Daphnia Magna was greater than 1000 mg of TiO2/L.</td>
</tr>
</tbody>
</table>
Boron 19287-88-8

The 72-h EC50 value for reduction of biomass of Pseudokirchneriella subcapitata exposed to Boric acid at pH 7.5 to 8.3 was 40.2 mg/L.
The 96-hr LC50 for Pimephales promelas exposed to Boric acid (82%)/borax (18%) mixture was 79.7 mg/L with water hardness of 91 mg/L and water pH of 8.0.
The 3 h NOEC of boric acid for activated sludge ranged from 17.5 to 20 mg/L.
The 48-hr LC50 for Ceriodaphnia dubia exposed to Boric acid/borax mixture ranged from 91 to 165 mg/L with pH ranging from 6.7 to 8.4.

Vanadium 7440-62-2

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 was greater than 100 mg/L.
The 48 h EC50 of sodium vanadate to Daphnia magna was 2,661 ug of V/L.

Tantalum 7440-25-7

Niobium (Columbium) 7440-03-1

Persistence and degradability

- 

Bioaccumulation

- 

Other adverse effects

This product as shipped is not classified for environmental endpoints. However, when subjected to sawing or grinding, particles may be generated that are classified for aquatic acute or aquatic chronic toxicity.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated packaging

None anticipated.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>RCRA - D Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium 7440-47-3</td>
<td>5.0 mg/L regulatory level</td>
</tr>
</tbody>
</table>

This product contains one or more substances that are listed with the State of California as a hazardous waste.

14. TRANSPORT INFORMATION

DOT

Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA - Complies
DSL/NDSL - Complies
EINECS/ELINCS - Complies
ENCS - Complies
IECSC - Complies
KECL - Complies
PICCS - Complies
AICS - Complies

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372: Chromium (Cr)

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel - 7440-02-0</td>
<td>7440-02-0</td>
<td>0-46</td>
<td>0.1</td>
</tr>
<tr>
<td>Chromium - 7440-47-3</td>
<td>7440-47-3</td>
<td>10-30</td>
<td>1.0</td>
</tr>
<tr>
<td>Manganese - 7439-96-5</td>
<td>7439-96-5</td>
<td>0-10</td>
<td>1.0</td>
</tr>
<tr>
<td>Copper - 7440-50-8</td>
<td>7440-50-8</td>
<td>0-4.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazard Categories

- Acute health hazard: Yes
- Chronic Health Hazard: Yes
- Fire hazard: No
- Sudden release of pressure hazard: No
- Reactive Hazard: No

CWA (Clean Water Act)
This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
<th>CWA - Hazardous Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel - 7440-02-0</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chromium - 7440-47-3</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper - 7440-50-8</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Hazardous Substances RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel - 7440-02-0</td>
<td>100 lb</td>
</tr>
<tr>
<td>Chromium - 7440-47-3</td>
<td>5000 lb</td>
</tr>
<tr>
<td>Copper - 7440-50-8</td>
<td>5000 lb</td>
</tr>
</tbody>
</table>

US State Regulations

California Proposition 65
This product contains the following Proposition 65 chemicals

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>California Proposition 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel - 7440-02-0</td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel - 7440-02-0</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Element</td>
<td>CAS Number</td>
<td>NFPA Health hazards</td>
<td>Flammability</td>
</tr>
<tr>
<td>------------------</td>
<td>------------</td>
<td>---------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Chromium</td>
<td>7440-47-3</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>7439-98-7</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Silicon</td>
<td>7440-21-3</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Copper</td>
<td>7440-50-8</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Aluminum</td>
<td>7429-90-5</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tungsten</td>
<td>7440-33-7</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Titanium</td>
<td>7440-32-6</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td>7440-62-2</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tantalum</td>
<td>7440-25-7</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. EPA Label Information
EPA Pesticide Registration Number: Not applicable

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health hazards 1</td>
<td>0</td>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td>HMIS Health hazards</td>
<td>2*</td>
<td>0</td>
<td>Physical hazards 0</td>
</tr>
<tr>
<td>Chronic Hazard Star Legend * = Chronic Health Hazard</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Issue Date: 28-May-2015
Revision Date: 27-May-2016
Revision Note: Updated Section(s): 1, 3, 7

Note:
The information provided in this safety data sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered 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 materials or in any process, unless specified in the text.

End of Safety Data Sheet

Additional information available from:
Safety data sheets and labels available at ATImetals.com