Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Code  PM007
Product Name  Titanium Alloy With Cobalt Compacts
Synonyms  Titanium Alloy With Cobalt Compacts: - TNM Co Compacts
Contains Cobalt, Nickel

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

Recommended Use  Titanium alloy product manufacture
Uses advised against

1.3. Details of the supplier of the safety data sheet

Manufacturer  ATI, 1000 Six PPG Place, Pittsburgh, PA 15222 USA

1.4. Emergency telephone number

Emergency Telephone  Chemtrec: +1-703-741-5970

Section 2: HAZARDS IDENTIFICATION

This product is an article and, as such, does not present a hazard to human health by inhalation or ingestion

2.1. Classification of the substance or mixture
Regulation (EC) No 1272/2008

<table>
<thead>
<tr>
<th>Hazard Class</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory sensitisation</td>
<td>Category 1B</td>
</tr>
<tr>
<td>Skin sensitisation</td>
<td>Category 1</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Category 1B</td>
</tr>
</tbody>
</table>

2.2. Label elements

Emergency Overview

Danger

Hazard statements
May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause cancer
May cause an allergic skin reaction
# Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wear protective gloves

# Precautionary Statements - Response
If skin irritation or rash occurs: Get medical advice/attention
If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician

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

## 2.3 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: Titanium dioxide, an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

## Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

#### Synonyms
Titanium Alloy With Cobalt Compacts: - TNM Co Compacts.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>EC No</th>
<th>CAS No</th>
<th>Weight-%</th>
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<tr>
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<td>7440-32-6</td>
<td>50-100</td>
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<tr>
<td>Aluminium</td>
<td>231-072-3</td>
<td>7429-90-5</td>
<td>0-40</td>
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<tr>
<td>Niobium</td>
<td>231-113-5</td>
<td>7440-03-1</td>
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<td>Chromium</td>
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<td>Zirconium</td>
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<td>7440-67-7</td>
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<td>Cobalt</td>
<td>213-158-0</td>
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<tr>
<td>Boron</td>
<td>231-151-2</td>
<td>7440-42-8</td>
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</tr>
</tbody>
</table>

## Section 4: FIRST AID MEASURES

### 4.1. Description of first aid measures

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

#### Skin Contact
In the case of skin allergic reactions see a doctor.

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

#### Ingestion
Not an expected route of exposure.

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

#### Symptoms
May cause allergic skin reaction.
4.3. Indication of any immediate medical attention and special treatment needed

Note to doctors  Treat symptomatically.

Section 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media
Product not flammable in the form as distributed, flammable as finely divided particles or pieces resulting from processing of this product. Isolate large fires and allow to burn out. Smother small fires 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

5.2. Special hazards arising from the substance or mixture

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 minimise 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, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

5.3. Advice for firefighters

Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear.

Section 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions
Use personal protective equipment as required.

For emergency responders
Use personal protective equipment as required.

6.2. Environmental precautions

Not applicable to massive product.

6.3. 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.

6.4. Reference to other sections

See Section 12: ECOLOGICAL INFORMATION.

Section 7: HANDLING AND STORAGE

7.1. 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 minimise combustible dust hazard.

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

7.2. 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.

7.3. Specific end use(s)

Risk Management Methods (RMM)
The information required is contained in this Safety Data Sheet.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>European Union</th>
<th>United Kingdom</th>
<th>France</th>
<th>Spain</th>
<th>Germany</th>
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<td>TWA: 0.5 mg/m³</td>
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<td>TWA: 5 mg/m³</td>
<td>TWA: 5 mg/m³</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
8.2. Exposure controls

Engineering Controls
Avoid generation of uncontrolled particles.

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 contaminate concentrations. Respiratory protection must be provided in accordance with current local regulations.

Environmental exposure controls
Section 6: ACCIDENTAL RELEASE MEASURES.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. 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>Colour</td>
<td>metallic grey or Silver</td>
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<tr>
<td>Odour</td>
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</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
<th>Remarks • Method</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>Boiling point / boiling range</td>
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<tr>
<td>Flash point</td>
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<td></td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>-</td>
<td>Product not flammable in the form as distributed, flammable as finely divided particles or pieces resulting from processing of this product</td>
</tr>
</tbody>
</table>

Flammability Limit in Air
Section 10: STABILITY AND REACTIVITY

10.1. Reactivity
Not applicable

10.2. Chemical stability
Stable under normal conditions.

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

10.3. Possibility of hazardous reactions
Hazardous polymerisation
Hazardous polymerisation does not occur.

Possibility of Hazardous Reactions
None under normal processing.

10.4. Conditions to avoid
Dust formation and dust accumulation.

10.5. 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.

10.6. 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. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

Section 11: TOXICOLOGICAL INFORMATION

Upper flammability limit: -
Lower flammability limit: -
Vapour pressure: - Not applicable
Vapour density: - Not applicable
Specific Gravity: 8.0-8.5
Water solubility: Insoluble
Solubility(ies): Not applicable
Partition coefficient: - Not applicable
Autoignition temperature: - Not applicable
Decomposition temperature: - Not applicable
Kinematic viscosity: - Not applicable
Dynamic viscosity: - Not applicable
Explosive properties: Not applicable
Oxidising properties: Not applicable

Softening point: -
Molecular weight: -
VOC Content (%): Not applicable
Density: -
Bulk density: -
11.1. Information on toxicological effects

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 sensitisation 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>
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<td>&gt; 5000 mg/kg bw</td>
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<td>-</td>
</tr>
<tr>
<td>Aluminium</td>
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<td>&gt; 1 mg/L</td>
</tr>
<tr>
<td>Niobium</td>
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</table>

**Chemical Name**

**Oral LD50**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>Inhalation LC50</th>
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<tbody>
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<td>Titanium</td>
<td>&gt; 5000 mg/kg bw</td>
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<tr>
<td>Aluminium</td>
<td>15,900 mg/kg bw</td>
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<td>&gt; 1 mg/L</td>
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<td>Niobium</td>
<td>&gt; 10,000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
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</tr>
<tr>
<td>Tungsten</td>
<td>&gt; 2000 mg/kg bw</td>
<td>&gt; 2000 mg/kg bw</td>
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<td>Zirconium</td>
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<td>&lt;0.05 mg/L</td>
</tr>
<tr>
<td>Boron</td>
<td>&gt; 2000 mg/kg bw</td>
<td>-</td>
<td>&gt; 5.08 mg/L</td>
</tr>
</tbody>
</table>

**Chemical Name**

**Chemical Name**

**Information on toxicological effects**

**Symptoms**
May cause sensitisation by skin contact. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

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

**Acute toxicity**
Cobalt-containing powders may be harmful if inhaled.

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

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

**Sensitisation**
May cause sensitisation by skin contact. Cobalt-containing alloys may cause sensitization by inhalation.

**Germ cell mutagenicity**
Product not classified.

**Carcinogenicity**
May cause cancer by inhalation.

**Reproductive toxicity**
Product not classified.

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

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

**Aspiration hazard**
Product not classified.

### Section 12: ECOLOGICAL INFORMATION

#### 12.1. Toxicity

This product as shipped is not classified for aquatic toxicity.

<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>
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<td>The 72 h EC50 of titanium</td>
<td>The 96 h LC50 of titanium</td>
<td>The 3 h ECS50 of titanium</td>
<td>The 48 h EC50 of titanium</td>
</tr>
<tr>
<td>Substance</td>
<td>EC50 or LC50 Values</td>
<td></td>
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<tr>
<td>Titanium Dioxide to <em>Pseudokirchneriella subcapitata</em> was 61 mg of TiO2/L.</td>
<td>The 96 h LC50 of titanium dioxide to <em>Pimephales promelas</em> was greater than 1,000 mg of TiO2/L. The 48-hr LC50 of titanium dioxide to <em>Danio rerio</em> was greater than 96 mg of TiO2/L.</td>
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<tr>
<td>Aluminium</td>
<td>The 96-h EC50 values for reduction of biomass of <em>Pseudokirchneriella subcapitata</em> in AAP-Medium at pH 6.7, and 8 were estimated as 20.1, 5.4, and 150.6 µg/L, respectively, for dissolved Al.</td>
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<tr>
<td>Niobium</td>
<td>The 72 h EC50 of sodium tungstate to <em>Pseudokirchneriella subcapitata</em> was 31.0 mg of W/L.</td>
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<tr>
<td>Tungsten</td>
<td>The 72 h EC50 of sodium molybdate dihydrate to <em>Pseudokirchneriella subcapitata</em> was 362.9 mg of Mo/L.</td>
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<tr>
<td>Molybdenum</td>
<td>The 72 h EC50 of sodium molybdate dihydrate to <em>Pseudokirchneriella subcapitata</em> was 644.2 mg/L.</td>
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<tr>
<td>Chromium</td>
<td>The 96 h LC50 of sodium molybdate dihydrate to <em>Pimephales promelas</em> was 120 mg of Co/L. The 48 h LC50 of sodium molybdate dihydrate to <em>Ceriodaphnia dubia</em> was 1,727.8 mg/L.</td>
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<tr>
<td>Zirconium</td>
<td>The 14 d NOEC of zirconium dichloride oxide to <em>Chlorella vulgaris</em> was greater than 102.5 mg of Zr/L.</td>
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<tr>
<td>Cobalt</td>
<td>The 72 h EC50 of cobalt dichloride to <em>Pseudokirchneriella subcapitata</em> was 144 ug of Co/L.</td>
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<tr>
<td>Boron</td>
<td>The 72-h EC50 value for reduction of biomass of <em>Pseudokirchneriella subcapitata</em> exposed to Boric acid at pH 7.5 to 8.3 was 40.2 mg/L.</td>
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</tbody>
</table>

12.2. Persistence and degradability

12.3. Bioaccumulative potential

12.4. Mobility in soil

12.5. Results of PBT and vPvB assessment

The PBT and vPvB criteria do not apply to inorganic substances.

12.6. 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 chronic toxicity

**Section 13: DISPOSAL CONSIDERATIONS**

13.1. Waste treatment methods

Waste from residues/unused products

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

Contaminated packaging

None anticipated.

**Section 14: TRANSPORT INFORMATION**

**IMDG**

14.1 UN/ID no
Not regulated
14.2 Proper shipping name
Not regulated
14.3 Hazard Class
Not regulated
14.4 Packing Group
Not regulated
14.5 Marine pollutant
Not applicable
14.6 Special Provisions
None
14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code
Not applicable

**RID**

14.1 UN/ID no
Not regulated
14.2 Proper shipping name
Not regulated
14.3 Hazard Class
Not regulated
14.4 Packing Group
Not regulated
14.5 Environmental hazard
Not applicable
14.6 Special Provisions
None

**ADR**

14.1 UN/ID no
Not regulated
14.2 Proper shipping name
Not regulated
14.3 Hazard Class
Not regulated
14.4 Packing Group
Not regulated
14.5 Environmental hazard
Not applicable
14.6 Special Provisions
None

**ICAO (air)**

14.1 UN/ID no
Not regulated
14.2 Proper shipping name
Not regulated
14.3 Hazard Class
Not regulated
14.4 Packing Group
Not applicable
14.5 Environmental hazard
Not applicable
14.6 Special Provisions
None

**IATA**

14.1 UN/ID no
Not regulated
14.2 Proper shipping name
Not regulated
14.3 Hazard Class
Not regulated
14.4 Packing Group
Not regulated
14.5 Environmental hazard
Not applicable
14.6 Special Provisions
None

**Section 15: REGULATORY INFORMATION**

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

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.

Authorisations and/or restrictions on use:
This product does not contain substances subject to authorisation (Regulation (EC) No. 1907/2006 (REACH), Annex XIV). This product does not contain substances subject to restriction (Regulation (EC) No. 1907/2006 (REACH), Annex XVII).

International Inventories

<table>
<thead>
<tr>
<th>International Inventories</th>
<th>Complies</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSL/NDSL</td>
<td>Complies</td>
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<tr>
<td>EINECS/ELINCS</td>
<td>Complies</td>
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<tr>
<td>ENCS</td>
<td>Complies</td>
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<tr>
<td>IECSC</td>
<td>Complies</td>
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<tr>
<td>KECL</td>
<td>Complies</td>
</tr>
<tr>
<td>PICCS</td>
<td>Not Listed</td>
</tr>
<tr>
<td>AICS</td>
<td>Complies</td>
</tr>
</tbody>
</table>

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

15.2. Chemical safety assessment
No chemical safety assessment has been performed for this product.

Section 16: OTHER INFORMATION

Issue Date 28-May-2015
Revision Date 07-Jan-2019
Revision Note Updated Section(s): 3, 4, 5, 7, 9, 11, 12, 15.

This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006
Note:
The information provided in this Material 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.

Additional information available from:

End of Safety Data Sheet

Safety data sheets and labels available at ATImetals.com