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

1.1. Product identifier

Product Code FRP003
Product Name Titanium Alloy

Synonyms ATI CP1™, ATI CP1-MIL™, AL 611 TITANIUM, AL 6111 (CP-11), AL 6412 (CP-12), AL 616 (CP-16), AL 6171 (CP-17), AL 618 (CP-18), ATI CP2™, ATI CP2-MIL™, AL 612, ATI 6-4 ELI™, 6AI-4V ELI, ATI CP3™, ATI CP3-MIL™, AL 613, ATI CP4™, ATI CP4-MIL™, AL614, ATI 429® ALLOY, ATI 6-4™, AL 615, AL 617 (CP-7), ATI 3-2.5™, AL 619, ASTM Grade 21, TITANIUM ALLOY (7-4) Ti-7 Al-4 Mo, ATI 15-333™, Titanium Alloy 15-3-3-3

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 Address 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

2.1. Classification of the substance or mixture

Regulation (EC) No 1272/2008

2.2. Label elements

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Physical state</th>
<th>Odour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various massive product forms</td>
<td>Solid</td>
<td>Odourless</td>
</tr>
</tbody>
</table>

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, Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system.
Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms
ATI CP1™, ATI CP1-MIL™, AL 611 TITANIUM, AL 611 (CP-11), AL 6412 (CP-12), AL 616 (CP-16), AL 6171 (CP-17), AL 618 (CP-18), ATI CP2™, ATI CP2-MIL™, AL 612, ATI 6-4 ELI™, 6Al-4V ELI, ATI CP3™, ATI CP3-MIL™, AL 613, ATI CP4™, ATI CP4-MIL™, AL614, ATI 425® ALLOY, ATI 6-4™, AL 615, AL 617 (CP-7), ATI 3-2.5™, AL 619, ASTM Grade 21, TITANIUM ALLOY (7-4) Ti-7 Al-4 Mo, ATI 15-333™, Titanium Alloy 15-3-3-3.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>EC No</th>
<th>CAS No</th>
<th>Weight-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium</td>
<td>231-142-3</td>
<td>7440-32-6</td>
<td>88-100</td>
</tr>
<tr>
<td>Aluminium</td>
<td>231-072-3</td>
<td>7429-90-5</td>
<td>0-7</td>
</tr>
<tr>
<td>Vanadium</td>
<td>231-171-1</td>
<td>7440-62-2</td>
<td>0-4.5</td>
</tr>
<tr>
<td>Nickel</td>
<td>231-111-4</td>
<td>7440-02-0</td>
<td>0-0.9</td>
</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 irritation or 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: FIRE FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media
None in massive form, flammable as finely divided particles. 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.

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. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system.
5.3. Advice for firefighters

Wear self-contained breathing apparatus and protective suit. Use personal protective equipment as required.

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, freon.

7.3. Specific end use(s)

Risk Management Methods (RMM)
Not required.

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>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Chemical Name</td>
<td>Italy</td>
<td>Portugal</td>
<td>Netherlands</td>
<td>Finland</td>
<td>Denmark</td>
</tr>
<tr>
<td>---------------</td>
<td>-------</td>
<td>----------</td>
<td>-------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Titanium</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Aluminium</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vanadium</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nickel</td>
<td>-</td>
<td>TWA: 1.5 mg/m³</td>
<td>-</td>
<td>TWA: 1 mg/m³</td>
<td>TWA: 0.05 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Austria</th>
<th>Switzerland</th>
<th>Poland</th>
<th>Norway</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium</td>
<td>-</td>
<td>-</td>
<td>STEL: 20 mg/m³</td>
<td>TWA: 3 mg/m³</td>
<td>TWA: 1.2 mg/m³</td>
</tr>
<tr>
<td>Aluminium</td>
<td>STEL: 20 mg/m³</td>
<td>TWA: 10 mg/m³</td>
<td>TWA: 3 mg/m³</td>
<td>TWA: 1.2 mg/m³</td>
<td>TWA: 5 mg/m³</td>
</tr>
<tr>
<td>Vanadium</td>
<td>STEL 1 mg/m³</td>
<td>TWA: 0.5 mg/m³</td>
<td>-</td>
<td>-</td>
<td>TWA: 0.2 mg/m³</td>
</tr>
<tr>
<td>Nickel</td>
<td>TWA: 0.5 mg/m³</td>
<td>TWA: 0.25 mg/m³</td>
<td>TWA: 0.05 mg/m³</td>
<td>STEL: 0.15 mg/m³</td>
<td>TWA: 0.5 mg/m³</td>
</tr>
</tbody>
</table>

### Derived No Effect Level (DNEL)
No DNELs are available for this product as a whole.

### Predicted No Effect Concentration (PNEC)
No PNECs are available for this product as a whole.

### 8.2. Exposure controls

#### Engineering Controls
Avoid generation of particulates.

#### 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**
Wear fire/flame resistant/retardant clothing. Cut-resistant gloves and/or protective clothing may be appropriate when sharp surfaces are present. 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>
<td>Odour Odourless</td>
</tr>
<tr>
<td>Odour 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>1540-1670 °C / 2800-3040 °F</td>
<td></td>
</tr>
<tr>
<td>Boiling point / boiling range</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
### 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, 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. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system.
Section 11: TOXICOLOGICAL INFORMATION

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.

### Chemical Name | Oral LD50 | Dermal LD50 | Inhalation LC50
--- | --- | --- | ---
Titanium | > 5000 mg/kg bw | - | -
Aluminium | 15,900 mg/kg bw | - | -
Vanadium | > 2000 mg/kg bw | - | > 1 mg/L
Nickel | > 9000 mg/kg bw | - | > 10.2 mg/L

Information on toxicological effects

- **Symptoms**: May cause sensitisation 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.
- **Sensitisation**: May cause sensitisation by skin contact.
- **Germ cell mutagenicity**: Product not classified.
- **Carcinogenicity**: Product not classified.

### Chemical Name | ACGIH | IARC | NTP | OSHA
--- | --- | --- | --- | ---
Nickel | 7440-02-0 | Group 1 | Known | X

- **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

| Chemical Name | Algae/aquatic plants | Fish | Toxicity to Micro-organisms | Crustacea |
--- | --- | --- | --- | ---
Titanium | The 72 h EC50 of titanium dioxide to *Pseudokirchneriella subcapitata* was 61 mg of TiO2/L. | The 96 h LC50 of titanium dioxide to *Cyprinodon variegatus* was greater than 10,000 mg of TiO2/L. The 96 h LC50 of titanium dioxide to *Pimephales promelas* was greater than 1000 mg/L. | The 3 h EC50 of titanium dioxide for activated sludge were greater than 1000 mg/L. | The 48 h EC50 of titanium dioxide to *Daphnia Magna* was greater than 1000 mg of TiO2/L. |
<table>
<thead>
<tr>
<th>Substance</th>
<th>96-h EC50 Values for Reduction of Biomass of</th>
<th>96 h LC50 of</th>
<th>48-hr LC50 for Ceriodaphnia dubia exposed to Aluminia</th>
<th>1,000 mg of TiO2/L.</th>
<th>aluminium to Oncorhynchus mykiss was 7.4 mg of Al/L at pH 6.5 and 14.6 mg of Al/L at pH 7.5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium</td>
<td>Pseudokirchneriella subcapitata 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>
<td>The 96 h LC50 of aluminium to Oncorhynchus mykiss was 7.4 mg of Al/L at pH 6.5 and 14.6 mg of Al/L at pH 7.5.</td>
<td>The 48-hr LC50 for Ceriodaphnia dubia exposed to Aluminium chloride increased from 0.72 to greater than 99.6 mg/L with water hardness increasing from 25 to 200 mg/L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td>The 72 h EC50 of vanadium pentoxide to Desmodesmus subspicatus was 2,907 ug of V/L.</td>
<td>The 96 h LC50 of vanadium pentoxide to Pimephales promelas was 1,850 ug of V/L.</td>
<td>The 3 h EC50 of sodium metavanadate for activated sludge was greater than 100 mg/L.</td>
<td>The 48 h EC50 of sodium vanadate to Daphnia magna was 2,661 ug of V/L.</td>
<td></td>
</tr>
<tr>
<td>Nickel</td>
<td>NOEC/EC10 values range from 12.3 μg/l for Scenedesmus acuminatus to 425 μg/l for Pseudokirchneriella subcapitata.</td>
<td>The 96 h 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 48 h LC50s values range from 0.013 mg Ni/L for Ceriodaphnia dubia to 4970 mg Ni/L for Daphnia magna.</td>
<td></td>
</tr>
</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

---

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 73/78 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 applicable
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

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>French RG number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium</td>
<td>7440-32-6</td>
<td>-</td>
</tr>
<tr>
<td>Aluminium</td>
<td>7429-90-5</td>
<td>RG 32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RG 16,RG 16bis</td>
</tr>
<tr>
<td>Vanadium</td>
<td>7440-62-2</td>
<td>RG 66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Nickel</td>
<td>7440-02-0</td>
<td>RG 37ter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

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

TSCA Complies
DSL/NDSL Complies
EINECS/ELINCS Complies
ENCS Complies
IECSC Complies
15.2. Chemical safety assessment

No chemical safety assessment has been performed for this product.

**Section 16: OTHER INFORMATION**

<table>
<thead>
<tr>
<th>Issue Date</th>
<th>28-May-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision Date</td>
<td>27-May-2016</td>
</tr>
<tr>
<td>Revision Note</td>
<td>Updated Section(s): 1, 3, 7.</td>
</tr>
</tbody>
</table>