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

Product identifier
Product Name Nickel Iron Alloy

Other means of identification
Product Code FRP001
Synonyms ATI 36™, AL 36 INVAR, AL 42, MOLY PERMALLOY, Sealmet™ 4 ELECTRICAL STEEL, AL 52, AL 4750 ELECTRICAL ALLOY, CuClad, AL 44

Recommended use of the chemical and restrictions on use
Recommended Use Nickel Iron Alloy 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 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.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity - Oral</td>
<td>Category 4</td>
</tr>
<tr>
<td>Skin sensitization</td>
<td>Category 1</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Category 1B</td>
</tr>
<tr>
<td>Specific target organ toxicity (repeated exposure)</td>
<td>Category 1</td>
</tr>
</tbody>
</table>

Label elements

Emergency Overview

Danger

Hazard statements
May cause cancer
Harmful if swallowed
May cause an allergic skin reaction
Causes damage to the respiratory tract through prolonged or repeated exposure if inhaled
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
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>7440-50-8</td>
<td>&gt;95 of cladding/core</td>
</tr>
<tr>
<td>Nickel</td>
<td>7440-02-0</td>
<td>34-80</td>
</tr>
<tr>
<td>Iron</td>
<td>7439-89-6</td>
<td>12-66</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>7439-98-7</td>
<td>0-5</td>
</tr>
<tr>
<td>Cobalt</td>
<td>7440-48-4</td>
<td>0-0.5</td>
</tr>
</tbody>
</table>

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 smoke, fume, or particulate 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. May cause acute gastrointestinal effects if swallowed.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE-FIGHTING MEASURES
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.

Specific hazards arising from the chemical
Intense heat. 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
Zinc, copper, magnesium, or cadmium fumes may cause metal fume 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
Firefighters should wear self-contained breathing apparatus and full firefighting turnout 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
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.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines
### 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><strong>Physical state</strong></td>
<td>Solid</td>
<td></td>
</tr>
<tr>
<td><strong>Appearance</strong></td>
<td>Various massive product forms</td>
<td></td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>metallic, gray or brown</td>
<td></td>
</tr>
<tr>
<td><strong>Odor</strong></td>
<td>Odorless</td>
<td></td>
</tr>
<tr>
<td><strong>Odor threshold</strong></td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Melting point/freezing point</strong></td>
<td>1260-1430 °C 2300-2600 °F</td>
<td></td>
</tr>
<tr>
<td><strong>Boiling point / boiling range</strong></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Flash point</strong></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Evaporation rate</strong></td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Flammability (solid, gas)</strong></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**
- **Upper flammability limit:** -
- **Lower flammability limit:** -

**Vapor pressure**
- Not applicable

**Vapor density**
- Not applicable

**Specific Gravity**
7.9

**Water solubility**
Insoluble

**Solubility in other solvents**
- Not applicable

**Partition coefficient**
- Not applicable

**Autoignition temperature**
- Not applicable

**Decomposition temperature**
- Not applicable
FRP001 Nickel Iron Alloy

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.

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: 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 (mg/kg bw)</th>
<th>Dermal LD50 (mg/kg bw)</th>
<th>Inhalation LC50 (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper 7440-50-8</td>
<td>481</td>
<td>&gt;2000</td>
<td>&gt;5.11</td>
</tr>
<tr>
<td>Nickel 7440-02-0</td>
<td>&gt;9000</td>
<td>-</td>
<td>&gt;10.2</td>
</tr>
<tr>
<td>Iron 7439-89-6</td>
<td>98,600</td>
<td>-</td>
<td>&gt;0.25</td>
</tr>
<tr>
<td>Molybdenum 7439-98-7</td>
<td>&gt;2000</td>
<td>&gt;2000</td>
<td>&gt;5.10</td>
</tr>
<tr>
<td>Cobalt 7440-48-4</td>
<td>550</td>
<td>&gt;2000</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
Information on toxicological effects

Symptoms
May cause sensitization by skin contact. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause acute gastrointestinal effects if swallowed.

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

Acute toxicity
Harmful if swallowed.

Skin corrosion/irritation
Product not classified.

Serious eye damage/eye irritation
Product not classified.

Sensitization
May cause sensitization by skin contact. Cobalt-containing alloys may cause sensitization by inhalation.

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</td>
<td>Group 1</td>
<td>Group 2B</td>
<td>Known</td>
<td>X</td>
</tr>
<tr>
<td>Cobalt</td>
<td>A3</td>
<td>Group 2A</td>
<td>Group 2B</td>
<td>Known</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.

<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>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 mg 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>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>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>Molybdenum 7439-98-7</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 3 h EC50 of molybdenum trioxide for activated sludge was 820 mg/L.</td>
<td>The 48 h LC50 of sodium molybdate dihydrate to Ceriodaphnia dubia was 1,015 mg/L. The 48 h LC50 of sodium molybdate dihydrate to Daphnia magna was greater than 1,727.8 mg/L.</td>
</tr>
<tr>
<td>Cobalt 7440-48-4</td>
<td>The 72 h EC50 of cobalt dichloride to Pseudokirchneriella</td>
<td>The 96h LC50 of cobalt dichloride ranged from 1.5 mg Co/L for Oncorhynchus kisutch.</td>
<td>The 3 h EC50 of cobalt dichloride for activated sludge was 120 mg of Co/L.</td>
<td>The 48 h LC50 of cobalt dichloride ranged from 0.61 mg Co/L for Ceriodaphnia dubia.</td>
</tr>
</tbody>
</table>
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.

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

<table>
<thead>
<tr>
<th>International Inventories</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSCA</td>
<td>Complies</td>
</tr>
<tr>
<td>DSL/NDSL</td>
<td>Complies</td>
</tr>
<tr>
<td>EINECS/ELINCS</td>
<td>Complies</td>
</tr>
<tr>
<td>ENCS</td>
<td>Complies</td>
</tr>
<tr>
<td>IECSC</td>
<td>Complies</td>
</tr>
<tr>
<td>KECL</td>
<td>Complies</td>
</tr>
<tr>
<td>PICCS</td>
<td>Complies</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

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>Copper - 7440-50-8</td>
<td>7440-50-8</td>
<td>&gt;95 of cladding/core</td>
<td>1.0</td>
</tr>
<tr>
<td>Nickel - 7440-02-0</td>
<td>7440-02-0</td>
<td>34-80</td>
<td>0.1</td>
</tr>
<tr>
<td>Cobalt - 7440-48-4</td>
<td>7440-48-4</td>
<td>0-0.5</td>
<td>0.1</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>Copper</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7440-50-8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nickel</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7440-02-0</td>
<td></td>
<td></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>Copper</td>
<td>5000 lb</td>
</tr>
<tr>
<td>7440-50-8</td>
<td></td>
</tr>
<tr>
<td>Nickel</td>
<td>100 lb</td>
</tr>
<tr>
<td>7440-02-0</td>
<td></td>
</tr>
</tbody>
</table>

### US State Regulations
#### California Proposition 65
This product contains the Proposition 65 chemicals listed below. Proposition 65 warning label available at ATImetals.com.

<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>
<tr>
<td>Cobalt - 7440-48-4</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>Copper - 7440-50-8</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Nickel - 7440-02-0</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Molybdenum - 7439-98-7</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cobalt - 7440-48-4</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

#### U.S. EPA Label Information
**EPA Pesticide Registration Number** Not applicable

16. OTHER INFORMATION

**NFPA**
- Health hazards: 1
- Flammability: 0
- Instability: 0
- Physical and Chemical Properties: -

**HMIS**
- Health hazards: 2*
- Flammability: 0
- Physical hazards: 0
- Personal protection: X

*Chronic Hazard Star Legend* = Chronic Health Hazard
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.

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