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

Product identifier
Product Name Iron Alloy Compacts

Other means of identification
Product Code PM014
Synonyms Iron Alloy Compacts: 304, Bor07, 316, 330, 422, VIMCRU 20, 15Cr-5Ni, 17Cr-4Ni, Fe-3B-5.6Si, Fe-8Si-Nb-1.5Cu, 800H (Fe-21Cr-32.5Ni-0.4Al-0.4Ti), AMS355 (Fe-15.5Cr-4.5Ni-2.87Mo), Fe-18Cr-10Ni-0.7Ti, Fe-12Cr-9.65Ni-0.65Mo-0.2Ti, Fe-14.25Cr-5.45Ni-0.9Mo-0.85W-0.2V, Fe-25Cr-25Mn-25Ni

Recommended use of the chemical and restrictions on use
Recommended Use 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>Skin sensitization</th>
<th>Category 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcinogenicity</td>
<td>Category 2</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 an allergic skin reaction
Suspected of causing cancer
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

Precautionary Statements - Response
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: 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
Iron Alloy Compacts: 304, Bor07, 316, 330, 422, VIMCRU 20, 15Cr-5Ni, 17Cr-4Ni; Fe-3B-5.6Si, Fe-8Si-6Nb-1.5Cu, 800H (Fe-21Cr-32.5Ni-0.4Al-0.4Ti), AMS355 (Fe-15.5Cr-4.5Ni-2.87Mo), Fe-18Cr-10Ni-0.7Ti, Fe-12Cr-9.65Ni-0.65Mo-0.2Ti, Fe-14.25Cr-5.45Ni-0.9Mo-0.85W-0.2V, Fe-25Cr-25Mn-25Ni.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Weight-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>7439-89-6</td>
<td>50 - 80</td>
</tr>
<tr>
<td>Nickel</td>
<td>7440-02-0</td>
<td>1 - 42</td>
</tr>
<tr>
<td>Chromium</td>
<td>7440-47-3</td>
<td>0 - 40</td>
</tr>
<tr>
<td>Vanadium</td>
<td>7440-62-2</td>
<td>0 - 15</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>7439-98-7</td>
<td>0 - 11</td>
</tr>
<tr>
<td>Tungsten</td>
<td>7440-33-7</td>
<td>0 - 8</td>
</tr>
<tr>
<td>Boron</td>
<td>7440-42-8</td>
<td>0 - 2</td>
</tr>
<tr>
<td>Carbon</td>
<td>7440-44-0</td>
<td>0 - 1.6</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 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.

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
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.

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

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron 7439-89-6</td>
<td>TWA: 1.5 mg/m³ inhalable fraction</td>
<td>TWA: 1 mg/m³</td>
</tr>
<tr>
<td>Nickel 7440-02-0</td>
<td>TWA: 0.5 mg/m³</td>
<td>TWA: 1 mg/m³</td>
</tr>
<tr>
<td>Chromium 7440-47-3</td>
<td>-</td>
<td>Ceiling: 0.5 mg/m³ V2O5 respirable dust</td>
</tr>
<tr>
<td>Vanadium 7440-62-2</td>
<td>-</td>
<td>Ceiling: 0.1 mg/m³ V2O5 fume</td>
</tr>
<tr>
<td>Molybdenum 7439-99-7</td>
<td>TWA: 10 mg/m³ inhalable fraction</td>
<td>-</td>
</tr>
<tr>
<td>Tungsten 7440-33-7</td>
<td>STEL: 10 mg/m³ STEL: 10 mg/m³ W</td>
<td>(vacated) STEL: 10 mg/m³ (vacated) STEL: 10 mg/m³ W</td>
</tr>
<tr>
<td>Boron 7440-42-8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Carbon 7440-44-0</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>Odor threshold: Odorless</td>
</tr>
<tr>
<td>Color</td>
<td>metallic gray or silver</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>-</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>1400-1540 °C / 2560-2800 °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>
<tr>
<td>Evaporation rate</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>
<tr>
<td>Flammability (solid, gas)</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Flammability Limit in Air

- **Upper flammability limit**: -
- **Lower flammability limit**: -
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: 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</td>
<td>98,600 mg/kg bw</td>
<td>-</td>
<td>&gt; 0.25 mg/L</td>
</tr>
<tr>
<td>Chemical Name</td>
<td>ACGIH</td>
<td>IARC</td>
<td>NTP</td>
</tr>
<tr>
<td>---------------</td>
<td>-------</td>
<td>------</td>
<td>----------------</td>
</tr>
<tr>
<td>Nickel</td>
<td>Group 1</td>
<td>Group 2B</td>
<td>Known</td>
</tr>
<tr>
<td>Chromium</td>
<td>Group 3</td>
<td></td>
<td>Reasonably Anticipated</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>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 accuminatus 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>Vanadium 7440-62-2</td>
<td>The 72 h EC50 of vanadium pentoxide to Desmodesmus subspicatus was 2,907 µg of V/L.</td>
<td>The 96 h LC50 of vanadium pentoxide to Pimephales promelas was 1,850 µg 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 µg of V/L.</td>
</tr>
<tr>
<td>Molybdenum 7440-44-0</td>
<td>The 72 h EC50 of sodium</td>
<td>The 96 h LC50 of sodium</td>
<td>The 3 h EC50 of</td>
<td>The 48 h LC50 of sodium</td>
</tr>
</tbody>
</table>
### 7439-98-7
- Molybdate dihydrate to *Pseudokirchneriella subcapitata* was 362.9 mg of Mo/L.
- Molybdate dihydrate to *Pimephales promelas* was 644.2 mg/L.
- Molybdenum trioxide for activated sludge was 820 mg/L.
- Molybdate dihydrate to *Ceriodaphnia dubia* was greater than 1,015 mg/L.
- The 48 h LC50 of sodium molybdate dihydrate to *Daphnia magna* was greater than 1,727.8 mg/L.

### Tungsten 7440-33-7
- The 72 h EC50 of sodium tungstate to *Pseudokirchneriella subcapitata* was 31.0 mg of W/L.
- The 96 h LC50 of sodium tungstate to *Danio rerio* was greater than 106 mg of W/L.
- The 30 min EC50 of sodium tungstate for activated sludge were greater than 1000 mg/L.
- The 48 h EC50 of sodium tungstate to *Daphnia magna* was greater than 96 mg of W/L.

### Boron 7440-42-8
- 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.

### Carbon 7440-44-0
- The 72 h EL50 of Carbon to *Pseudokirchneriella subcapitata* was greater than 100 mg/L.
- The 96 h LL50 of Carbon in water to *Danio rerio* was greater than 100 mg/L.
- The 3 h EC50 of Carbon for activated sludge was 1000 mg/L.
- The 48 h EL50 of Carbon to *Daphnia magna* was greater than 100 mg/L.

### 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 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
**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

<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>1 - 42</td>
<td>0.1</td>
</tr>
<tr>
<td>Chromium - 7440-47-3</td>
<td>7440-47-3</td>
<td>0 - 40</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>X</td>
<td></td>
</tr>
<tr>
<td>Chromium - 7440-47-3</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>
</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>
</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</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

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health hazards</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Physical hazards</th>
<th>Personal protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>2*</td>
<td>0</td>
<td></td>
<td>0</td>
<td>X</td>
</tr>
</tbody>
</table>

Chronic Hazard Star Legend
* = Chronic Health Hazard

Issue Date 28-May-2015
Revision Date 31-Jan-2019
Revision Note Updated Section(s): 3, 4, 5, 7, 9, 15

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