# SAFETY DATA SHEET

## 1. Identification

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| **Product identifier** | **ALUMINUM ALLOYS WITH LOW BERYLLIUM** |
| **Other means of identification** | |
| **SDS number** | 1056 |
| **Version #** | 11 |
| **Revision date** | February 10, 2016. |
| **Other means of identification** | |
| **Synonyms** | C475F, C555, C74T, C75T, C76T, C89T |
| **Recommended use** | Wrought aluminum products |
| **Recommended restrictions** | For industrial use only. |

**Manufacturer/Importer/Supplier/Distributor information**

**Manufacturer**

Alcoa Inc.
201 Isabella Street
Pittsburgh, PA 15212-5858 USA
Health and Safety Tel: 1-412-553-4649
Health and Safety Fax: 1-412-553-4822
Health and Safety Email: accmsds@alcoa.com

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|---|---|
| **Emergency Information** | CHEMTREC: +1-703-527-3887 +1-800-424-9300 (24 Hour Emergency Telephone, multiple languages spoken); ALCOA: +1-412-553-4001 (24 Hour Emergency Telephone, only English spoken) |
| **Website** | For a current Safety Data Sheet, refer to Alcoa websites: www.alcoa.com or internally at my.alcoa.com EHS Community |

## 2. Hazard(s) identification

**Potential health effects**

The following statements summarize the health effects generally expected in cases of overexposures. User specific situations should be assessed by a qualified individual. Additional health information can be found in Section 11.
The health effects listed below are not likely to occur unless processing of this product generates dusts or fumes.

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| **Physical hazards** | Not classified. |
| **Health hazards** | Not classified. |
| **Environmental hazards** | Not classified. |
| **Authority defined hazards** | Combustible dust |
| **Label elements** | |
| **Hazard symbol** | None. |
| **Signal word** | Warning |
| **Hazard statement** | May form combustible dust concentrations in air. |
| **Precautionary statement** | |
| **Prevention** | Not applicable. |
| **Response** | Not applicable. |
| **Storage** | Store in a dry place. |
| **Disposal** | Dispose of contents/container in accordance with local/regional/national/international regulations. |
| **Hazard(s) not otherwise classified (HNOC)** | None known. |
| **Supplemental information** | None. |

**Specific hazards**

Dust and fume from processing: Contains beryllium. May produce an allergic reaction.

Non-combustible as supplied. Small chips, fine turnings, and dust from processing may be readily ignitable.

Explosion/fire hazards may be present when (See Sections 5, 7 and 10 for additional information):
- Dust or fines are dispersed in air.
- Chips, dust or fines are in contact with water.
- Dust and fines are in contact with certain metal oxides (e.g., rust, copper oxide).
- Molten metal in contact with water/moisture or certain metal oxides (e.g., rust, copper oxide).

Dust and fume from processing: Can cause irritation of the eyes, skin and upper respiratory tract.

## 3. Composition/information on ingredients

**Composition comments**

Complete composition is provided below and may include some components classified as non-hazardous.

**Mixtures**

| Chemical name | Common name and synonyms | CAS number | % |
|---|---|---|---|
| Aluminum | | 7429-90-5 | >86 |
| Zinc | | 7440-66-6 | <10.6 |
| Magnesium | | 7439-95-4 | <5.6 |
| Copper | | 7440-50-8 | <5.0 |
| Manganese | | 7439-96-5 | <1.0 |
| Iron | | 7439-89-6 | <0.6 |
| Chromium | | 7440-47-3 | <0.30 |
| Silicon | | 7440-21-3 | <0.3 |
| Nickel | | 7440-02-0 | <0.06 |
| Lead | | 7439-92-1 | ≤0.03 |
| Beryllium | | 7440-41-7 | <0.002 |

**Additional Information**

Additional compounds which may be formed during processing are listed in Section 8.

## 4. First-aid measures

**Eye contact**

Dust and fumes from processing: Rinse eyes with plenty of water or saline for at least 15 minutes. Consult a physician.

**Skin contact**

Dust and fume from processing or contact with lubricant/residual oil: Wash with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Inhalation**

Dust and fumes from processing: Remove to fresh air. Check for clear airway, breathing, and presence of pulse. If breathing is difficult, provide oxygen. Loosen any tight clothing on neck or chest. Provide cardiopulmonary resuscitation for persons without pulse or respirations. Consult a physician.

**Ingestion**

Dust and fumes from processing: If swallowed, dilute by drinking water. Recommend quantities up to 30 mL (~1 oz.) in children and 250 mL (~9 oz.) in adults. Never give anything by mouth to a victim who is unconscious or is having convulsions. Do NOT induce vomiting. Consult a physician.

**Most important symptoms/effects, acute and delayed**

Dust and fumes from processing: Can cause irritation of the eyes, skin and upper respiratory tract.

Health effects from mechanical processing (e.g., cutting, grinding): Dust from processing: Chronic overexposure: Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes),.

Additional health effects from elevated temperature processing (e.g., welding, melting): Acute overexposure: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise), reduced ability of the blood to carry oxygen (methemaglobin), and the accumulation of fluid in the lungs (pulmonary edema). Chronic overexposure: Can cause benign lung disease scarring of the lungs (pulmonary fibrosis), respiratory sensitization, central nervous system damage, secondary Parkinson's disease, reproductive harm and lung canc.

Contact with residual oil/oil coating: Prolonged skin contact may cause skin irritation and/or dermatitis.
See Section 11 of the SDS for additional information on health hazards.

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| **Medical conditions aggravated by exposure** | Asthma, chronic lung disease, and skin rashes. |
| **Indication of immediate medical attention and special treatment needed** | Provide general supportive measures and treat symptomatically. |
| **General information** | If exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. |

## 5. Fire-fighting measures

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| **Suitable extinguishing media** | Use Class D extinguishing agents on fines, dust or molten metal.<br>Use coarse water spray on chips and turnings. |
| **Unsuitable extinguishing media** | DO NOT USE water in fighting fires around molten metal.<br>DO NOT USE halogenated extinguishing agents on small chips/fines.<br>These fire extinguishing agents will react with the burning material. |
| **Specific hazards arising from the chemical** | Explosion/fire hazards may be present when:<br>• Dust clouds may be explosive. Even a minor dust cloud can explode violently. Dust accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions.<br>• Chips, fines and dust in contact with water can generate flammable/explosive hydrogen gas. These gases could present an explosion hazard in confined or poorly ventilated spaces.<br>• Dust and fines in contact with certain metal oxides (e.g., rust, copper oxide). A thermite reaction, with considerable heat generation, can be initiated by a weak ignition source.<br>• Molten metal in contact with water/moisture or certain metal oxides (e.g., rust, copper oxide). Moisture entrapped by molten metal can be explosive. Contact of molten aluminum with certain metal oxides can initiate a thermite reaction. Finely divided metals (e.g., powders or wire) may have enough surface oxide to produce thermite reactions/explosions.<br>Thermite reactions can also occur with oxides of lead, copper, iron, bismuth and certain other metals. |
| **Hazardous combustion products** | No hazardous decomposition products are known. |
| **Special protective equipment and precautions for firefighters** | Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate. |
| **Fire fighting equipment/instructions** | Apply extinguishing media carefully to avoid creating airborne dust. Use gentle surface application of Class D extinguishing agent or dry inert granular material (e.g., sand) to cover and ring the burning material. Do not disturb the material until completely cool. If impossible to extinguish, protect surroundings and allow fire to burn itself out. |
| **General fire hazards** | This product does not present fire or explosion hazards as shipped. Small chips, fine turnings, and dust from processing may be readily ignitable. |
| **Explosion data** | |
| **Sensitivity to mechanical impact** | Not sensitive. |
| **Sensitivity to static discharge** | Take precautionary measures against static discharges when there is a risk of dust explosion. |

## 6. Accidental release measures

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|---|---|
| **Personal precautions, protective equipment and emergency procedures** | Avoid generating dust. Avoid inhalation of fumes from molten product. Avoid contact with sharp edges or heated metal. Molten, heated and cold aluminum look alike; do not touch unless you know it is cold. Use personal protection recommended in Section 8 of the SDS. |
| **Personal precautions, protective equipment and emergency procedures** | |
| **For emergency responders** | Avoid generating dust. Avoid inhalation of fumes from molten product. Avoid contact with sharp edges or heated metal. Molten, heated and cold aluminum look alike; do not touch unless you know it is cold. Use personal protection recommended in Section 8 of the SDS. |
| **Evacuation procedures** | Persons not wearing appropriate protective equipment should be excluded from area of spill until clean-up has been completed. |
| **Methods and materials for containment and cleaning up** | Collect scrap for recycling.<br>If molten: Use dry sand to contain the flow of material. All tooling (e.g., shovels or hand tools) and containers which come in contact with molten metal must be preheated or specially coated, rust free and approved for such use. Allow the spill to cool before remelting as scrap. |
| **Environmental precautions** | Reuse or recycle material whenever possible. |

## 7. Handling and storage

**Handling**

Keep material dry. Avoid generating dust. Avoid contact with sharp edges or heated metal. Hot and cold aluminum are not visually different. Hot aluminum does not necessarily glow red. Use with adequate ventilation. Use personal protection recommended in Section 8 of the SDS.

**Storage**

Store in a dry place.

**Requirements for Processes Which Generate Dusts or Fines**

If processing of this product generates dust or if extremely fine particulate is generated, obtain and follow the safety procedures and equipment guides contained in Aluminum Association Bulletin F-1 and National Fire Protection Association (NFPA) standards listed in Section 16.

Use non-sparking handling equipment, tools and natural bristle brush. Cover and reseal partially empty containers. Provide grounding and bonding where necessary to prevent accumulation of static charges during metal dust handling and transfer operations (See Section 15).

Local ventilation and vacuum systems must be designed to handle explosive dusts. Dry vacuums and electrostatic precipitators must not be used, unless specifically approved for use with flammable/explosive dusts. Dust collection systems must be dedicated to aluminum dust only and should be clearly labeled as such. Do not co-mingle fines of aluminum with fines of iron, iron oxide (rust) or other metal oxides.

Avoid all ignition sources. Dust accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions. Do not use compressed air to remove settled material from floors, beams or equipment.
Do not allow small chunks, fines or dust to contact water, particularly in enclosed areas.

**Requirements for Remelting of Scrap Material or Ingot**

Molten metal and water can be an explosive combination. The risk is greatest when there is sufficient molten metal to entrap or seal off the water. Water and other forms of contamination on or contained in scrap or remelt ingot are known to have caused explosions in melting operations. While the products may have minimal surface roughness and internal voids, there remains the possibility of moisture contamination or entrapment. If confined, even a few drops of water can lead to violent explosions.

All tooling and containers which come in contact with molten metal must be preheated or specially coated and approved for such use. Molds and ladles must be preheated or oiled prior to casting. Any surfaces that may contact molten metal (i.e., concrete) should be specially coated.

Drops of molten metal in water (e.g. from plasma arc cutting), while not normally an explosion hazard, can generate enough flammable hydrogen gas to present an explosion hazard. Vigorous circulation of the water and removal of the particles minimize the hazards.

During melting operations, the following minimum guidelines should be observed:
• Inspect all materials prior to furnace charging and completely remove surface contamination such as water, ice, snow, deposits of grease and oil or other surface contamination resulting from weather exposure, shipment, or storage.
• Store materials in dry, heated areas with any cracks or cavities pointed downwards.
• Preheat and dry large items adequately before charging into a furnace containing molten metal. This is typically done by use of a drying oven or homogenizing furnace. The drying cycle should bring the metal temperature of the coldest item of the batch to 400°F (200°C) and then hold at that temperature for 6 hours.

Thermite explosions have been reported when aluminum alloys were melted in furnaces used for alloying with lead, bismuth or other metals with low melting temperatures. These metals, when added as high purity ingots, can seep through cracks in furnace liners and become oxidized. During subsequent melts in the furnace, molten aluminum can contact these metal oxides resulting in a thermite explosion.

**Dross Handling**

Beryllium may concentrate in the dross formed when aluminum scrap is remelted. Therefore, the potential for exposures to beryllium when handling dross must be considered. Control of airborne dust levels would be critical in reducing or eliminating this potential. For more information on the hazards associated with handling dross that contains beryllium, refer to Alcoa SDS No. 1013, Aluminum Dross with Low Beryllium. Copies of this SDS are available on www.alcoa.com or by calling +1-412-553-4649.

## 8. Exposure controls/personal protection

**Exposure guidelines**

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

**Occupational exposure limits**

**U.S. - OSHA**

| Components | Type | Value | Form |
|---|---|---|---|
| Aluminum (CAS 7429-90-5) | TWA | 5 mg/m3 | Respirable fraction |
| | | 15 mg/m3 | Total dust |
| Chromium (CAS 7440-47-3) | TWA | 1 mg/m3 | |
| Copper (CAS 7440-50-8) | TWA | 1 mg/m3 | Dust and mist. |
| | | 0.1 mg/m3 | Fume. |
| Manganese (CAS 7439-96-5) | Ceiling | 5 mg/m3 | Fume |
| Nickel (CAS 7440-02-0) | TWA | 1 mg/m3 | |
| Silicon (CAS 7440-21-3) | TWA | 5 mg/m3 | Respirable fraction. |
| | | 15 mg/m3 | Total dust |

| Compounds Formed During Processing | Type | Value | Form |
|---|---|---|---|
| Aluminum oxide (non-fibrous) (CAS 1344-28-1) | TWA | 5 mg/m3 | Respirable fraction. |
| | | 15 mg/m3 | Total dust. |
| Chromium (II) compounds | TWA | 0.5 mg/m3 | (as Cr) |
| Chromium (III) compounds | TWA | 0.5 mg/m3 | (as Cr) |
| Chromium (VI) compounds, certain water insoluble forms | TWA | 0.0025 mg/m3 | Action Level as Cr(VI)) |
| Chromium (VI) compounds (CAS 18540-29-9) | TWA | 0.0025 mg/m3 | Action Level as Cr(VI) |
| Iron oxide (CAS 1309-37-1) | TWA | 10 mg/m3 | Fume. |
| Magnesium oxide (CAS 1309-48-4) | TWA | 15 mg/m3 | Total particulate. |
| Manganese compounds, inorganic | Ceiling | 5 mg/m3 | (as Mn) Fume |
| Nickel compounds, insoluble | TWA | 1 mg/m3 | (as Ni) |
| Nitric oxide (CAS 10102-43-9) | TWA | 30 mg/m3 | |
| | | 25 ppm | |
| Oil mist, mineral (CAS 8012-95-1) | TWA | 5 mg/m3 | Mist. |
| Ozone (CAS 10028-15-6) | TWA | 0.2 mg/m3 | |
| | | 0.1 ppm | |
| Zinc oxide (CAS 1314-13-2) | TWA | 5 mg/m3 | Respirable fraction. |
| | | 5 mg/m3 | Fume. |
| | | 5 mg/m3 | |
| | | 15 mg/m3 | Total dust. |
| | TWA (fume) | 5 mg/m3 | Fume. |
| | TWA (total dust) | 15 mg/m3 | Total dust. |

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

| Components | Type | Value |
|---|---|---|
| Lead (CAS 7439-92-1) | TWA | 0.05 mg/m3 |

| Compounds Formed During Processing | Type | Value | Form |
|---|---|---|---|
| Chromium (VI) compounds, certain water insoluble forms | TWA | 0.005 mg/m3 | as Cr(VI) |
| Chromium (VI) compounds, water soluble forms | TWA | 0.005 mg/m3 | |
| Chromium (VI) compounds (CAS 18540-29-9) | TWA | 0.005 mg/m3 | as Cr(VI) |

**US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)**

| Compounds Formed During Processing | Type | Value | Form |
|---|---|---|---|
| Nitrogen dioxide (CAS 10102-44-0) | Ceiling | 9 mg/m3 | |
| | | 5 ppm | |
| Oil mist, mineral (CAS 8012-95-1) | PEL | 5 mg/m3 | Mist. |
| Zinc oxide (CAS 1314-13-2) | PEL | 5 mg/m3 | Respirable fraction. |
| | | 5 mg/m3 | Fume. |
| | | 15 mg/m3 | Total dust. |

**US. OSHA Table Z-2 (29 CFR 1910.1000)**

| Components | Type | Value |
|---|---|---|
| Beryllium (CAS 7440-41-7) | Ceiling | 0.005 mg/m3 |
| | TWA | 0.002 mg/m3 |

| Compounds Formed During Processing | Type | Value |
|---|---|---|
| Beryllium compounds | Ceiling | 0.005 mg/m3 |
| | TWA | 0.002 mg/m3 |

**ACGIH**

| Components | Type | Value | Form |
|---|---|---|---|
| Copper (CAS 7440-50-8) | TWA | 1 mg/m3 | (Dust and Mist) |
| | | 0.2 mg/m3 | Fume |
| Manganese (CAS 7439-96-5) | TWA (inhalable fraction) | 0.2 mg/m3 | (inhalable fraction) |
| | TWA (respirable fraction) | 0.02 mg/m3 | (respirable fraction) |

| Compounds Formed During Processing | Type | Value | Form |
|---|---|---|---|
| Aluminum oxide (non-fibrous) (CAS 1344-28-1) | TWA | 1 mg/m3 | Respirable fraction, as Al |
| Chromium (VI) compounds, water soluble forms | TWA | 0.05 mg/m3 | (as Cr) |
| Chromium (VI) compounds (CAS 18540-29-9) | TWA | 0.05 mg/m3 | Soluble compounds as Cr |
| Ozone (CAS 10028-15-6) | TWA | 0.2 ppm | (Heavy, moderate or light workloads (≤2 hours)) |

**US ACGIH Threshold Limit Values: Short Term Exposure Limit (STEL): mg/m3**

| Compounds Formed During Processing | Type | Value | Form |
|---|---|---|---|
| Zinc oxide (CAS 1314-13-2) | STEL | 10 mg/m3 | Respirable fraction. |

**US ACGIH Threshold Limit Values: Time Weighted Average (TWA): mg/m3 & ppm**

| Compounds Formed During Processing | Type | Value |
|---|---|---|
| Nitric oxide (CAS 10102-43-9) | TWA | 25 ppm |
| Nitrogen dioxide (CAS 10102-44-0) | TWA | 0.2 ppm |

**US ACGIH Threshold Limit Values: Time Weighted Average (TWA): mg/m3, non-standard units**

| Components | Type | Value | Form |
|---|---|---|---|
| Aluminum (CAS 7429-90-5) | TWA | 1 mg/m3 | Respirable fraction. |
| Beryllium (CAS 7440-41-7) | TWA | 0.00005 mg/m3 | Inhalable fraction. |
| Chromium (CAS 7440-47-3) | TWA | 0.5 mg/m3 | |
| Lead (CAS 7439-92-1) | TWA | 0.05 mg/m3 | |
| Nickel (CAS 7440-02-0) | TWA | 1.5 mg/m3 | Inhalable fraction. |

**US ACGIH Threshold Limit Values: Time Weighted Average (TWA): mg/m3, non-standard units**

| Compounds Formed During Processing | Type | Value | Form |
|---|---|---|---|
| Beryllium compounds | TWA | 0.00005 mg/m3 | Inhalable fraction. |
| Chromium (III) compounds | TWA | 0.5 mg/m3 | |
| Chromium (VI) compounds, certain water insoluble forms | TWA | 0.01 mg/m3 | (as Cr) |
| Chromium (VI) compounds (CAS 18540-29-9) | TWA | 0.01 mg/m3 | Insoluble compounds as Cr |
| Iron oxide (CAS 1309-37-1) | TWA | 5 mg/m3 | Respirable fraction. |
| Magnesium oxide (CAS 1309-48-4) | TWA | 10 mg/m3 | Inhalable fraction. |
| Manganese compounds, inorganic | TWA | 0.1 mg/m3 | Inhalable fraction. |
| | | 0.02 mg/m3 | Respirable fraction. |
| Nickel compounds, insoluble | TWA | 0.2 mg/m3 | Inhalable fraction. |
| Oil mist, mineral (CAS 8012-95-1) | TWA | 5 mg/m3 | Inhalable fraction. |
| Zinc oxide (CAS 1314-13-2) | TWA | 2 mg/m3 | Respirable fraction. |

**Alcoa**

| Components | Type | Value | Form |
|---|---|---|---|
| Aluminum (CAS 7429-90-5) | TWA | 3 mg/m3 | Respirable fraction |
| | | 10 mg/m3 | Total dust |
| Beryllium (CAS 7440-41-7) | STEL | 1 µg/m3 | Peak/ Inhalable |
| | TWA | 0.2 µg/m3 | Inhalable |
| Manganese (CAS 7439-96-5) | TWA | 0.05 mg/m3 | Total dust. |
| | | 0.02 mg/m3 | Respirable fraction. |
| Nickel (CAS 7440-02-0) | TWA | 1 mg/m3 | |

| Compounds Formed During Processing | Type | Value | Form |
|---|---|---|---|
| Aluminum oxide (non-fibrous) (CAS 1344-28-1) | TWA | 3 mg/m3 | Respirable fraction. |
| | | 10 mg/m3 | Total dust. |
| Beryllium compounds | TWA | 0.2 µg/m3 | Soluble |
| Chromium (VI) compounds (CAS 18540-29-9) | TWA | 0.25 µg/m3 | |
| Manganese compounds, inorganic | TWA | 0.05 mg/m3 | Total dust, as Mn. |
| | | 0.02 mg/m3 | Respirable fraction, as Mn. |
| Nickel compounds, insoluble | TWA | 0.1 mg/m3 | Insoluble |
| Oil mist, mineral (CAS 8012-95-1) | TWA | 0.5 mg/m3 | (8 Hour) |

**General**

Beryllium can concentrate 10-fold or higher in dross. This can create a potential for over-exposures to beryllium during dross handling, particularly when dust levels are not adequately controlled.

Appropriate exposure assessments should be conducted by a qualified Industrial Hygienist for all tasks involving welding, cutting and grinding. Engineering controls or other measures (e.g., approved respiratory protection) may be necessary to reduce dust and beryllium concentrations depending on the exposure potential.

The presence of airborne beryllium has been detected during the welding of aluminum alloys with beryllium content as low as 0.002% by weight.

In accordance with OSHA 29 CFR 1910.252: Welding or cutting operations involving beryllium-containing base or filler metals shall be done using local exhaust ventilation and airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposures is within the acceptable concentrations defined by 29 CFR 1910.1000. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators.

Good industrial hygiene practices, including reducing beryllium exposures to the greatest extent possible, are recommended. Beryllium work areas should be established where employees are exposed to beryllium levels above the occupational exposure limits recommended by Alcoa or where the potential exists for significant skin contact with dusts containing beryllium. Access to these work areas should be restricted and the number of employees exposed to beryllium should be limited.

Adequate protective work clothing should be provided to employees in beryllium work areas to prevent contamination of personal clothing. This work clothing should not be worn outside the work area. Special laundering practices should be followed (e.g., separation of contaminated clothing, use of water soluble laundry bags) and personnel assigned to launder contaminated clothing shall be advised of beryllium's presence and potential health effects.

Good housekeeping and personal hygiene practices should be implemented. Dry cleaning of dust (e.g., broom sweeping, use of compressed air) should not be permitted. When vacuuming, equipment specifically certified for use with flammable/explosive dusts and utilizing high efficiency particulate (HEPA) filters are required. Food, tobacco and cosmetic products should be prohibited in the work area. Employees in beryllium work areas should be required to shower at the end of the work shift.

Medical surveillance is recommended for all employees exposed to >0.1 ug/m3 beryllium as a TWA or >1.0 ug/m3 beryllium as a STEL. Surveillance should include baseline chest X-rays (periodic as required by a physician) and annual respiratory history, spirometry, and serum beryllium lymphocyte proliferation tests (BeLPT). Employees sensitized or showing symptoms of beryllium related disease should be restricted from further exposure to beryllium.

Personnel who handle and work with molten metal should utilize primary protective clothing like polycarbonate face shields, fire resistant tapper's jackets, neck shades (snoods), leggings, spats and similar equipment to prevent burn injuries. In addition to primary protection, secondary or day-to-day work clothing that is fire resistant and sheds metal splash is recommended for use with molten metal. Synthetic materials should never be worn even as secondary clothing (undergarments).

Minimize breathing oil vapors and mist. Remove oil contaminated clothing; launder or dry-clean before reuse. Remove oil contaminated shoes and thoroughly clean and dry before reuse. Cleanse skin thoroughly after contact, before breaks and meals, and at the end of the work period. Oil coating is readily removed from skin with waterless hand cleaners followed by a thorough washing with soap and water.

**Appropriate engineering controls**

Dust and fumes from processing: Use with adequate explosion-proof ventilation to meet the limits listed in Section 8. Local ventilation and vacuum systems must be designed to handle combustible/explosive dust, fines or particulate. Dry vacuums and electrostatic precipitators must not be used, unless specifically approved for use with combustible/explosive dusts, fines or particulate and must be dedicated to aluminum dust only and should be clearly labeled as such. Vacuum cleaner hoses must be conductive and nozzles or fitting made of conductive, non-sparking material. Do not co-mingle dust, fines or particulate of aluminum with dust, fines or particulate of steel, iron, iron oxide (rust) or other metal oxides.

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

**Eye/face protection**

Wear safety glasses with side shields. Wear a face shield when working with molten material.

| | |
|---|---|
| **Skin protection** | |
| **Hand protection** | Wear appropriate gloves to avoid any skin injury. If the product is coated with oil, wear oil-resistant gloves to avoid skin contact. The need for personal protective equipment (gloves) should be based upon a hazard assessment and recommendations from health / safety professionals. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material. |
| **Other** | The need for personal protective equipment should be based upon a hazard assessment and recommendations from health / safety professionals.<br>Molten metal: Wear fire/flame resistant/retardant clothing. |
| **Respiratory protection** | Dust and fumes from processing: Use NIOSH-approved respiratory protection as specified by an Industrial Hygienist or other qualified professional if concentrations exceed the limits listed in Section 8. Suggested respiratory protection: P95, P100 for Lead. |
| **Thermal hazards** | Contact with molten material can cause thermal burns. Hot aluminum does not necessarily glow red. Wear appropriate thermal protective clothing, when necessary. When material is heated, wear gloves to protect against thermal burns. Flame retardant protective clothing is recommended.<br>Molten metal: Full Face Shield. |
| **General hygiene considerations** | Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product. When using, do not eat, drink or smoke. |
| **Control parameters** | Follow standard monitoring procedures. Sampling to establish lead level exposure is advised where exposure to airborne particulate or fumes is possible. Consult OSHA Lead Standard 29 CFR 1910.1025 for specific health/industrial hygiene precautions and requirements to follow when handling lead compounds. |
| **Environmental exposure controls** | No special environmental precautions required. |

## 9. Physical and chemical properties

| | |
|---|---|
| **Form** | Solid. |
| **Color** | Silver colored. |
| **Odor** | Odorless |
| **Odor threshold** | Not applicable |
| **pH** | Not applicable |
| **Density** | 2.70 - 2.80 g/cm3 (0.098 - 0.101 lb/in3) |
| **Melting point/freezing point** | 1832 - 2102 °F (1000 - 1150 °C) |
| **Initial boiling point and boiling range** | Not applicable |
| **Flash point** | Not applicable |
| **Evaporation rate** | Not applicable. |
| **Flammability (solid, gas)** | Not applicable. |
| **Upper/lower flammability or explosive limits** | |
| **Flammability limit - upper (%)** | Not applicable |
| **Flammability limit - lower (%)** | Not applicable |
| **Explosive properties** | Dust clouds may be explosive under certain conditions. If small particles are generated during further processing, handling or by other means, may form combustible dust concentrations in air. |
| **Dust explosion properties** | |
| **St class** | Very strong explosion. |
| **Vapor pressure** | Not applicable |
| **Vapor density** | Not applicable |
| **Relative density** | Not determined. |
| **Solubility(ies)** | Insoluble |
| **Specific gravity** | Not determined |
| **Partition coefficient (n-octanol/water)** | Not applicable.<br>Not applicable |
| **Auto-ignition temperature** | Not applicable |
| **Decomposition temperature** | Not applicable |

| | |
|---|---|
| **Viscosity** | Not applicable. |

## 10. Stability and reactivity

| | |
|---|---|
| **Reactivity** | The product is stable and non-reactive under normal conditions of use, storage and transport. |
| **Chemical stability** | Stable under normal conditions of use, storage, and transportation. |
| **Possibility of hazardous reactions** | Hazardous polymerization does not occur. |
| **Conditions to avoid** | Chips, fines, dust and molten metal are considerably more reactive with the following:<br>• Water: Slowly generates flammable/explosive hydrogen gas and heat. Generation rate is greatly increased with smaller particles (e.g., fines and dusts). Molten metal can react violently/explosively with water or moisture, particularly when the water is entrapped.<br>• Heat: Oxidizes at a rate dependent upon temperature and particle size.<br><br>Explosions can occur with coils of foil that have been submerged or partially submerged in water for an extended period of time. Water can penetrate between the layers of foil, react with the aluminum surface and generate heat and hydrogen gas. When the coils are removed from the cooling effects of the water, rapid temperature increases can occur causing steam explosions which result in the rupture of the coils and discharge of debris.<br><br>Coils of foil may be a potential hazard under the following conditions:<br>• Coil has been annealed (annealing removes residual oil that could prevent penetration of water<br>) • Foil is very thin gauge (5-9 µm thickness which increases surface area)<br>• Coil has been immersed for an extended period of time (several hours or more)<br>• Wetted coil has recently been removed from the cooling effects of the water<br><br>In such situations, the coils should be isolated (30 meters from any personnel) for at least 72 hours as soon as possible after removal from the water. Coils making crackling sounds or emitting steam should not be approached or transported in commerce. Wetted coils should not be charged into a furnace for remelting until completely dry.<br><br>Grinding, sanding, buffing and polishing operations may generate potentially explosive aluminum dust, fines or particulate that must not be co-mingled with dust, fines or particulate of steel, iron, iron oxide (rust) or other metal oxides. Vacuum and dust collection systems utilized for processing aluminum must be placarded as follows:<br><br>WARNING – Aluminum Metal Only – Fire or Explosion Can Result with Other Metals. |
| **Incompatible materials** | Chips, fines, dust and molten metal are considerably more reactive with the following:<br>• Strong oxidizers: Violent reaction with considerable heat generation. Can react explosively with nitrates (e.g., ammonium nitrate and fertilizers containing nitrate) when heated or molten.<br>• Acids and alkalis: Reacts to generate flammable/explosive hydrogen gas. Generation rate is greatly increased with smaller particles (e.g., fines and dusts).<br>• Halogenated compounds: Many halogenated hydrocarbons, including halogenated fire extinguishing agents, can react violently with finely divided or molten aluminum.<br>• Iron oxide (rust) and other metal oxides (e.g., copper and lead oxides): A violent thermite reaction generating considerable heat can occur. Reaction with aluminum fines and dusts requires only very weak ignition sources for initiation. Molten aluminum can react violently with iron oxide without external ignition source.<br>Thermite reactions can occur with oxides of lead, copper, iron, bismuth and certain other metals.<br>• Iron powder and water: Explosive reaction forming hydrogen gas when heated above 1470°F (800°C).<br>Thermite explosions have been reported when aluminum alloys were melted in furnaces used for alloying with lead, bismuth or other metals with low melting temperatures. These metals, when added as high purity ingots, can seep through cracks in furnace liners and become oxidized. During subsequent melts in the furnace, molten aluminum can contact these metal oxides resulting in a thermite explosion. |
| **Hazardous decomposition products** | No hazardous decomposition products are known. |

## 11. Toxicological information

**Health effects associated with ingredients**

Aluminum dust/fines and fumes: Low health risk by inhalation. Generally considered to be biologically inert (milling, cutting, grinding).

Copper dust/mists: Can cause irritation of the eyes, mucous membranes, skin, and respiratory tract. Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes) and hair discoloration.

Chromium dust and fumes: Can cause irritation of eye, skin and respiratory tract. Metallic chromium and trivalent chromium: Not classifiable as to their carcinogenicity to humans by IARC.

Silicon (inert dusts): Chronic overexposures: Can cause chronic bronchitis and narrowing of airways.

Nickel dust and fume: Can cause irritation of eyes, skin and respiratory tract. Eye contact: Can cause inflammation of the eyes and eyelids (conjunctivitis). Skin contact: Can cause sensitization and allergic contact dermatitis. Chronic overexposures: Can cause perforation of the nasal septum, inflammation of the nasal passages (sinusitis), respiratory sensitization, asthma and scarring of the lungs (pulmonary fibrosis). Nickel alloys IARC/NTP: Reviewed and not recommended for listing by NTP. Listed as possibly carcinogenic to humans by IARC (Group 2B).

Lead dust or fume: Can cause irritation of eyes and upper respiratory tract. Acute overexposures: Can cause nausea and muscle cramps. Chronic overexposures: Can cause weakness in the extremities (peripheral neuropathy), abdominal cramps, gastrointestinal tract effects, kidney damage, liver damage, central nervous system damage, damage to the blood forming organs, blood cell damage and reproductive harm. Can cause reduced fertility and fetal toxicity in pregnant women. IARC/NTP: Listed as "reasonably anticipated to be a human carcinogen" by the NTP. Listed as possibly carcinogenic to humans by IARC (Group 2B).

Beryllium: Can cause lung sensitization in susceptible individuals. Skin contact: Can cause irritant dermatitis, allergic contact dermatitis and lumps on the skin (granulomas). Acute overexposures: Can cause inflammation of the lung tissues (Acute Beryllium Disease). Acute Beryllium Disease can be fatal but is unlikely to occur when processing beryllium-containing aluminum alloys.

Chronic exposures: Chronic inhalation of dust and fumes by sensitized individuals can result in a serious, progressive disease called Chronic Beryllium Disease (CBD). This disease is an allergic condition in which the lung tissues become inflamed. This inflammation, sometimes accompanied with scarring of the lungs (pulmonary fibrosis), restricts the uptake of oxygen into the blood stream. CBD can, over time, be fatal.

Beryllium studies with experimental animals by inhalation have found lung tumors. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1).

Some products are supplied with an oil coating or have residual oil from the manufacturing process. Oil: Can cause irritation of skin. Skin contact (prolonged or repeated): Can cause dermatitis.

**Health effects associated with compounds formed during processing**

The following could be expected if welded, remelted or otherwise processed at elevated temperatures:

Alumina (aluminum oxide): Low health risk by inhalation. Generally considered to be biologically inert.

Zinc oxide fumes: Can cause irritation of upper respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

Magnesium oxide fumes: Can cause irritation of the eyes and respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

Copper fume: Can cause irritation of the eyes, mucous membranes, and respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

Manganese oxide fumes: Can cause irritation of the eyes, skin, and respiratory tract. Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise).

Manganese compounds: Chronic overexposures: Can cause inflammation of the lung tissues, scarring of the lungs (pulmonary fibrosis), central nervous system damage, Secondary Parkinson's Disease and reproductive harm in males.

Iron oxide: Chronic overexposures: Can cause benign lung disease (siderosis). Ingestion: Can cause irritation of gastrointestinal tract, bleeding, changes in the pH of the body fluids (metabolic acidosis) and liver damage.

Hexavalent chromium compounds (Chromium VI): Can cause irritation of eye, skin and respiratory tract. Skin contact: Can cause irritant dermatitis, allergic reactions and skin ulcers. Chronic overexposures: Can cause perforation of the nasal septum, respiratory sensitization, asthma, the accumulation of fluid in the lungs (pulmonary edema), lung damage, kidney damage, lung cancer, nasal cancer and cancer of the gastrointestinal tract. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1).

Chromium (III) compounds: Can cause irritation of eye, skin and respiratory tract. IARC/NTP: Not classifiable as to their carcinogenicity to humans by IARC.

Silica, amorphous: Acute overexposures: Can cause dryness of eyes, nose and upper respiratory tract.

Nickel compounds: Associated with lung cancer, cancer of the vocal cords and nasal cancer. IARC/NTP: Listed as "known to be a human carcinogen" by the NTP. Listed as carcinogenic to humans by IARC (Group 1).

If the product is heated well above ambient temperatures or machined, oil vapor or mist may be generated.
Oil vapor or mist: Can cause irritation of respiratory tract. Acute overexposures: Can cause bronchitis, headache, central nervous system effects (nausea, dizziness and loss of coordination) and drowsiness (narcosis).

Welding, plasma arc cutting, and arc spray metalizing can generate ozone.
Ozone: Can cause irritation of eyes, nose and upper respiratory tract. Acute overexposures: Can cause shortness of breath, tightness of chest, headache, cough, nausea and narrowing of airways. Effects are reversible on cessation of exposure. Acute overexposures (high concentrations): Can cause respiratory distress, respiratory tract damage, bleeding and the accumulation of fluid in the lungs (pulmonary edema). Effects can be delayed up to 1-2 hours. Additional information: Studies (inhalation) with experimental animals have found genetic damage, reproductive harm, blood cell damage, lung damage and death.

Welding fumes: IARC/NTP: Listed as possibly carcinogenic to humans by IARC (Group 2B). Additional information: In one study, occupational asthma was associated with exposures to fumes from aluminum welding.

Plasma arc cutting of aluminum can generate oxides of nitrogen.
Oxides of nitrogen (NO and NO2): Can cause irritation of eyes, skin and respiratory tract. Acute overexposures: Can cause reduced ability of the blood to carry oxygen (methemaglobin). Can cause cough, shortness of breath, accumulation of fluid in the lungs (pulmonary edema) and death. Effects can be delayed up to 2-3 weeks.
Nitrogen dioxide (NO2): Chronic overexposures: Can cause scarring of the lungs (pulmonary fibrosis).

**Information on likely routes of exposure**

| | |
|---|---|
| **Eye contact** | Dust and fumes from processing: Can cause irritation. |
| **Skin contact** | Dust and fumes from processing: Can cause irritation. |
| | Contact with residual oil/oil coating: Can cause irritation. Prolonged or repeated skin contact may cause dermatitis. |

| | |
|---|---|
| **Inhalation** | Dust from mechanical processing: Additional health effects from elevated temperature processing (e.g., welding, melting): Acute overexposure: Can cause metal fume fever (nausea, fever, chills, shortness of breath malaise), reduced ability of the blood to carry oxygen (methemoglobin) the accumulation of fluid in the lungs (pulmonary edema).<br><br>Chronic overexposures: Can cause benign lung disease scarring of the lungs (pulmonary fibrosis), respiratory sensitization, central nervous system damage, secondary Parkinson's disease, reproductive harm and lung cancer. |
| **Ingestion** | Not relevant, due to the form of the product. |
| **Symptoms related to the physical, chemical and toxicological characteristics** | Dust and fumes from processing: Can cause irritation of the eyes, skin and upper respiratory tract.<br><br>Health effects from mechanical processing (e.g., cutting, grinding): Dust from processing: Chronic overexposures: Can cause reduction in the number of red blood cells (anemia), and skin abnormalities (pigmentation changes),.<br><br>Additional health effects from elevated temperature processing (e.g., welding, melting): Acute overexposure: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise), reduced ability of the blood to carry oxygen (methemaglobin), and the accumulation of fluid in the lungs (pulmonary edema).<br>Chronic overexposure: Can cause benign lung disease scarring of the lungs (pulmonary fibrosis), respiratory sensitization, central nervous system damage, secondary Parkinson's disease, reproductive harm and lung cancer. Contact with residual oil/oil coating: Prolonged skin contact may cause skin irritation and/or dermatitis. |

**Information on toxicological effects**

| **Components** | **Species** | **Test Results** |
|---|---|---|
| Aluminum (CAS 7429-90-5) | | |
| **Acute** | | |
| **Inhalation** | | |
| LC50 | Rat | > 2.3 mg/l<br>7.6 mg/l |
| **Oral** | | |
| LD50 | Rat | > 2000 mg/kg |
| Nickel (CAS 7440-02-0) | | |
| **Acute** | | |
| **Oral** | | |
| LD50 | Rat | > 9000 mg/kg |
| Zinc (CAS 7440-66-6) | | |
| **Acute** | | |
| **Oral** | | |
| LD50 | Rat | 630 mg/kg |
| **Compounds Formed During Processing** | **Species** | **Test Results** |
| Aluminum oxide (non-fibrous) (CAS 1344-28-1) | | |
| **Acute** | | |
| **Inhalation** | | |
| LC50 | Rat | > 2.3 mg/l<br>7.6 mg/l |
| **Oral** | | |
| LD50 | Rat | > 5000 mg/kg |
| Iron oxide (CAS 1309-37-1) | | |
| **Acute** | | |
| **Oral** | | |
| LD50 | Rat | > 10000 mg/kg |

| Compounds Formed During Processing | Species | Test Results |
|---|---|---|
| Zinc oxide (CAS 1314-13-2) | | |
| **Acute** | | |
| **Inhalation** | | |
| LC50 | Mouse | > 5.7 mg/l, 4 Hours |
| **Oral** | | |
| LD50 | Mouse | 7950 mg/kg |
| | Rat | > 5000 mg/kg |
| | | > 5 g/kg |

**Acute toxicity** Not classified. Based on available data, the classification criteria are not met.

**Skin corrosion/irritation** Non-corrosive.

**Serious eye damage/eye irritation** Can cause irritation.

**Respiratory or skin sensitization** Dust and fume from processing: Contains beryllium. May produce an allergic reaction. Contains nickel. May produce an allergic reaction.

**ACGIH Sensitization**

| | |
|---|---|
| Beryllium (CAS 7440-41-7) | Respiratory sensitization |
| Beryllium compounds (CAS Not available) | Respiratory sensitization |

**Respiratory sensitization** Dust and fume from processing: Contains beryllium. May produce an allergic reaction. May cause sensitization by inhalation.

**Skin sensitization** Contact with residual oil/oil coating: Prolonged skin contact may cause skin irritation and/or dermatitis.

**Germ cell mutagenicity** Not classified. Product as shipped: No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic. Based on available data, the classification criteria are not met.

**Neurological effects** Not classified. Based on available data, the classification criteria are not met.

**Pre-existing conditions aggravated by exposure** Dust and fume from processing: Asthma, chronic lung disease, and skin rashes.

**Carcinogenicity** Product as shipped: Not classified. Dust from mechanical processing: Can present a cancer hazard (Nickel, Beryllium). Dust and fumes from welding or elevated temperature processing: Can present a cancer hazard (Hexavalent chromium compounds, Nickel compounds, Beryllium compounds, Welding fume).

**ACGIH Carcinogens**

| | |
|---|---|
| Aluminum (CAS 7429-90-5) | Not classifiable as a human carcinogen. A4 |
| Aluminum oxide (non-fibrous) (CAS 1344-28-1) | Not classifiable as a human carcinogen. A4 |
| Beryllium (CAS 7440-41-7) | A1 Confirmed human carcinogen. |
| Beryllium compounds (CAS Not available) | A1 Confirmed human carcinogen. |
| Chromium (CAS 7440-47-3) | Not classifiable as a human carcinogen. A4 |
| Chromium (III) compounds (CAS Not available) | Not classifiable as a human carcinogen. A4 |
| Chromium (VI) compounds (CAS 18540-29-9) | A1 Confirmed human carcinogen. |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | A1 Confirmed human carcinogen. |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | A1 Confirmed human carcinogen. |
| Iron oxide (CAS 1309-37-1) | Not classifiable as a human carcinogen. A4 |
| Lead (CAS 7439-92-1) | A3 Confirmed animal carcinogen with unknown relevance to humans. |
| Magnesium oxide (CAS 1309-48-4) | Not classifiable as a human carcinogen. A4 |
| Nickel (CAS 7440-02-0) | Not suspected as a human carcinogen. A5 |
| Nickel compounds, insoluble (CAS Not available) | A1 Confirmed human carcinogen. |
| Oil mist, mineral (CAS 8012-95-1) | A2 Suspected human carcinogen. |
| | Not classifiable as a human carcinogen. A4 |

**IARC Monographs. Overall Evaluation of Carcinogenicity**

| | |
|---|---|
| Beryllium (CAS 7440-41-7) | 1 Carcinogenic to humans. |
| Beryllium compounds (CAS Not available) | 1 Carcinogenic to humans. |
| Chromium (CAS 7440-47-3) | 3 Not classifiable as to carcinogenicity to humans. |
| Chromium (III) compounds (CAS Not available) | 3 Not classifiable as to carcinogenicity to humans. |
| Chromium (VI) compounds (CAS 18540-29-9) | 1 Carcinogenic to humans. |

| | |
|---|---|
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | 1 Carcinogenic to humans. |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | 1 Carcinogenic to humans. |
| Iron oxide (CAS 1309-37-1) | 3 Not classifiable as to carcinogenicity to humans. |
| Lead (CAS 7439-92-1) | 2B Possibly carcinogenic to humans. |
| Nickel (CAS 7440-02-0) | 1 Carcinogenic to humans. |
| Nickel compounds, insoluble (CAS Not available) | 1 Carcinogenic to humans. |

**US. National Toxicology Program (NTP) Report on Carcinogens**

| | |
|---|---|
| Beryllium (CAS 7440-41-7) | Known To Be Human Carcinogen. |
| Beryllium compounds (CAS Not available) | Known To Be Human Carcinogen. |
| Chromium (VI) compounds (CAS 18540-29-9) | Known To Be Human Carcinogen. |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Known To Be Human Carcinogen. |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Known To Be Human Carcinogen. |
| Lead (CAS 7439-92-1) | Reasonably Anticipated to be a Human Carcinogen. |
| Nickel (CAS 7440-02-0) | Known To Be Human Carcinogen.<br>Reasonably Anticipated to be a Human Carcinogen. |
| Oil mist, mineral (CAS 8012-95-1) | Known To Be Human Carcinogen. |

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

| | |
|---|---|
| Chromium (VI) compounds (CAS 18540-29-9) | Cancer |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Cancer |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Cancer |

**Reproductive toxicity** Does not present any reproductive hazards.
Based on available data, the classification criteria are not met.

**Routes of exposure** Inhalation. Ingestion. Skin contact.

**Specific target organ toxicity - single exposure** Based on available data, the classification criteria are not met.

**Specific target organ toxicity - repeated exposure** Based on available data, the classification criteria are not met.

**Aspiration hazard** Not an aspiration hazard.

## 12. Ecological information

**Ecotoxicity** No data is available on the product itself.

| Components | | Species | Test Results |
|---|---|---|---|
| Chromium (CAS 7440-47-3) | | | |
| **Aquatic** | | | |
| Crustacea | EC50 | Water flea (Daphnia magna) | 0.01 - 0.7 mg/l, 48 hours |
| Fish | LC50 | Carp (Cyprinus carpio) | 14.3 mg/l, 96 hours |
| Copper (CAS 7440-50-8) | | | |
| **Aquatic** | | | |
| Crustacea | EC50 | Water flea (Daphnia magna) | 0.036 mg/l, 48 hours |
| Fish | LC50 | Fathead minnow (Pimephales promelas) | 0.0319 - 0.0544 mg/l, 96 hours |
| Iron (CAS 7439-89-6) | | | |
| **Aquatic** | | | |
| Crustacea | LC50 | Cockle (Cerastoderma edule) | 100 - 330 mg/l, 48 hours |
| | | Common shrimp, sand shrimp (Crangon crangon) | 33 - 100 mg/l, 48 hours |
| Fish | LC50 | Channel catfish (Ictalurus punctatus) | > 500 mg/l, 96 hours |
| Lead (CAS 7439-92-1) | | | |
| **Aquatic** | | | |
| Fish | LC50 | Rainbow trout,donaldson trout (Oncorhynchus mykiss) | 1.17 mg/l, 96 hours |

| Components | | Species | Test Results |
|---|---|---|---|
| Manganese (CAS 7439-96-5) | | | |
| **Aquatic** | | | |
| Crustacea | EC50 | Water flea (Daphnia magna) | 40 mg/l, 48 hours |
| Nickel (CAS 7440-02-0) | | | |
| **Aquatic** | | | |
| Crustacea | EC50 | Water flea (Daphnia magna) | 1 mg/l, 48 hours |
| Fish | LC50 | Fathead minnow (Pimephales promelas) | 2.923 mg/l, 96 hours |
| Zinc (CAS 7440-66-6) | | | |
| **Aquatic** | | | |
| Crustacea | EC50 | Water flea (Daphnia magna) | 2.8 mg/l, 48 hours |
| Fish | LC50 | Rainbow trout,donaldson trout (Oncorhynchus mykiss) | 0.56 mg/l, 96 hours |

| Compounds Formed During Processing | | Species | Test Results |
|---|---|---|---|
| Zinc oxide (CAS 1314-13-2) | | | |
| **Aquatic** | | | |
| Fish | LC50 | Fathead minnow (Pimephales promelas) | 2246 mg/l, 96 hours |

**Persistence and degradability** The product contains inorganic compounds which are not biodegradable.

**Bioaccumulative potential** No data available on bioaccumulation.

**Mobility in soil** Not considered mobile.

**Mobility in general** Not considered mobile.

**Other adverse effects** None known.

## 13. Disposal considerations

**Disposal instructions** Reuse or recycle material whenever possible. If reuse or recycling is not possible, disposal must be made according to local or governmental regulations. Keep scrap separate from other metal scrap.

**Waste codes** RCRA Status: Not federally regulated in the U.S. if disposed of "as is."
RCRA waste codes other than described here may apply depending on use of the product. Status must be determined at the point of waste generation. Refer to 40 CFR 261 or state equivalent in the U.S. TCLP testing is recommended for chromium and lead in a waste disposal scenario.

**Waste from residues / unused products** Dispose of in accordance with local regulations.

**Contaminated packaging** Dispose of in accordance with local regulations.

## 14. Transport information

**General Shipping Information**

**Basic Shipping Information**

**ID number** -

**Proper shipping name** Not regulated

**Hazard class** -

**Packing group** -

**General Shipping Notes**

• When "Not regulated", enter the proper freight classification, SDS Number and Product Name onto the shipping paperwork.

**Disclaimer**

This section provides basic classification information and, where relevant, information with respect to specific modal regulations, environmental hazards and special precautions. Otherwise, it is presumed that the information is not available/not relevant

## 15. Regulatory information

**US federal regulations** In reference to Title VI of the Clean Air Act of 1990, this material does not contain nor was it manufactured using ozone-depleting chemicals.
All electrical equipment must be suitable for use in hazardous atmospheres involving aluminum powder in accordance with 29 CFR 1910.307. The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installation which will meet this requirement.

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

Not regulated.

**CERCLA Hazardous Substance List (40 CFR 302.4)**

| | |
|---|---|
| Beryllium (CAS 7440-41-7) | Listed. |
| Beryllium compounds (CAS Not available) | Listed. |
| Chromium (CAS 7440-47-3) | Listed. |
| Copper (CAS 7440-50-8) | Listed. |
| Lead (CAS 7439-92-1) | Listed. |
| Manganese (CAS 7439-96-5) | Listed. |
| Nickel (CAS 7440-02-0) | Listed. |
| Zinc (CAS 7440-66-6) | Listed. |

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

| | |
|---|---|
| Chromium (VI) compounds (CAS 18540-29-9) | Cancer |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Cancer |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Cancer |
| Lead (CAS 7439-92-1) | Reproductive toxicity |
| Chromium (VI) compounds (CAS 18540-29-9) | Eye irritation |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Eye irritation |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Eye irritation |
| Lead (CAS 7439-92-1) | Central nervous system |
| Chromium (VI) compounds (CAS 18540-29-9) | Skin sensitization |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Skin sensitization |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Skin sensitization |
| Lead (CAS 7439-92-1) | Kidney |
| | Blood |
| | Acute toxicity |

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

| | | |
|---|---|---|
| **Section 311/312 hazard categories** | Immediate Hazard - Yes | If particulates/fumes generated during processing |
| | Delayed Hazard - Yes | If particulates/fumes generated during processing |
| | Fire Hazard - No | |
| | Pressure Hazard - No | |
| | Reactivity Hazard - Yes | If molten |

**SARA 302 Extremely hazardous substance**

| Chemical name | CAS number | Reportable quantity | Threshold planning quantity | Threshold planning quantity, lower value | Threshold planning quantity, upper value |
|---|---|---|---|---|---|

Nothing listed.

**SARA 311/312 Hazardous chemical** Yes

**Disclaimer** The user of this SDS should verify the substance specific concentration information as it relates to regulatory reporting. Listed concentrations may cover a range of formulations and process batch variations.

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**SARA 313 (TRI reporting)**

| Chemical name | CAS number | % by wt. |
|---|---|---|
| Aluminum | 7429-90-5 | >86 |
| Zinc | 7440-66-6 | <10.6 |
| Copper | 7440-50-8 | <5.0 |
| Manganese | 7439-96-5 | <1.0 |

**US state regulations**

**US. California Proposition 65**

**US - California Proposition 65 - CRT: Listed date/Carcinogenic substance**

| | |
|---|---|
| Beryllium (CAS 7440-41-7) | Listed: October 1, 1987 |
| Beryllium compounds (CAS Not available) | Listed: October 1, 1987 |
| Chromium (VI) compounds (CAS 18540-29-9) | Listed: February 27, 1987 |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Listed: February 27, 1987 |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Listed: February 27, 1987 |
| Lead (CAS 7439-92-1) | Listed: October 1, 1992 |
| Nickel (CAS 7440-02-0) | Listed: May 7, 2004 |
| Nickel compounds, insoluble (CAS Not available) | Listed: May 7, 2004 |

**US - California Proposition 65 - CRT: Listed date/Developmental toxin**

| | |
|---|---|
| Chromium (VI) compounds (CAS 18540-29-9) | Listed: December 19, 2008 |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Listed: December 19, 2008 |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Listed: December 19, 2008 |
| Lead (CAS 7439-92-1) | Listed: February 27, 1987 |

**US - California Proposition 65 - CRT: Listed date/Female reproductive toxin**

| | |
|---|---|
| Chromium (VI) compounds (CAS 18540-29-9) | Listed: December 19, 2008 |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Listed: December 19, 2008 |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Listed: December 19, 2008 |
| Lead (CAS 7439-92-1) | Listed: February 27, 1987 |

**US - California Proposition 65 - CRT: Listed date/Male reproductive toxin**

| | |
|---|---|
| Chromium (VI) compounds (CAS 18540-29-9) | Listed: December 19, 2008 |
| Chromium (VI) compounds, certain water insoluble forms (CAS Not available) | Listed: December 19, 2008 |
| Chromium (VI) compounds, water soluble forms (CAS Not available) | Listed: December 19, 2008 |
| Lead (CAS 7439-92-1) | Listed: February 27, 1987 |

**International Inventories**

| Country(s) or region | Inventory name | On inventory (yes/no)* |
|---|---|---|
| Australia | Australian Inventory of Chemical Substances (AICS) | Yes |
| Canada | Domestic Substances List (DSL) | Yes |
| Canada | Non-Domestic Substances List (NDSL) | No |
| China | Inventory of Existing Chemical Substances in China (IECSC) | Yes |
| Europe | European Inventory of Existing Commercial Chemical Substances (EINECS) | Yes |
| Europe | European List of Notified Chemical Substances (ELINCS) | No |
| Japan | Inventory of Existing and New Chemical Substances (ENCS) | No |
| Korea | Existing Chemicals List (ECL) | Yes |
| Philippines | Philippine Inventory of Chemicals and Chemical Substances (PICCS) | Yes |
| United States & Puerto Rico | Toxic Substances Control Act (TSCA) Inventory | Yes |

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

## 16. Other information, including date of preparation or last revision

| | |
|---|---|
| **SDS Status** | February 10, 2016: Change(s) in Section: 2 and 16.<br>May 30, 2015: New format.<br>August 14, 2013: Change(s) in Section: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 15 and 16.<br>June 8, 2012: Change(s) in Section: 1, 2, 4, 5, 6, 7, 8, 10, 11, 12 and 13.<br>April 29, 2009: Change(s) in Section: 2, 7, 10 and 11.<br>October 24, 2008: New format.<br>September 28, 2007: Change(s) in Section: 1, 2, 3 and 8.<br>December 20, 2006: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 2, 3, 4, 5, 7, 8, 10, 11, 12 and 15.<br>December 4, 2003: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1 and 2.<br>Origination date: September 7, 1999<br><br>Hazardous Materials Control Committee<br>Preparer: Jim Perriello, +1-865-977-2051.<br><br>SDS System Number: 151060 |
| **Revision date** | February 10, 2016. |
| **Version #** | 11 |
| **Revision Information** | Product and Company Identification: Synonyms<br>Composition / Information on Ingredients: Ingredients<br>Physical & Chemical Properties: Multiple Properties<br>Transport Information: Material Transportation Information<br>Regulatory Information: United States<br>Regulatory information: Disclaimer<br>HazReg Data: North America<br>GHS: Qualifiers |
| **Further information** | Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling. |
| **Disclaimer** | The information in the sheet was written based on the best knowledge and experience currently available. |

**Other information**

- Guide to Occupational Exposure Values 2015, Compiled by the American Conference of Governmental Industrial Hygienists (ACGIH).
- NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, September 2005.
- expub, Expert Publishing, LLC., www.expub.com,
- Ariel, 3E Company, www.3Ecompany.com
- Aluminum Association's Bulletin F-1, "Guidelines for Handling Aluminum Fines Generated During Various Aluminum Fabricating Operations." The Aluminum Association, 1525 Wilson Boulevard, Suite 600, Arlington, Virginia 22209, www.aluminum.org.
- Aluminum Association, "Guidelines for Handling Molten Aluminum, The Aluminum Association, 1525 Wilson Boulevard, Suite 600, Arlington, Virginia 22209, www.aluminum.org.
- NFPA 484, Standard for Combustible Metals (NFPA phone: 800-344-3555)
- NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 70, Standard for National Electrical Code (Electrical Equipment, Grounding and Bonding)
- NFPA 77, Standard for Static Electricity

Key/Legend:

| | |
|---|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| AICS | Australian Inventory of Chemical Substances |
| CAS | Chemical Abstract Services |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CPR | Cardio-pulmonary Resuscitation |
| DOT | Department of Transportation |
| DSL | Domestic Substances List (Canada) |
| EC | Effective Concentration |
| ED | Effective Dose |
| EINECS | European Inventory of Existing Commercial Chemical Substances |
| ENCS | Japan - Existing and New Chemical Substances |
| EWC | European Waste Catalogue |
| EPA | Environmental Protective Agency |
| IARC | International Agency for Research on Cancer |
| LC | Lethal Concentration |
| LD | Lethal Dose |
| MAK | Maximum Workplace Concentration (Germany) "maximale Arbeitsplatz-Konzentration" |
| NDSL | Non-Domestic Substances List (Canada) |
| NIOSH | National Institute for Occupational Safety and Health |
| NTP | National Toxicology Program |
| OEL | Occupational Exposure Limit |
| OSHA | Occupational Safety and Health Administration |
| PIN | Product Identification Number |
| PMCC | Pensky Marten Closed Cup |
| RCRA | Resource Conservation and Recovery Act |
| SARA | Superfund Amendments and Reauthorization Act |
| SIMDUT | Système d'Information sur les Matières Dangereuses Utilisées au Travail |
| STEL | Short Term Exposure Limit |
| TCLP | Toxic Chemicals Leachate Program |
| TDG | Transportation of Dangerous Goods |
| TLV | Threshold Limit Value |
| TSCA | Toxic Substances Control Act |
| TWA | Time Weighted Average |
| WHMIS | Workplace Hazardous Materials Information System |

m meter, cm centimeter, mm millimeter, in inch,
g gram, kg kilogram, lb pound, µg microgram,
ppm parts per million, ft feet

*** End of SDS ***

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ALCOA

AIRCORPS AVIATION
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BEMIDJI MN 56619

## MATERIAL SAFETY DATA SHEET NOTIFICATION

04/20/2016

Alcoa Sales Order: 1000795699
Purchase Order: P15385

MSDS No: 1056
Latest Revision Date: 08/14/2013

The Material Safety Data Sheet for the product(s) you have purchased from Alcoa Inc. contains health, safety and environmental information that will enable your company to use our products in a safe and environmentally sound manner. We are providing an MSDS with this particular order because:

1. This is the first time you have ordered product(s) covered by this MSDS, or
2. This MSDS has been revised since a copy was last sent to you, or
3. Annual notification is required for product(s) which may contain chemicals subject to reporting under Section 313 of SARA III and 40 CFR 372 (U.S. customers only)

The most current version of all Alcoa MSDSs can be found at www.alcoa.com.

If you repackage or otherwise distribute this product to industrial customers, this MSDS or a similar one should be provided to them.

Unless otherwise indicated, this notification is being sent to the billing address specified on the Sales Order. If there is a specific address to which MSDSs should be sent, please complete the following and email, FAX or mail to:

Email: ACCMSDS@alcoa.com
FAX: +1-412-553-4822

Nancy Truver
201 Isabella Street
Pittsburgh, PA 15212-5858 USA

( )* Email address: _____
( )* Fax number: _____
( )* Mailing address: _____
_____
_____
_____

* - Check preferred method of communication

Signature: _____ Date: _____

_____
(please print name)

James Perriello
Alcoa EHS Services

Alcoa Inc.
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Pittsburgh, PA 15212-5858

# MATERIAL SAFETY DATA SHEET NOTIFICATION

**See Other Side**

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## MATERIAL SAFETY DATA SHEET NOTIFICATION

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