



SAFETY DATA SHEET

1. Identification

Product identifier ALUMINUM EXTRUSIONS, ANODIZED ALUMINUM PRODUCTS

Other means of identification

SDS number 509

Version # 06

Revision date May 27, 2015.

Other means of identification

Synonyms Aluminum Alloys 6xxx Series

Recommended use Fabricated aluminum parts and products

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Alcoa Inc.
201 Isabella Street
Pittsburgh, PA 15212-5858 USA
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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

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 Prevent dust accumulation to minimize explosion hazard.

Response Not assigned.

Storage Not assigned.

Disposal Reuse or recycle material whenever possible.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information

Dust and fume from processing: Can cause irritation of the eyes, skin and respiratory tract. Additional health effects from elevated temperature processing (e.g., welding, melting): Acute overexposure: Can cause metal fume fever, reduced ability of the blood to carry oxygen and the accumulation of fluid in the lungs.

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

Explosion/fire hazards may be present when:

- 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 is in contact with water/moisture or certain metal oxides (e.g., rust, copper oxide).

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 | 96 - 99 |
| Zinc | | 7440-66-6 | <6.5 |
| Manganese | | 7439-96-5 | <1.5 |
| Magnesium | | 7439-95-4 | <1.2 |
| Chromium | | 7440-47-3 | <0.35 |

Additional Information Exact composition will vary. Unless additional information is available, processor should assume that all potential ingredients are present. 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 fumes from processing: 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. Provide cardiopulmonary resuscitation for persons without pulse or respirations. If breathing is difficult, provide oxygen. Loosen any tight clothing on neck or chest. Consult a physician.

Ingestion

Not relevant, due to the form of the product.

Most important symptoms/effects, acute and delayed

Dust and fumes from processing: Can cause irritation of the eyes, skin and upper respiratory tract. See Section 11 of the SDS for additional information on health hazards.

Medical conditions aggravated by exposure

Dust and fume from processing: Asthma, chronic lung disease, Secondary Parkinson's disease and skin rashes.

Indication of immediate medical attention and special treatment needed

Provide general supportive measures and treat symptomatically.

General information

Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media

Use Class D extinguishing agents on fines, dust or molten metal. Use water spray to cool exposed containers.

Unsuitable extinguishing media

DO NOT USE halogenated extinguishing agents on small chips/fines. DO NOT USE water in fighting fires around molten metal. These fire extinguishing agents will react with the burning material.

| | |
|--|---|
| Specific hazards arising from the chemical | <p>May be a potential hazard under the following conditions:</p> <ul style="list-style-type: none"> • 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. • 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. • 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. • 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. |
| Special protective equipment and precautions for firefighters | Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate. |
| 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 | Not sensitive. Dust from processing Take precautionary measures against static discharges. |

6. Accidental release measures

| | |
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| Personal precautions, protective equipment and emergency procedures | Avoid contact with sharp edges or heated metal. Use personal protection recommended in Section 8 of the SDS. |
| Personal precautions, protective equipment and emergency procedures | |
| For emergency responders | Avoid contact with sharp edges or heated metal. Use personal protection recommended in Section 8 of the SDS. |
| Evacuation procedures | None necessary. |
| Methods and materials for containment and cleaning up | Pick up mechanically. Collect scrap for recycling. 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 | No special environmental precautions required. |

7. Handling and storage

| | |
|---|--|
| Handling | 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 personal protection recommended in Section 8 of the SDS. |
| Storage | Keep material dry. |
| Requirements for Processes Which Generate Dusts or Fines | <p>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.</p> <p>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).</p> <p>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.</p> <p>Do not allow small chunks, fines or dust to contact water, particularly in enclosed areas.</p> <p>Avoid all ignition sources. Good housekeeping practices must be maintained. Do not use compressed air to remove settled material from floors, beams or equipment.</p> |

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, containers, molds and ladles which come in contact with molten metal must be preheated or specially coated, rust free and approved for such use. Any surfaces that may contact molten metal (e.g., 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.

8. Exposure controls/personal protection

Occupational exposure limits

U.S. - OSHA Components

| U.S. - OSHA Components | Type | Value | Form |
|---------------------------|---------|---|-----------------------------------|
| Aluminum (CAS 7429-90-5) | TWA | 5 mg/m ³ 15 mg/m ³ | Respirable fraction Total dust |
| Chromium (CAS 7440-47-3) | TWA | 1 mg/m ³ | |
| Manganese (CAS 7439-96-5) | Ceiling | 5 mg/m ³ | Fume |

Compounds Formed During Processing

| Compounds Formed During Processing | Type | Value | Form |
|--|---------|--|--|
| Aluminum oxide (non-fibrous) (CAS 1344-28-1) | TWA | 5 mg/m ³ 15 mg/m ³ | Respirable fraction. Total dust. |
| Chromium (II) compounds | TWA | 0.5 mg/m ³ | (as Cr) |
| Chromium (III) compounds | TWA | 0.5 mg/m ³ | (as Cr) |
| Chromium (VI) compounds, certain water insoluble forms | TWA | 0.0025 mg/m ³ | Action Level as Cr(VI)) |
| Chromium (VI) compounds (CAS 18540-29-9) | TWA | 0.0025 mg/m ³ | Action Level as Cr(VI) |
| Magnesium oxide (CAS 1309-48-4) | TWA | 15 mg/m ³ | Total particulate. |
| Manganese compounds, inorganic | Ceiling | 5 mg/m ³ | (as Mn) Fume |
| Nitric oxide (CAS 10102-43-9) | TWA | 30 mg/m ³ 25 ppm | |
| Ozone (CAS 10028-15-6) | TWA | 0.2 mg/m ³ 0.1 ppm | |
| Zinc oxide (CAS 1314-13-2) | TWA | 5 mg/m ³ 5 mg/m ³ 15 mg/m ³ | Respirable fraction. Fume. Total dust. |

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

| 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 |
|---|-------------|--------------|-------------|
| Mineral oil (CAS 8012-95-1) | PEL | 5 mg/m3 | Mist. |
| Nitrogen dioxide (CAS 10102-44-0) | Ceiling | 9 mg/m3 | |
| | | 5 ppm | |

ACGIH

| Components | Type | Value | Form |
|---------------------------|---------------------------|--------------|-----------------------|
| 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 | Form |
|---|-------------|--------------|-------------|
| 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. |
| Chromium (CAS 7440-47-3) | TWA | 0.5 mg/m3 | |
| Compounds Formed During Processing | Type | Value | Form |
| Chromium (III) compounds | TWA | 0.5 mg/m3 | |
| Chromium (VI) compounds, certain water insoluble forms | TWA | 0.01 mg/m3 | (as Cr) |

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

| Compounds Formed During Processing | Type | Value | Form |
|---|-------------|-----------------------|---|
| Chromium (VI) compounds (CAS 18540-29-9) | TWA | 0.01 mg/m3 | Insoluble compounds as Cr |
| Magnesium oxide (CAS 1309-48-4) | TWA | 10 mg/m3 | Inhalable fraction. |
| Manganese compounds, inorganic | TWA | 0.1 mg/m3 | Inhalable fraction. |
| Mineral oil (CAS 8012-95-1) | TWA | 0.02 mg/m3 5 mg/m3 | Respirable fraction. 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 10 mg/m3 | Respirable fraction Total dust |
| Manganese (CAS 7439-96-5) | TWA | 0.05 mg/m3 0.02 mg/m3 | Total dust. Respirable fraction. |

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

General

The need for personal protective equipment should be based upon a hazard assessment and recommendations from health / safety professionals.

If the product is coated with oil, wear oil-resistant gloves to avoid skin contact. 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.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields.

Skin protection

Hand protection

Wear impervious gloves to avoid repeated or prolonged skin contact with residual oils and to avoid any skin injury.

Other

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).

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. Suitable respiratory protective device recommended: P95.

Thermal hazards

Contact with molten material can cause thermal burns.

General hygiene considerations

Handle in accordance with good industrial hygiene and safety practice.

| | |
|--|--|
| Control parameters | Follow standard monitoring procedures. |
| Environmental exposure controls | No special environmental precautions required. |

9. Physical and chemical properties

| | |
|---|---|
| Form | Solid. |
| Color | Silvery. |
| Odor | Odorless |
| Odor threshold | Not applicable |
| pH | Not applicable |
| Density | 2.69 - 2.70 g/cm ³ (0.097 - 0.098 lb/in ³) |
| Melting point/freezing point | 1025 - 1210 °F (551.67 - 654.44 °C) |
| Initial boiling point and boiling range | Not determined |
| 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 | Not applicable. |
| Vapor pressure | Not applicable |
| Vapor density | Not applicable |
| Relative density | Not determined. |
| Solubility(ies) | Insoluble |
| Partition coefficient (n-octanol/water) | 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 as shipped. |
| 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: <ul style="list-style-type: none"> • 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. • Heat: Oxidizes at a rate dependent upon temperature and particle size. |

Incompatible materials

Chips, fines, dust and molten metal are considerably more reactive with the following:

- 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.
- Acids and alkalis: Reacts to generate flammable/explosive hydrogen gas. Generation rate is greatly increased with smaller particles (e.g., fines and dusts).
- Halogenated compounds: Many halogenated hydrocarbons, including halogenated fire extinguishing agents, can react violently with finely divided or molten aluminum.
- Iron powder and water: Explosive reaction forming hydrogen gas when heated above 1470°F (800°C).
- 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.

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.

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.

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).

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.

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).

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 (methemoglobin). 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.

Inhalation Acute overexposure: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise), reduced ability of the blood to carry oxygen (methemoglobin) and the accumulation of fluid in the lungs (pulmonary edema). Dust: Can cause irritation of the upper respiratory tract.

Additional health effects from elevated temperature processing (e.g., welding, melting): Fumes: Can cause irritation of the respiratory tract. Chronic overexposures: Can cause respiratory sensitization, scarring of the lungs (pulmonary fibrosis), secondary Parkinson's disease, reproductive harm in males 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 respiratory tract.

Information on toxicological effects

| Components | Species | Test Results |
|--------------------------|---------|------------------------|
| Aluminum (CAS 7429-90-5) | | |
| <u>Acute</u> | | |
| <u>Inhalation</u> | | |
| LC50 | Rat | > 2.3 mg/l 7.6 mg/l |

| Components | Species | Test Results |
|---|---|--|
| Oral LD50 | Rat | > 2000 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 7.6 mg/l |
| Oral LD50 | Rat | > 5000 mg/kg |
| Nitric oxide (CAS 10102-43-9) | | |
| Acute Inhalation LC50 | Rat | 115 ppm, 1 Hours 57.5 ppm, 4 Hours |
| Nitrogen dioxide (CAS 10102-44-0) | | |
| Acute Inhalation LC50 | Guinea pig Rat | 30 ppm, 1 Hours 88 ppm, 4 Hours |
| Zinc oxide (CAS 1314-13-2) | | |
| Acute Inhalation LC50 | Mouse | > 5.7 mg/l, 4 Hours |
| Oral LD50 | Mouse Rat | 7950 mg/kg > 5000 mg/kg > 5 g/kg |
| Acute toxicity | Based on available data, the classification criteria are not met. | |
| Skin corrosion/irritation | Based on available data, the classification criteria are not met. | |
| Serious eye damage/eye irritation | Based on available data, the classification criteria are not met. | |
| Respiratory or skin sensitization | | |
| Respiratory sensitization | Based on available data, the classification criteria are not met. | |
| Skin sensitization | Based on available data, the classification criteria are not met. | |
| Germ cell mutagenicity | 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, Secondary Parkinson's disease and skin rashes. | |
| Carcinogenicity | Not classified. Based on available data, the classification criteria are not met. | |
| IARC Monographs. Overall Evaluation of Carcinogenicity | | |
| Chromium (CAS 7440-47-3) | 3 Not classifiable as to carcinogenicity to humans. | |
| Reproductive toxicity | Based on available data, the classification criteria are not met. | |
| 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 Based on available data, the classification criteria are not met.

12. Ecological information

Ecotoxicity No data available for this product.

| 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 |
| Manganese (CAS 7439-96-5) | | | |
| Aquatic | | | |
| Crustacea | EC50 | Water flea (Daphnia magna) | 40 mg/l, 48 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 |
|------------------------------------|------|---|--------------------------------|
| Nitrogen dioxide (CAS 10102-44-0) | | | |
| Aquatic | | | |
| Fish | LC50 | Tench (Tinca tinca) | 19.6 mg/l, 96 hours |
| Ozone (CAS 10028-15-6) | | | |
| Aquatic | | | |
| Fish | LC50 | Rainbow trout,donaldson trout (Oncorhynchus mykiss) | 0.0081 - 0.0106 mg/l, 96 hours |
| 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 The product is not bioaccumulating.

Mobility in soil 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.

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 in a waste disposal scenario.

Waste from residues / unused products If reuse or recycling is not possible, disposal must be made according to local or governmental 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)

| | |
|---------------------------|---------|
| Chromium (CAS 7440-47-3) | Listed. |
| Manganese (CAS 7439-96-5) | Listed. |
| Zinc (CAS 7440-66-6) | Listed. |

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 |
|------------------|------------|---------------------|-----------------------------|--|--|
| Ozone | 10028-15-6 | 100 | 100 lbs | | |
| Nitric oxide | 10102-43-9 | 10 | 100 lbs | | |
| Nitrogen dioxide | 10102-44-0 | 10 | 100 lbs | | |

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

| Chemical name | CAS number | % by wt. |
|--|---------------|----------|
| Aluminum | 7429-90-5 | 96 - 99 |
| Zinc | 7440-66-6 | <6.5 |
| Manganese | 7439-96-5 | <1.5 |
| Manganese compounds, inorganic | Not available | >= 1 |
| Zinc oxide | 1314-13-2 | >= 1 |
| Chromium (II) compounds | Not available | >= 1 |
| Chromium (III) compounds | Not available | >= 1 |
| Chromium (VI) compounds, water soluble forms | Not available | >= 1 |
| Chromium (VI) compounds | 18540-29-9 | >= 1 |
| Chromium (VI) compounds, certain water insoluble forms | Not available | >= 1 |
| Ozone | 10028-15-6 | >= 1 |

US state regulations

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US - New Jersey RTK - Substances: Listed substance

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Magnesium (CAS 7439-95-4)
Manganese (CAS 7439-96-5)
Zinc (CAS 7440-66-6)

US - Pennsylvania RTK - Hazardous Substances: All compounds of this substance are considered environmental hazards

Chromium (CAS 7440-47-3)
Manganese (CAS 7439-96-5)
Zinc (CAS 7440-66-6)

US - Pennsylvania RTK - Hazardous Substances: Special hazard

Chromium (CAS 7440-47-3)

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Manganese (CAS 7439-96-5)
Zinc (CAS 7440-66-6)

US. Massachusetts RTK - Substance List

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Magnesium (CAS 7439-95-4)
Manganese (CAS 7439-96-5)
Zinc (CAS 7440-66-6)

US. New Jersey Worker and Community Right-to-Know Act

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Manganese (CAS 7439-96-5)
Zinc (CAS 7440-66-6)

US. Pennsylvania RTK - Hazardous Substances

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Magnesium (CAS 7439-95-4)
Manganese (CAS 7439-96-5)
Zinc (CAS 7440-66-6)

US. Pennsylvania Worker and Community Right-to-Know Law

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Magnesium (CAS 7439-95-4)
Manganese (CAS 7439-96-5)
Zinc (CAS 7440-66-6)

US. Rhode Island RTK

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Manganese (CAS 7439-96-5)
Zinc (CAS 7440-66-6)

US. California Proposition 65

Not Listed.

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 |
| New Zealand | New Zealand Inventory | Yes |
| Philippines | Philippine Inventory of Chemicals and Chemical Substances (PICCS) | Yes |

| | | |
|-----------------------------|---|-------------------------------|
| Country(s) or region | Inventory name | On inventory (yes/no)* |
| 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 May 27, 2015: New format.
February 24, 2012: New format.
January 6, 2009: New format.
October 12, 2005: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 3, 4, 5, 7, 8, 11 and 15.
July 25, 2002: New format.

Origination date: July 10, 1989

Hazardous Materials Control Committee
Preparer: Jim Perriello, +1-865-977-2051.

SDS System Number: 115726

Revision date May 27, 2015.

Version # 06

Revision Information Product and Company Identification: Product and Company Identification
Composition / Information on Ingredients: Ingredients
Physical & Chemical Properties: Multiple Properties
Transport Information: Agency Name, Packaging Type, and Transport Mode Selection
Regulatory Information: Safety Phrases
GHS: Classification

Disclaimer The information in the sheet was written based on the best knowledge and experience currently available.

Other information

- 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 ***

Hazard statement

May form combustible dust concentrations in air.

Precautionary statement

Prevention

Keep away from heat/sparks/open flames/hot surfaces - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Prevent dust accumulation to minimize explosion hazard. Observe good industrial hygiene practices.

Response

Take off contaminated clothing and wash before reuse. In case of fire: Use appropriate media to extinguish.

Storage

Store away from incompatible materials.

Warning

Supplemental information

FIRE FIGHTING MEASURES: This product does not present fire or explosion hazards as shipped. Small chips, fine turnings and dust from processing may be readily ignitable. Use Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips and turnings.

DO NOT USE halogenated extinguishing agents on small chips/fines.

DO NOT USE water in fighting fires around molten metal.

IN CASE OF SPILL: 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. Wear appropriate personal protective equipment.

See Alcoa SDS Number 0509.

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