



SAFETY DATA SHEET

Date: May 19, 2016

1. Identification

Product identifier ALUMINIUM LITHIUM ALLOYS

Trade Name Impression Trays

Synonyms

Manufacturer/Importer/Supplier /Distributor information RMO Inc.
650 West Colfax Avenue
Denver, CO 80204

Emergency Information CHEMTREC: +1-800-424-9300 24 Hour Emergency Telephone
International: 202-483-7616

2. Hazard(s) identification

Potential health effects

The health effects listed below are not likely to occur unless processing of this product generates dusts or fumes.

Physical hazards Not classified.

Health hazards Skin corrosion/irritation Category 2
Serious eye damage/eye irritation Category 2A

Environmental hazards Not classified.

Authority defined hazards Combustible dust

Label elements



Signal word Warning

Hazard statement Causes skin irritation. Causes serious eye irritation. May form combustible dust concentrations in air.

Precautionary statement
Prevention Wash thoroughly after handling. Wear eye/face protection. Wear protective gloves.

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

Supplemental information None.

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

Response
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.
IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Take off contaminated clothing and wash before reuse.

Storage Keep dry. Store in a dry place.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

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	>95
Zinc		7440-66-6	<7.0
Magnesium		7439-95-4	<6.1
Copper		7440-50-8	<5.3
Lithium		7439-93-2	<2.9
Manganese		7439-96-5	<0.8
Silver		7440-22-4	<0.8
Chromium		7440-47-3	<0.2

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 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. 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	Not relevant, due to the form of the product.
Most important symptoms/effects, acute and delayed	Dust and fumes from processing: Health effects from mechanical processing (e.g., cutting, grinding): Irritating to eyes, respiratory system and skin. Prolonged skin contact may cause skin irritation and/or dermatitis. Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise and muscular pain.
Indication of immediate medical attention and special treatment needed	No hazards which require special first aid measures.
General information	If you feel unwell, seek medical advice (show the label where possible).

5. Fire-fighting measures

Suitable extinguishing media	Use Lith-X, Class D extinguishing agents, fluxing salts or dry sand on fires involving dusts, fines or molten metal. If possible, isolate the burning material to prevent fire spread, and allow the material to burn itself out.
Unsuitable extinguishing media	DO NOT USE water in fighting fires around molten metal. DO NOT USE halogenated extinguishing agents on small chips/fines. These fire extinguishing agents will react with the burning material.
Specific hazards arising from the chemical	May be a potential hazard under the following conditions: • 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.
Hazardous combustion products	• 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. None 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	In case of fire and/or explosion do not breathe fumes. Use gentle surface application of Lith-X/Class D extinguishing agent or dry inert granular material (e.g., sand) to cover and ring the burning material. If possible, isolate the burning material to prevent fire spread, and allow the material to burn itself out. Keep water, halogenated extinguishing agents and foam away from the molten material.
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	Not sensitive.
Sensitivity to mechanical impact	Take precautionary measures against static discharges when there is a risk of dust explosion.
Sensitivity to static discharge	

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Avoid generating dust. 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 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	Molten metal: 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. 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	Collect and dispose of spillage as indicated in section 13 of the SDS.

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. Aluminum-Lithium products are heat treated by solution treatment and age process. When heat treating by salt bath processes, particular care must be exercised to control the temperature of the baths to prevent melting of these alloys because of the potential for explosion. For wrought products, melting can occur in the range of 1022-1122°F (550-600°C). Use personal protection recommended in Section 8 of the SDS.
Storage	Keep material dry.
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) brochures 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. Do not allow chips, fines or dust to contact water, particularly in enclosed areas. Avoid all ignition sources. Good housekeeping practices must be maintained. 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

Storage

Keep material dry.

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) brochures 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.

Do not allow chips, fines or dust to contact water, particularly in enclosed areas.

Avoid all ignition sources. Good housekeeping practices must be maintained. 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

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.

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.

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	Respirable fraction
		15 mg/m ³	Total dust
Chromium (CAS 7440-47-3)	TWA	1 mg/m ³	
Copper (CAS 7440-50-8)	TWA	1 mg/m ³	Dust and mist.
		0.1 mg/m ³	Fume.
Manganese (CAS 7439-96-5)	Ceiling	5 mg/m ³	Fume
Silver (CAS 7440-22-4)	TWA	0.01 mg/m ³	

**U.S. - OSHA
Compounds Formed
During Processing**

Compounds Formed During Processing	Type	Value	Form
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	TWA	5 mg/m ³	Respirable fraction.
Chromium (II) compounds	TWA	15 mg/m ³	Total dust.
Chromium (III) compounds	TWA	0.5 mg/m ³	(as Cr)
Chromium (VI) compounds, certain water insoluble forms	TWA	0.5 mg/m ³	(as Cr)
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.0025 mg/m ³	Action Level as Cr(VI)
Manganese compounds, inorganic	Ceiling	5 mg/m ³	(as Mn) Fume
Nitric oxide (CAS 10102-43-9)	TWA	30 mg/m ³	
Oil mist, mineral (CAS 8012-95-1)	TWA	25 ppm 5 mg/m ³	Mist.
Ozone (CAS 10028-15-6)	TWA	0.2 mg/m ³	
Zinc oxide (CAS 1314-13-2)	TWA	0.1 ppm 5 mg/m ³	Respirable fraction.
		5 mg/m ³	Fume.
		15 mg/m ³	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/m ³	as Cr(VI)
Chromium (VI) compounds, water soluble forms	TWA	0.005 mg/m ³	
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.005 mg/m ³	as Cr(VI)

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

Compounds Formed During Processing	Type	Value	Form
Magnesium oxide (CAS 1309-48-4)	PEL	15 mg/m ³	Total particulate.
Nitrogen dioxide (CAS 10102-44-0)	Ceiling	9 mg/m ³	
Oil mist, mineral (CAS 8012-95-1)	PEL	5 ppm 5 mg/m ³	Mist.

**ACGIH
Compounds Formed
During Processing**

Compounds Formed During Processing	Type	Value	Form
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	TWA	1 mg/m ³	Respirable fraction, as Al
Chromium (VI) compounds, water soluble forms	TWA	0.05 mg/m ³	(as Cr)
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.05 mg/m ³	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.
Chromium (CAS 7440-47-3)	TWA	0.5 mg/m3	
Silver (CAS 7440-22-4)	TWA	0.1 mg/m3	Dust and fume.

Compounds Formed During Processing

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)
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.
		0.02 mg/m3	Respirable 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
Manganese (CAS 7439-96-5)	TWA	0.05 mg/m3	Total dust.
		0.02 mg/m3	Respirable fraction.

Compounds Formed During Processing

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.
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.
Oil mist, mineral (CAS 8012-95-1)	TWA	0.5 mg/m3	(8 Hour)

General	<p>When Aluminum-Lithium alloys are heated to elevated temperatures, irritating and corrosive dusts containing lithium oxide and lithium hydroxide can be generated. When these dusts are present, wear appropriate personal protective equipment (goggles and gloves) to prevent irritation or corrosive burns of the eyes and skin.</p> <p>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).</p> <p>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.</p>
Appropriate engineering controls	<p>Dust and fumes from processing: Use with adequate explosion-proof ventilation designed to handle particulates to meet the limits listed in Section 8, Exposure Guidelines.</p> <p>Ventilation and exhausting are required due to potential for formation of lithium oxide and lithium hydroxide. Remelting of aluminum-lithium scrap requires specialized ventilation and air pollution systems such as dry collectors.</p>
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	The need for personal protective equipment should be based upon a hazard assessment and recommendations from health / safety professionals.
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.
Thermal hazards	Contact with molten material can cause thermal burns. Hot aluminum does not necessarily glow red. When material is heated, wear gloves to protect against thermal burns. Wear appropriate thermal protective clothing, when necessary. Molten metal: Flame retardant protective clothing is recommended.
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice. When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product.
Control parameters	Follow standard monitoring procedures.
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
Melting point/freezing point	950 - 1202 °F (510 - 650 °C) as cast ingot. Wrought alloy: / 950 - 1202 °F (510 - 650 °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	Dust clouds may be explosive. Dust accumulation from this product may present an explosion hazard in the presence of an ignition source.
Dust explosion properties	
St class	Very strong explosion.
Vapor pressure	Not applicable
Vapor density	Not applicable
Relative density	Not determined
Solubility(ies)	None
Partition coefficient (n-octanol/water)	Not applicable. 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	<p>Chips, fines, dust and molten metal are considerably more reactive with the following:</p> <ul style="list-style-type: none"> • Heat: Oxidizes at a rate dependent upon temperature and particle size. <p>Avoid dust formation. 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:</p> <p style="text-align: center;">WARNING – Aluminum Metal Only – Fire or Explosion Can Result with Other Metals.</p> <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. <p>Salt bath heat treatment of aluminum-lithium alloys may cause severe exothermic reactions if the alloy melts in the salt bath.</p>
Incompatible materials	<p>Chips, fines, dust and molten metal are considerably more reactive with the following:</p> <ul style="list-style-type: none"> • 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 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. • Iron powder and water: Explosive reaction forming hydrogen gas when heated above 1470°F (800°C).
Hazardous decomposition products	None known.

11. Toxicological information

Health effects associated with ingredients

The following health effects are not likely to occur unless sawing or cutting generates dust.

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.

Lithium: Can cause severe irritation and burns of eyes and skin, especially when wet. Can cause irritation of respiratory tract. Skin contact: Can cause dermatitis. Acute overexposures: Can cause central nervous system effects (sedation and confusion), coma and death. Chronic overexposures: Can cause kidney damage, thyroid function changes, altered mental states, central nervous system effects, cardiovascular system effects and gastrointestinal tract effects (nausea, vomiting and pain). Associated with birth defects (heart abnormalities and central nervous system damage).

Silver: Can cause irritation of eyes, mucous membranes and skin. Chronic overexposures: Can cause irreversible blue-gray discoloration of mucous membranes, eyes and skin (argyria).

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.

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.

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).

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).

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).

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).

Information on likely routes of exposure

Eye contact	Dust and fumes from processing: Can cause irritation.
Skin contact	Contact with residual oil/oil coating: Can cause irritation. Prolonged or repeated skin contact may cause dermatitis. Dust and fumes from processing: Can cause irritation. Additional health effects from elevated temperature processing (e.g., welding, plasma arc cutting): Can cause allergic contact dermatitis.
Inhalation	Dust and fumes from processing: Can cause irritation of the upper respiratory tract. Health effects from mechanical processing (e.g., cutting, grinding): Chronic overexposures: Can cause skin abnormalities (pigmentation changes). Additional health effects from elevated temperature processing (e.g., welding, plasma arc cutting): Acute overexposures: Can cause metal fume fever (nausea, fever, chills, shortness of breath and malaise) and the accumulation of fluid in the lungs. Chronic overexposures: Can cause respiratory sensitization, scarring of the lungs (pulmonary fibrosis), central nervous system effects, 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	Health effects from mechanical processing (e.g., cutting, grinding): Dust from processing: Irritating to eyes, respiratory system and skin. Contact with residual oil/oil coating: Prolonged skin contact may cause skin irritation and/or dermatitis. Additional health effects from elevated temperature processing (e.g., welding, plasma arc cutting): Acute overexposure: Can cause metal fume fever (nausea, chills, fever, shortness of breath, and malaise). Chronic overexposures: Can cause skin abnormalities (pigmentation changes), scarring of the lungs (pulmonary fibrosis), secondary Parkinson's disease, reproductive harm in males respiratory sensitization, and lung cancer.

Information on toxicological effects

Components	Species	Test Results
Aluminum (CAS 7429-90-5)		
<u>Acute</u>		
Inhalation		
LC50	Rat	> 2.3 mg/l 7.6 mg/l
Oral		
LD50	Rat	> 2000 mg/kg
Silver (CAS 7440-22-4)		
<u>Acute</u>		
Dermal		
LD50	Rat	> 2000 mg/kg
Oral		
LD50	Rat	> 5000 mg/kg
Zinc (CAS 7440-66-6)		
<u>Acute</u>		
Oral		
LD50	Rat	630 mg/kg
Compounds Formed During Processing	Species	Test Results
Aluminum oxide (non-fibrous) (CAS 1344-28-1)		
<u>Acute</u>		
Inhalation		
LC50	Rat	> 2.3 mg/l 7.6 mg/l
Oral		
LD50	Rat	> 5000 mg/kg

Compounds Formed During Processing	Species	Test Results
Nitric oxide (CAS 10102-43-9)		
<u>Acute</u>		
Inhalation		
LC50	Rat	115 ppm, 1 Hours 57.5 ppm, 4 Hours
Nitrogen dioxide (CAS 10102-44-0)		
<u>Acute</u>		
Inhalation		
LC50	Guinea pig Rat	30 ppm, 1 Hours 88 ppm, 4 Hours
Zinc oxide (CAS 1314-13-2)		
<u>Acute</u>		
Inhalation		
LC50	Mouse	> 5.7 mg/l, 4 Hours
Oral		
LD50	Mouse Rat	7950 mg/kg > 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	Dust and fume from processing: Can cause irritation.	
Respiratory or skin sensitization		
Respiratory sensitization	Based on available data, the classification criteria are not met.	
Skin sensitization	Dust and fume from processing: May cause irritation. Contact with residual oil/oil coating: Prolonged skin contact may cause skin irritation and/or dermatitis.	
Germ cell mutagenicity	Not classified. Contains no ingredient listed as a mutagen.	
Pre-existing conditions aggravated by exposure	Dust or fume from processing: Asthma, chronic lung disease, and skin rashes.	
Carcinogenicity	Product as shipped: Does not present any cancer hazards. Dust and fumes from processing: Can present a cancer hazard (Hexavalent chromium compounds, Welding fumes).	
IARC Monographs. Overall Evaluation of Carcinogenicity		
Chromium (CAS 7440-47-3)	3 Not classifiable as to carcinogenicity to humans.	
Chromium (III) compounds (CAS CAS No. Not available)	3 Not classifiable as to carcinogenicity to humans.	
Chromium (VI) compounds (CAS 18540-29-9)	1 Carcinogenic to humans.	
US. National Toxicology Program (NTP) Report on Carcinogens		
Chromium (VI) compounds (CAS 18540-29-9)	Known To Be 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	
Reproductive toxicity	Product as shipped: Does not present any reproductive hazards. Dust and fume from processing: Does not present any reproductive hazards. Additional health effects from elevated temperature processing (e.g., welding, melting): Can present a reproductive hazard (Manganese compounds).	
Routes of exposure	Skin contact. Dust and fume from processing: Inhalation. Eye contact.	
Specific target organ toxicity - single exposure	Not classified. Based on available data, the classification criteria are not met. Dust or fume from processing: May cause irritation to the respiratory system.	

Specific target organ toxicity - repeated exposure Product as shipped: Not classified. Based on available data, the classification criteria are not met.

Aspiration hazard Not an aspiration hazard.

12. Ecological information

Ecotoxicity Not expected to be harmful to aquatic organisms.

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
Manganese (CAS 7439-96-5)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	40 mg/l, 48 hours
Silver (CAS 7440-22-4)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	0.0002 mg/l, 48 hours
Fish	LC50	Fathead minnow (Pimephales promelas)	0.0023 - 0.0033 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 Not inherently biodegradable.

Bioaccumulative potential The product is not bioaccumulating.

Mobility in soil Not considered mobile.

Mobility in general Not considered mobile.

Other adverse effects Not available.

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.

While specific standards have not been established by the U.S. Food and Drug Administration (FDA), caution indicates that lithium containing scrap must not be recycled in such a manner as to become a component of FDA sensitive products.

If scrap is to be reclaimed by melting, it should be done with a qualified understanding of the health and safety issues described in Sections 2 and 5. If scrap is sent off-site, recipient should be made aware that the product contains lithium.

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.

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)

Chromium (VI) compounds (CAS 18540-29-9) 0.1 % Annual Export Notification required.

CERCLA Hazardous Substance List (40 CFR 302.4)

Chromium (CAS 7440-47-3) Listed.
Copper (CAS 7440-50-8) Listed.
Manganese (CAS 7439-96-5) Listed.
Manganese compounds, inorganic (CAS CAS No. Not available) Listed.
Silver (CAS 7440-22-4) 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
Eye irritation
Skin sensitization

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
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SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Aluminum dust	7429-90-5	>95
Zinc	7440-66-6	<7.0
Copper	7440-50-8	<5.3

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)
Aluminum oxide (non-fibrous) (CAS 1344-28-1)

Chromium (CAS 7440-47-3)
Chromium (II) compounds (CAS CAS No. Not available)
Chromium (VI) compounds (CAS 18540-29-9)
Copper (CAS 7440-50-8)
Lithium (CAS 7439-93-2)
Magnesium (CAS 7439-95-4)
Magnesium oxide (CAS 1309-48-4)
Manganese (CAS 7439-96-5)
Manganese compounds, inorganic (CAS CAS No. Not available)
Oil mist, mineral (CAS 8012-95-1)
Silver (CAS 7440-22-4)
Zinc (CAS 7440-66-6)
Zinc oxide (CAS 1314-13-2)

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

Chromium (CAS 7440-47-3)
Copper (CAS 7440-50-8)
Manganese (CAS 7439-96-5)
Silver (CAS 7440-22-4)
Zinc (CAS 7440-66-6)

US - Pennsylvania RTK - Hazardous Substances: Special hazard

Chromium (CAS 7440-47-3)
Chromium (VI) compounds (CAS 18540-29-9)

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)
Chromium (VI) compounds (CAS 18540-29-9)
Copper (CAS 7440-50-8)
Manganese (CAS 7439-96-5)
Oil mist, mineral (CAS 8012-95-1)
Silver (CAS 7440-22-4)
Zinc (CAS 7440-66-6)

US. Massachusetts RTK - Substance List

Aluminum (CAS 7429-90-5)
Aluminum oxide (non-fibrous) (CAS 1344-28-1)
Chromium (CAS 7440-47-3)
Copper (CAS 7440-50-8)
Lithium (CAS 7439-93-2)
Magnesium (CAS 7439-95-4)
Magnesium oxide (CAS 1309-48-4)
Manganese (CAS 7439-96-5)
Oil mist, mineral (CAS 8012-95-1)
Silver (CAS 7440-22-4)
Zinc (CAS 7440-66-6)
Zinc oxide (CAS 1314-13-2)

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

Aluminum (CAS 7429-90-5)
Aluminum oxide (non-fibrous) (CAS 1344-28-1)
Chromium (CAS 7440-47-3)
Chromium (II) compounds (CAS CAS No. Not available)
Chromium (III) compounds (CAS CAS No. Not available)
Chromium (VI) compounds (CAS 18540-29-9)
Copper (CAS 7440-50-8)
Manganese (CAS 7439-96-5)
Manganese compounds, inorganic (CAS CAS No. Not available)
Silver (CAS 7440-22-4)
Zinc (CAS 7440-66-6)
Zinc oxide (CAS 1314-13-2)

US. Pennsylvania RTK - Hazardous Substances

Aluminum (CAS 7429-90-5)
Aluminum oxide (non-fibrous) (CAS 1344-28-1)

Chromium (CAS 7440-47-3)
 Copper (CAS 7440-50-8)
 Lithium (CAS 7439-93-2)
 Magnesium (CAS 7439-95-4)
 Magnesium oxide (CAS 1309-48-4)
 Manganese (CAS 7439-96-5)
 Oil mist, mineral (CAS 8012-95-1)
 Silver (CAS 7440-22-4)
 Zinc (CAS 7440-66-6)
 Zinc oxide (CAS 1314-13-2)

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

Aluminum (CAS 7429-90-5)
 Aluminum oxide (non-fibrous) (CAS 1344-28-1)
 Chromium (CAS 7440-47-3)
 Chromium (VI) compounds (CAS 18540-29-9)
 Copper (CAS 7440-50-8)
 Lithium (CAS 7439-93-2)
 Magnesium (CAS 7439-95-4)
 Magnesium oxide (CAS 1309-48-4)
 Manganese (CAS 7439-96-5)
 Oil mist, mineral (CAS 8012-95-1)
 Silver (CAS 7440-22-4)
 Zinc (CAS 7440-66-6)
 Zinc oxide (CAS 1314-13-2)

US. Rhode Island RTK

Aluminum (CAS 7429-90-5)
 Aluminum oxide (non-fibrous) (CAS 1344-28-1)
 Chromium (CAS 7440-47-3)
 Chromium (II) compounds (CAS CAS No. Not available)
 Chromium (VI) compounds (CAS 18540-29-9)
 Copper (CAS 7440-50-8)
 Manganese (CAS 7439-96-5)
 Manganese compounds, inorganic (CAS CAS No. Not available)
 Silver (CAS 7440-22-4)
 Zinc (CAS 7440-66-6)
 Zinc oxide (CAS 1314-13-2)

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
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 21, 2015: New format.
December 6, 2012: Change(s) in Section: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15 and 16.
July 11, 2012: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14 and 15.
July 31, 2009: New format.
June 28, 2006: Change to ANSI z.400.1 (2004) format. Change(s) in Section: 1, 2, 3, 4, 5, 8, 9, 11, 12 and 15
July 20, 2004: Change(s) in Section: 1, 2, 3, 8, and 15.
May 31, 2002: New format.

Origination date: June 27, 1983

Preparer: Jim Perriello, +1-865-977-2051

SDS System Number: 115811

Revision date

May 21, 2015.

Version

07

Revision Information

Product and Company Identification: Synonyms
Composition / Information on Ingredients: Ingredients
Physical & Chemical Properties: Multiple Properties
Transport Information: Agency Name, Packaging Type, and Transport Mode Selection
Regulatory Information: Risk Phrases - Labeling
HazReg Data: North America
GHS: Qualifiers
REACH: Legal Entity Assignment

Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available. This safety data sheet was prepared in accordance with the Safety Data Sheet for Chemical Products (JIS Z 7250:2010).

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, • NFPA 68, Standard on Explosion Protection by Deflagration Venting, • NFPA 69, Standard on Explosion Prevention Systems

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
EWG	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 ***