SAFETY DATA SHEET

1. Identification

Product identifier **WROUGHT ALUMINUM PRODUCTS, 2xxx SERIES ALLOYS**

Other means of identification

SDS number 664

Version # 07

Revision date May 19, 2015.

Other means of identification

Synonyms 2xxx series alloys * C11E, C12E, C14B, C15E, C16E, C171, C17U, C183, C188, C22A, C268, C26H, C26T, C26U, C27T, C27U, C28T, C28U, C29H, C29T, C30T, C31T, C32B, C33T, C34Z, C36J, C36T, C37J, C38J, C39J, C40J, C415, C41J, C42J, C433, C45T, C463F, C46T, C471, C472, C47T, C49H, C49T, C49Z, C50Z, C51H, C51J, C51R, C51T, C52H, C563F, C572F, C575F, C594F, C597F, C610F, C626F, C68A, C70B, C70U, C71U, C71Z, C72U, C73U, C74B, C76A, C78B, C84Z, C86E, C88E, C89E, C90H, C91E, C96A, CJ88, CU20, CU32, CU34, CU82, CW04, CW23, CW73, CZ70 * _ * NEW: * Does not include alloy: 2021 {See SDS Number: 1535} * _ * _ * Does not include alloys: 2050, 2090, 2091, 2094, 2095, 2097, 2098, 2099, 2195, 2196, 2197, 2198, 2199, 2297, 2397, (See SDS Number 337); 2005, 2007, 2011, 2030, 2011A, 2028A, 2028B (See SDS Number 390); 2012, 2015, 2028, 2041, 2044, 2045, 2111, 2007A, 2007B, 2028C, 2111A, 2111B, (See SDS Number723).

Recommended use Various fabricated aluminum parts and products

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

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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

Classification

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

Potential health effects

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

Physical hazards	Not classified.	
Health hazards	Sensitization, skin	Category 1
	Carcinogenicity	Category 2
	Specific target organ toxicity, repeated exposure	Category 1 (respiratory tract)
Environmental hazards	Not classified.	
Authority defined hazards	Combustible dust	

Label elements

Signal word Danger

Hazard statement May cause an allergic skin reaction. Suspected of causing cancer. Causes damage to organs through prolonged or repeated exposure by inhalation. May form combustible dust concentrations in air.

Precautionary statement

Prevention Obtain special instructions before use. Contaminated work clothing must not be allowed out of the workplace. Wear protective gloves/protective clothing/eye protection/face protection. Do not breathe dust/fume. Wash thoroughly after handling. Do not eat, drink or smoke when using this product.

Response IF exposed or concerned: Get medical advice/attention. IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention. Wash contaminated clothing before reuse. Get medical advice/attention if you feel unwell.

Storage Store in a dry place.

Disposal Reuse or recycle material whenever possible. 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 Non-combustible as supplied. Small chips, fine turnings, and dust from processing may be readily ignitable.
Contains nickel. May produce an allergic reaction.

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 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 respiratory tract. 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.

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	85 - 97
Copper		7440-50-8	<6.9
Zinc		7440-66-6	<4.0
Nickel†		7440-02-0	<2.4
Magnesium		7439-95-4	<2
Iron		7439-89-6	<1.6
Silicon		7440-21-3	<1.4
Manganese		7439-96-5	<1.3
Silver		7440-22-4	<0.8
Chromium		7440-47-3	<0.6

Additional Information † - Alloys: 2018, 2031, 2032, 2218, 2618A, C421, C502.
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: Irritating to eyes, respiratory system and skin. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons. 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. See Section 11 of the SDS for additional information on health hazards.
Medical conditions aggravated by exposure	Asthma, chronic lung disease, and skin rashes.
Indication of immediate medical attention and special treatment needed	No hazards which require special first aid measures.
General information	If exposed or concerned: Get medical advice/attention.

5. Fire-fighting measures

Suitable extinguishing media	Use Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips and turnings. Apply extinguishing media carefully to avoid creating airborne dust.
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. • 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.
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	Use gentle surface application of Class D extinguishing agent or dry inert granular material (e.g., sand) to cover and ring the burning material. If impossible to extinguish, protect surroundings and allow fire to burn itself out. Apply extinguishing media carefully to avoid creating airborne dust.
General fire hazards	Non-combustible as supplied. Small chips, fine turnings, and dust from processing may be readily ignitable.
Explosion data	
Sensitivity to mechanical impact	Not applicable.
Sensitivity to static discharge	Take precautionary measures against static discharges when there is a risk of dust explosion.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Avoid generating dust. Avoid contact with skin and eyes. 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 contact with skin and eyes. 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	Keep unnecessary personnel away.
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	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.
Storage	Store in a dry place. Keep 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) 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 chips, 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. 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

Small amounts of beryllium (<0.0002% or <2 ppm) can be present in aluminum alloys either from naturally occurring beryllium in aluminum ore or as a alloying element in the aluminum recycling stream. This beryllium does not present an health hazard during processing (grinding, cutting or welding) of aluminum products. However, 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 +412-553-4649.

8. Exposure controls/personal protection

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
Silver (CAS 7440-22-4)	TWA	0.01 mg/m3	

Compounds Formed During Processing	Type	Value	Form
Chromium (VI) compounds, certain water insoluble forms	TWA	0.0025 mg/m3	Action Level as Cr(VI))
Ozone (CAS 10028-15-6)	TWA	0.2 mg/m3	
		0.1 ppm	

Residuals	Type	Value	Form
Oil mist, mineral (CAS 8012-95-1)	TWA	5 mg/m3	Mist.

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)

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

Residuals	Type	Value	Form
Oil mist, mineral (CAS 8012-95-1)	PEL	5 mg/m3	Mist.

ACGIH

Compounds Formed During Processing	Type	Value	Form
Ozone (CAS 10028-15-6)	TWA	0.2 ppm	(Heavy, moderate or light workloads (≤2 hours))

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	
Nickel† (CAS 7440-02-0)	TWA	1.5 mg/m3	Inhalable fraction.
Silver (CAS 7440-22-4)	TWA	0.1 mg/m3	Dust and fume.

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

Compounds Formed During Processing	Type	Value	Form
Chromium (VI) compounds, certain water insoluble forms	TWA	0.01 mg/m3	(as Cr)

Residuals	Type	Value	Form
Oil mist, mineral (CAS 8012-95-1)	TWA	5 mg/m3	Inhalable 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.
Nickel† (CAS 7440-02-0)	TWA	1 mg/m3	

Residuals	Type	Value	Form
Oil mist, mineral (CAS 8012-95-1)	TWA	0.5 mg/m3	(8 Hour)

General Use personal protective equipment as required.

Appropriate engineering controls 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.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles). Wear a face shield when working with molten material.

Skin protection

Hand protection Wear impervious gloves to avoid repeated or prolonged skin contact with residual oils and to avoid any skin injury. Wear appropriate gloves to avoid any skin injury. When material is heated, wear gloves to protect against thermal burns.

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

Thermal hazards Hot aluminum does not necessarily glow red. When material is heated, wear gloves to protect against thermal burns. Contact with molten material can cause thermal burns. 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 Silvery to gray.

Odor Odorless

Odor threshold Not applicable

pH Not applicable

Melting point/freezing point 900 - 1200 °F (482.22 - 648.89 °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 under certain conditions.
Dust explosion properties	
St class	Very strong dust explosion capabilty Very strong explosion.
Vapor pressure	Not applicable
Vapor density	Not applicable
Relative density	Not determined
Solubility(ies)	Insoluble
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.
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: • Heat: Oxidizes at a rate dependent upon temperature and particle size. • 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. 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. Coils of foil may be a potential hazard under the following conditions: • Coil has been annealed (annealing removes residual oil that could prevent penetration of water) • Foil is very thin gauge (5-9 µm thickness which increases surface area) • Coil has been immersed for an extended period of time (several hours or more) • Wetted coil has recently been removed from the cooling effects of the water 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.

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 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 reactions can occur with oxides of lead, copper, iron, bismuth and certain other metals. • Iron powder and water: Explosive reaction forming hydrogen gas when heated above 1470°F (800°C). 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.

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).

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

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.

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).

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).

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).

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.

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

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).

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

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).

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

Information on likely routes of exposure

Eye contact	Dust and fumes from processing: Direct contact with eyes may cause temporary 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. Prolonged or repeated skin contact may cause sensitization and allergic contact dermatitis.

Inhalation	Dust and fumes from processing: Irritating to respiratory system. Health effects from mechanical processing (e.g., cutting, grinding): Dust: Can cause irritation of the upper respiratory tract. Chronic overexposure: Can cause skin abnormalities (pigment changes), and reduction in the number of red blood cells (anemia). Additional health effects from elevated temperature processing (e.g., welding, melting): Acute exposure: Can cause metal fume fever (nauses, chills, fever, 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 exposure: Can cause scarring of the lungs (pulmonary fibrosis), central nervous system damage, Secondary Parkinson's Disease, respiratory sensitization, benign lung disease (siderosis) and lung cancer.
Ingestion	Dust and fumes from processing: Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Dust and fumes from processing: Irritating to eyes, respiratory system and skin. Contains (Nickel). May produce an allergic reaction. May cause sensitization of susceptible persons by skin contact or by inhalation of dust. Chronic overexposures: Can cause skin abnormalities (pigmentation changes) reduction in the number of red blood cells (anemia) and respiratory sensitization. Additional health effects from elevated temperature processing (e.g., if heated to decomposition): Acute overexposure: Can cause metal fume fever (nausea, chills, fever, 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 (siderosis) 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
		7.6 mg/l
Oral		
LD50	Rat	> 2000 mg/kg
Nickel† (CAS 7440-02-0)		
Acute		
Oral		
LD50	Rat	> 9000 mg/kg
Silver (CAS 7440-22-4)		
Acute		
Dermal		
LD50	Rat	> 2000 mg/kg
Oral		
LD50	Rat	> 5000 mg/kg
Zinc (CAS 7440-66-6)		
Acute		
Oral		
LD50	Rat	630 mg/kg

Acute toxicity	Product as shipped: 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: May be irritating to eyes.
Respiratory or skin sensitization	Dust and fume from processing: May cause allergic respiratory and skin reactions.
Respiratory sensitization	Not classified. Based on available data, the classification criteria are not met. Contains nickel. May produce an allergic reaction.

Skin sensitization Dust and fume from processing: Contains nickel. May produce an allergic reaction.

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

Germ cell mutagenicity Classification not possible. Due to partial or complete lack of data the classification is not possible.

Neurological effects Dust and fumes from processing: Classification not possible. Due to partial or complete lack of data the classification is not possible.

Pre-existing conditions aggravated by exposure Asthma, chronic lung disease, and skin rashes.

Carcinogenicity Product as shipped: Does not present any cancer hazards.

Health effects from mechanical processing (e.g., cutting, grinding): Dust from mechanical processing: Can present a cancer hazard (Nickel).
Dust and fumes from welding or elevated temperature processing: Can present a cancer hazard (Hexavalent chromium compounds, Nickel compounds).

IARC Monographs. Overall Evaluation of Carcinogenicity

Chromium (CAS 7440-47-3)	3 Not classifiable as to carcinogenicity to humans.
Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)	1 Carcinogenic to humans.
Nickel† (CAS 7440-02-0)	1 Carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens

Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)	Known To Be Human Carcinogen.
Nickel† (CAS 7440-02-0)	Known To Be Human Carcinogen. 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, certain water insoluble forms (CAS CAS No. Not available)	Cancer

Reproductive toxicity Product as shipped: Does not present any reproductive hazards.

Dust from mechanical processing: Does not present any reproductive hazards.

Welding Can present a reproductive hazard for males (Manganese oxide).

Routes of exposure Inhalation. Skin contact. Eye contact.

Specific target organ toxicity - single exposure Dust and fumes from processing: Not classified. Based on available data, the classification criteria are not met. May cause irritation to the respiratory system.

Specific target organ toxicity - repeated exposure May cause damage to organs through prolonged or repeated exposure by inhalation. Dust and fume from processing:

Aspiration hazard Not classified. Based on available data, the classification criteria are not met.

Chronic effects Dust and fumes from processing: Contains nickel, which can cause lung or nasal cancer.
Long-term breathing of this material may cause chronic lung disease.

Further information None known.

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

Components		Species	Test Results
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
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
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

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 applicable.

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.

Local disposal regulations Dispose in accordance with all applicable 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 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.
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

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

Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)	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.
Nickel† (CAS 7440-02-0)	Listed.
Silver (CAS 7440-22-4)	Listed.

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

Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)	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
Ozone	10028-15-6	100	100 lbs		
Nitrogen dioxide	10102-44-0	10	100 lbs		
Nitric oxide	10102-43-9	10	100 lbs		

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Aluminum	7429-90-5	85 - 97
Copper	7440-50-8	<6.9
Zinc	7440-66-6	<4.0
Nickel†	7440-02-0	<2.4
Manganese	7439-96-5	<1.3

US state regulations

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
WARNING: Processing of this product under certain conditions could create chromium (hexavalent compounds). Chromium (hexavalent compounds) are chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
WARNING: This product contains a chemical known to the State of California to cause cancer.

US - New Jersey RTK - Substances: Listed substance

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)
Copper (CAS 7440-50-8)
Magnesium (CAS 7439-95-4)
Manganese (CAS 7439-96-5)
Nickel† (CAS 7440-02-0)
Oil mist, mineral (CAS 8012-95-1)
Silicon (CAS 7440-21-3)

Silver (CAS 7440-22-4)
Zinc (CAS 7440-66-6)

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)
Nickel† (CAS 7440-02-0)
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, certain water insoluble forms (CAS CAS No. Not available)
Nickel† (CAS 7440-02-0)

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)
Copper (CAS 7440-50-8)
Iron (CAS 7439-89-6)
Manganese (CAS 7439-96-5)
Nickel† (CAS 7440-02-0)
Oil mist, mineral (CAS 8012-95-1)
Silver (CAS 7440-22-4)
Zinc (CAS 7440-66-6)

US. Massachusetts RTK - Substance List

Chromium (CAS 7440-47-3)
Copper (CAS 7440-50-8)
Magnesium (CAS 7439-95-4)
Manganese (CAS 7439-96-5)
Nickel† (CAS 7440-02-0)
Oil mist, mineral (CAS 8012-95-1)
Silicon (CAS 7440-21-3)
Silver (CAS 7440-22-4)

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

Chromium (CAS 7440-47-3)
Copper (CAS 7440-50-8)
Manganese (CAS 7439-96-5)
Nickel† (CAS 7440-02-0)
Silver (CAS 7440-22-4)

US. Pennsylvania RTK - Hazardous Substances

Chromium (CAS 7440-47-3)
Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)
Copper (CAS 7440-50-8)
Magnesium (CAS 7439-95-4)
Manganese (CAS 7439-96-5)
Nickel† (CAS 7440-02-0)
Oil mist, mineral (CAS 8012-95-1)
Silicon (CAS 7440-21-3)
Silver (CAS 7440-22-4)

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

Aluminum (CAS 7429-90-5)
Chromium (CAS 7440-47-3)
Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)
Copper (CAS 7440-50-8)
Magnesium (CAS 7439-95-4)
Manganese (CAS 7439-96-5)
Nickel† (CAS 7440-02-0)
Oil mist, mineral (CAS 8012-95-1)
Silicon (CAS 7440-21-3)
Silver (CAS 7440-22-4)

Zinc (CAS 7440-66-6)

US. Rhode Island RTK

Chromium (CAS 7440-47-3)
Copper (CAS 7440-50-8)
Manganese (CAS 7439-96-5)
Nickel† (CAS 7440-02-0)
Silver (CAS 7440-22-4)

US. California Proposition 65

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

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

Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)	Listed: February 27, 1987
Nickel† (CAS 7440-02-0)	Listed: May 7, 2004

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

Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)	Listed: December 19, 2008

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

Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)	Listed: December 19, 2008

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

Chromium (VI) compounds, certain water insoluble forms (CAS CAS No. Not available)	Listed: December 19, 2008

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	No
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 19, 2015: Change(s) in Section: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15 and 16.
November 24, 2009: New format.
October 20, 2006: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, and 15.
August 14, 2003: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 2, 3, 8 and 15.
Hazardous Materials Control Committee
Preparer: Jim Perriello, +1-865-977-2051. Origination date: March 16, 1990

SDS System Number: 115950

Revision date May 19, 2015.

Version # 07

Revision Information This document has undergone significant changes and should be reviewed in its entirety.

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

• 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
• 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

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 cause an allergic skin reaction. Suspected of causing cancer. Causes damage to organs through prolonged or repeated exposure by inhalation. May form combustible dust concentrations in air.

Precautionary statement

Prevention

Obtain special instructions before use. Contaminated work clothing must not be allowed out of the workplace. Wear protective gloves/protective clothing/eye protection/face protection. Do not breathe dust/fume. Wash thoroughly after handling. Do not eat, drink or smoke when using this product.

Response

IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention.

IF EXPOSED or concerned: Get medical advice/attention.

Wash contaminated clothing before reuse. Get medical advice/attention if you feel unwell.

Storage

Store in a dry place.

Disposal

Reuse or recycle material whenever possible. Dispose of contents/container in accordance with local/regional/national/international regulations.

Danger

Supplemental information

Non-combustible. Small chips, fine turnings and dust from processing may be readily ignitable. Contains nickel. May produce an allergic reaction.

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).

FIRE FIGHTING MEASURES: Use Class D extinguishing agents on fines, dust or molten metal. Use coarse water spray on chips and turnings.

IN CASE OF SPILL: Avoid the generation of dusts during clean-up. Collect scrap for recycling. Hot aluminum does not necessarily glow red. 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.

See Alcoa SDS Number 0664.

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ALCOA