



SAFETY DATA SHEET

1. Identification

Product identifier

WROUGHT ALUMINUM PRODUCTS, 6xxx SERIES ALLOYS

Other means of identification

SDS number

668

Version #

09

Revision date

March 10, 2015.

Synonym(s)

6xxx series alloys * C010D, C01D, C01T, C01U, C020D, C02B, C02P, C02T, C02U, C030D, C03B, C03J, C03P, C03S, C03T, C03U, C040D, C04A, C04H, C04J, C04P, C04T, C04Z, C050D, C05H, C05J, C05P, C05T, C05Z, C07C, C07E, C07H, C07J, C07S, C07Z, C08C, C08M, C09C, C09M, C09S, C0A7, C10C, C10M, C11J, C11M, C11P, C12B, C12C, C12T, C12Z, C13B, C13J, C13M, C14J, C14N, C15H, C16H, C16N, C16T, C17H, C17J, C17M, C17T, C18H, C18J, C18M, C19C, C19H, C19J, C20J, C20U, C210, C211, C21J, C21K, C22J, C22Z, C23C, C23D, C23J, C24D, C24H, C24J, C25T, C26A, C26M, C27M, C27S, C28M, C29A, C29J, C29M, C2A4, C30M, C31P, C327, C32A, C32S, C32T, C333, C336, C33A * C33E, C33Z, C34B, C34E, C34P, C36B, C36M, C36P, C37M, C37Z, C38B, C38C, C38D, C38M, C38P, C38Z, C39B, C39D, C39P, C39Z, C400, C40B, C40D, C40H, C40T, C40Z, C411F, C412F, C413F, C414F, C417F, C418F, C41A, C41B, C41D, C41H, C41P, C41Z, C420, C428F, C429F, C42A, C42D, C42P, C439F, C43A, C43B, C43D, C43P, C444, C44B, C44D, C44K, C44P, C44S, C44Z, C450, C451F, C452F, C456, C459F, C45A, C45E, C45H, C45M, C45P, C45S, C461, C462F, C468F, C46A, C46D, C46M, C46P, C46S, C471F, C472F, C478F, C482F, C485F, C487F, C48K, C48S, C48Z, C490F, C492F, C498F, C49J, C49M, C501F, C503F, C504F, C50C, C50M, C512, C514F, C51A, C51M, C51Z, C524F, C525F, C52J, C52K, * C52M, C52S, C531F, C532F, C534F, C537F, C538F, C539F, C53H, C53K, C53M, C53S, C54D, C54M, C54P, C54S, C54Z, C552F, C553, C555F, C55C, C55D, C55R, C55S, C55U, C55Z, C569F, C56C, C56M, C56S, C56Z, C570F, C576F, C57A, C57B, C57H, C57R, C57S, C57Z, C580F, C583F, C584F, C58C, C58K, C58M, C58P, C58R, C58S, C58Z, C593, C593F, C59C, C59D, C59R, C59S, C601F, C605F, C607F, C619F, C61B, C625F, C629F, C62A, C630F, C631F, C63B, C64A, C66A, C67R, C69A, C69R, C703, C704, C70C, C70D, C70K, C70M, C70S, C710, C71C, C71R, C71S, C724, C725, C726, C728, C72C, C72R, C72S, C72Z, C731, C732, C733, C734, C736, C737, C738, C739, C73H, C73K, C73M, C740, C741, C742, C743, C744, C745, C746, C747, C748, C749, C74A, C74H, C74M, C74S, C74W, C751, C752, C753, C754, C755, C756, C757, C758, C759, C75A, C75C, C75D, C75K, C75S, C75Z, C760, C761, C762, C763, C764, C765, C766, C767, C768, C769, C76D, C76E, C76M, C770, C771, C779, C77D, C77M, C78M, C79A, C79D, C79J, C79M, C7A1, C7A5, C80D, C80J, * C80M, C81U, C82K, C82M, C83M, C83S, C83Z, C84K, C84M, C85A, C85M, C85S, C86A, C86K, C86M, C86P, C86S, C87A, C87D, C87H, C87K, C87M, C87S, C88D, C88K, C88M, C88R, C88U, C89K, C89M, C89S, C90A, C90B, C90K, C90M, C90S, C91K, C91S, C92C, C92P, C92S, C93A, C93K, C93N, C93S, C94C, C94N, C94P, C94T, C95B, C95E, C95J, C95K, C95N, C95S, C95T, C95U, C95Z, C96B, C96K, C96S, C96Z, C97K, C97P, C989, C98N, C98P, C99P, CA65, CB90, CE84, CE93, CH68, CU74, CZ19, CZ26

Recommended use

Various fabricated aluminum parts and products

Recommended restrictions

For industrial use only.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

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

Emergency Information

CHEMTREC: +1-703-527-3887 +1-800-424-9300 (24 Hour Emergency Telephone, multiple languages spoken); ALCOA: +1-412-553-4001 (24 Hour Emergency Telephone, only English spoken)

Website

For a current Safety Data Sheet, refer to Alcoa websites: www.alcoa.com or internally at my.alcoa.com EHS Community

2. Hazard(s) identification

Classification

This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Physical hazards	Not classified.	
Health hazards	Sensitization, skin	Category 1
	Carcinogenicity	Category 2
	Reproductive toxicity	Category 1A
Environmental hazards	Not classified.	
OSHA defined hazards	Combustible dust	

Label elements



Signal word	Danger
Hazard statement	Suspected of causing cancer. May damage fertility or the unborn child. May form combustible dust concentrations in air.
Precautionary statement	
Prevention	Wear protective gloves/protective clothing/eye protection/face protection. Contaminated work clothing must not be allowed out of the workplace. Do not handle until all safety precautions have been read and understood. Prevent dust accumulation to minimize explosion hazard.
Response	If exposed or concerned: Get medical advice/attention.
Storage	Store in a dry place.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.
Specific hazards	Non-combustible as supplied. Small chips, fine turnings, dust, fines or particulate from processing may be readily ignitable. Explosion/fire hazards may be present when (See Sections 5, 7 and 10 for additional information): <ul style="list-style-type: none">• Dust, fines or particulate are dispersed in air.• Chips, dust, fines or particulate 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: Irritating to eyes, respiratory system and skin.

3. Composition/information on ingredients

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

Components	CAS #	Percent
Aluminum	7429-90-5	>90
Magnesium	7439-95-4	<4.1
Zinc	7440-66-6	<4.0
Silicon	7440-21-3	<1.9
Manganese	7439-96-5	<1.5
Copper	7440-50-8	<1.4
Iron	7439-89-6	<1.2
Chromium	7440-47-3	<0.5
Lead†	7439-92-1	0 - 0.4
Nickel‡	7440-02-0	0 - 0.2

Additional Information

† - Present as impurity. While Lead is not intentionally added to this mixture, it could potentially enter through the recycle stream.

‡ - Present as impurity. While Nickel is not intentionally added to this mixture, it could potentially enter through the recycle stream.

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

4. First-aid measures

Eye contact

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

Skin contact

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

Inhalation

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

Ingestion

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. Contains nickel. May produce an allergic reaction.

Additional health effects from elevated temperature processing (e.g., welding, melting): 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.

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

Medical conditions aggravated by exposure

Asthma, chronic lung disease, and skin rashes.

Indication of immediate medical attention and special treatment needed

Provide general supportive measures and treat symptomatically.

General information

Dust and fume from processing: If you feel unwell, seek medical advice (show the label where possible).

5. Fire-fighting measures

Suitable extinguishing media

Use Class D extinguishing agents on dust, fines, particulate or molten metal.

Use coarse water spray on chips and turnings.

Apply extinguishing media carefully to avoid creating airborne dust, fines or particulate.

Unsuitable extinguishing media

DO NOT USE halogenated extinguishing agents on small chips, dust, fines or particulate.

DO NOT USE water in fighting fires around molten metal.

These fire extinguishing agents will react with the burning material.

Specific hazards arising from the chemical

May be a potential hazard under the following conditions:

- Dust, fines or particulate 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, dust, fines or particulate in contact with water can generate flammable/explosive hydrogen gas. These gases could present an explosion hazard in confined or poorly ventilated spaces.

• Dust, fines or particulate 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., dust, fines or particulate, powders or wire) may have enough surface oxide to produce thermite reactions/explosions. Thermite reactions can also occur with oxides of lead, copper, iron, bismuth and certain other metals.

Hazardous combustion products

No hazardous decomposition products are known.

Special protective equipment and precautions for firefighters

Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

Fire-fighting equipment/instructions

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.

General fire hazards

This product does not present fire or explosion hazards as shipped. Small chips, fine turnings, dust, fines or particulate from processing may be readily ignitable.

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.

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

No special environmental precautions required.

7. Handling and storage

Handling

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

Storage

Store in a dry place.

Requirements for Processes Which Generate Dusts or Fines

If processing of this product generates dust, fines or particulate, obtain and follow the safety procedures and equipment guides contained in Aluminum Association Bulletin F-1 and National Fire Protection Association (NFPA) standard 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 combustible/explosive dust, fines or particulate. Dry vacuums and electrostatic precipitators must not be used, unless specifically approved for use with combustible/explosive dusts, fines or particulate and must be dedicated to aluminum dust only and should be clearly labeled as such. Vacuum cleaner hoses must be conductive and nozzles or fitting made of conductive, non-sparking material. Do not co-mingle dust, fines or particulate of aluminum with dust, fines or particulate of steel, iron, iron oxide (rust) or other metal oxides.

Dust collection systems must be dedicated to aluminum dust only and should be clearly labeled as such. Do not co-mingle dust, fines or particulate of aluminum with dust, fines or particulate of steel, iron, iron oxide (rust) or other metal oxides.

Avoid all ignition sources. Good housekeeping practices must be maintained. Do not use compressed air to remove settled material from floors, beams or equipment. Do not allow chips, dust, fines or particulate to contact water, particularly in enclosed areas.

Dust, fines or particulate accumulation on the floor, ledges and beams can present a risk of ignition, flame propagation and secondary explosions. Regularly clean building structures, equipment and machinery to avoid accumulation of dust, fines or particulate that could become airborne.

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.

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 a 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

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

Compounds Formed During Processing

Compounds Formed During Processing	Type	Value	Form
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	TWA	5 mg/m ³ 15 mg/m ³	Respirable fraction. Total dust.
Chromium (II) compounds (CAS No. Not available)	TWA	0.5 mg/m ³	(as Cr)
Chromium (III) compounds (CAS No. Not available)	TWA	0.5 mg/m ³	(as Cr)

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

	Type	Value	Form
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	TWA	0.0025 mg/m3	Action Level as Cr(VI))
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.0025 mg/m3	Action Level as Cr(VI)
Iron oxide (CAS 1309-37-1)	TWA	10 mg/m3	Fume.
Lead compounds, inorganic (CAS No. Not available)	TWA	0.05 mg/m3	(as Pb)
Manganese compounds, inorganic (CAS No. Not available)	Ceiling	0.03 mg/m3 5 mg/m3	Action Level (as Pb) (as Mn) Fume
Nickel compounds, insoluble (CAS No. Not available)	TWA	1 mg/m3	(as Ni)
Nitric oxide (CAS 10102-43-9)	TWA	30 mg/m3	
Oil mist, mineral (CAS 8012-95-1)	TWA	25 ppm 5 mg/m3	Mist.
Ozone (CAS 10028-15-6)	TWA	0.2 mg/m3	
Zinc oxide (CAS 1314-13-2)	TWA	0.1 ppm 5 mg/m3	Respirable fraction.
		5 mg/m3 15 mg/m3	Fume. Total dust.

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

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

**Compounds Formed
During Processing**

	Type	Value	Form
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	TWA	0.005 mg/m3	as Cr(VI)
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	TWA	0.005 mg/m3	
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.005 mg/m3	as Cr(VI)

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

Compounds Formed During Processing	Type	Value	Form
Magnesium oxide (CAS 1309-48-4)	PEL	15 mg/m3	Total particulate.
Nitrogen dioxide (CAS 10102-44-0)	Ceiling	9 mg/m3	
Oil mist, mineral (CAS 8012-95-1)	PEL	5 ppm 5 mg/m3	Mist.

ACGIH**Compounds Formed
During Processing****Type****Value****Form**

Aluminum oxide (non-fibrous) (CAS 1344-28-1)	TWA	1 mg/m3	Respirable fraction, as Al
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	TWA	0.05 mg/m3	(as Cr)
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.05 mg/m3	Soluble compounds as Cr
Ozone (CAS 10028-15-6)	TWA	0.2 ppm	(Heavy, moderate or light workloads (≤2 hours))

US ACGIH Threshold Limit Values: Short Term Exposure Limit (STEL): mg/m3**Compounds Formed
During Processing****Type****Value****Form**

Zinc oxide (CAS 1314-13-2)	STEL	10 mg/m3	Respirable fraction.
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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	
Copper (CAS 7440-50-8)	TWA	1 mg/m3	Dust and mist.
		0.2 mg/m3	Fume.
Lead† (CAS 7439-92-1)	TWA	0.05 mg/m3	
Manganese (CAS 7439-96-5)	TWA	0.1 mg/m3	Inhalable fraction.
		0.02 mg/m3	Respirable fraction.
Nickel‡ (CAS 7440-02-0)	TWA	1.5 mg/m3	Inhalable fraction.

**Compounds Formed
During Processing****Type****Value****Form**

Chromium (III) compounds (CAS No. Not available)	TWA	0.5 mg/m3	
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	TWA	0.01 mg/m3	(as Cr)
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.01 mg/m3	Insoluble compounds as Cr
Iron oxide (CAS 1309-37-1)	TWA	5 mg/m3	Respirable fraction.
Lead compounds, inorganic (CAS No. Not available)	TWA	0.05 mg/m3	
Magnesium oxide (CAS 1309-48-4)	TWA	10 mg/m3	Inhalable fraction.
Manganese compounds, inorganic (CAS No. Not available)	TWA	0.1 mg/m3	Inhalable fraction.
		0.02 mg/m3	Respirable fraction.
Nickel compounds, insoluble (CAS No. Not available)	TWA	0.2 mg/m3	Inhalable fraction.
Oil mist, mineral (CAS 8012-95-1)	TWA	5 mg/m3	Inhalable fraction.
Zinc oxide (CAS 1314-13-2)	TWA	2 mg/m3	Respirable fraction.

Alcoa Components	Type	Value	Form
Aluminum (CAS 7429-90-5)	TWA	3 mg/m3	Respirable fraction
		10 mg/m3	Total dust
Manganese (CAS 7439-96-5)	TWA	0.05 mg/m3	Total dust.
		0.02 mg/m3	Respirable fraction.
Nickel‡ (CAS 7440-02-0)	TWA	1 mg/m3	
Compounds Formed During Processing	Type	Value	Form
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	TWA	3 mg/m3	Respirable fraction.
		10 mg/m3	Total dust.
Chromium (VI) compounds (CAS 18540-29-9)	TWA	0.25 µg/m3	
Manganese compounds, inorganic (CAS No. Not available)	TWA	0.05 mg/m3	Total dust, as Mn.
		0.02 mg/m3	Respirable fraction, as Mn.
Nickel compounds, insoluble (CAS No. Not available)	TWA	0.1 mg/m3	Insoluble
Oil mist, mineral (CAS 8012-95-1)	TWA	0.5 mg/m3	(8 Hour)
General	Minimize breathing oil vapors and mist. Remove oil contaminated clothing; launder or dry-clean before reuse. Remove oil contaminated shoes and thoroughly clean and dry before reuse. Cleanse skin thoroughly after contact, before breaks and meals, and at the end of the work period. Oil coating is readily removed from skin with waterless hand cleaners followed by a thorough washing with soap and water.		
Appropriate engineering controls	Fixed vacuum cleaning and dust collection systems used to convey dust, fines or particulate need to discharge to a collection system located outside the building, designed and protected to prevent injury to personnel and damage to nearby equipment and structures.		
	If dust and fumes are generated through 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. 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.		
Other	Personnel who handle and work with molten metal should utilize primary protective clothing like polycarbonate face shields, fire resistant tapper's jackets, neck shades (snoods), leggings, spats and similar equipment to prevent burn injuries. In addition to primary protection, secondary or day-to-day work clothing that is fire resistant and sheds metal splash is recommended for use with molten metal. Synthetic materials should never be worn even as secondary clothing (undergarments).		
Respiratory protection	Dust, fines or particulate: Wear fire/flammable resistant/retardant, non-static clothing. 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: N95, N100 for Lead.		
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. Flame retardant protective clothing is recommended.		
General hygiene considerations	Wash hands and face before breaks and immediately after handling the product.		
9. Physical and chemical properties			
Form	Solid.		
Color	Silver colored.		
Odor	Odorless		

Odor threshold	Not applicable.
Density	2.69 - 2.74 g/cm ³
Bulk density	Not determined.
pH	Not applicable.
Melting point/freezing point	1029.92 - 1209.92 °F (554.4 - 654.4 °C) / Melting point
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 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 as shipped.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

Conditions to avoid

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:

WARNING – Aluminum Metal Only – Fire or Explosion Can Result with Other Metals.

Chips, dust, fines or particulate, 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, dust, fines or particulate, 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., dust, fines or particulate).
- Halogenated compounds: Many halogenated hydrocarbons, including halogenated fire extinguishing agents, can react violently with chips, dust, fines or particulate, 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).

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).

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

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).

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.

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

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.

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). 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.

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).

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.

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).

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.

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).

Lead (inorganic compounds): IARC/NTP: Listed as "reasonably anticipated to be a human carcinogen" by the NTP. Listed as probably carcinogenic to humans by IARC (Group 2A).

If the product is heated well above ambient temperatures or machined, oil vapor or mist may be generated.

Oil vapor or mist: Can cause irritation of respiratory tract. Acute overexposures: Can cause bronchitis, headache, central nervous system effects (nausea, dizziness and loss of coordination) and drowsiness (narcosis).

Welding, plasma arc cutting, and arc spray metalizing can generate ozone.

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

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

Plasma arc cutting of aluminum can generate oxides of nitrogen.

Oxides of nitrogen (NO and NO₂): Can cause irritation of eyes, skin and respiratory tract. Acute overexposures: Can cause reduced ability of the blood to carry oxygen (methemoglobin). Can cause cough, shortness of breath, accumulation of fluid in the lungs (pulmonary edema) and death. Effects can be delayed up to 2-3 weeks.

Nitrogen dioxide (NO₂): Chronic overexposures: Can cause scarring of the lungs (pulmonary fibrosis).

Information on likely routes of exposure

Eye contact Dust and fumes from processing: Can cause irritation.

Inhalation Health effects from mechanical processing (e.g., cutting, grinding): Dust: Can cause irritation of the upper respiratory tract. Chronic exposure: Can cause reduction in the number of red blood cells (anemia), skin abnormalities (pigmentation changes), central nervous system damage, secondary Parkinson's disease and reproductive harm.

Additional health effects from elevated temperature processing (e.g., welding, melting): Dusts and fumes: Can cause irritation of the respiratory tract. Acute exposure: Can cause metal fume fever (nausea, chills, fever, shortness of breath and malaise) reduced ability of the blood to carry oxygen (methemoglobin) and the accumulation of fluid in the lungs (pulmonary edema). Chronic exposure: Can cause respiratory sensitization and lung disease.

Ingestion Not likely, due to the form of the product.

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.

Contains (Nickel). May produce an allergic reaction.

Symptoms related to the physical, chemical and toxicological characteristics

Dust and fume from processing: Product dust may be irritating to eyes, skin and respiratory system.
 Contains nickel, which can cause lung or nasal cancer. Long-term breathing of this material may cause chronic lung disease.
 May cause allergic respiratory and skin reactions. May cause sensitization by inhalation and skin contact.
 Chronic exposure to breathing low levels of manganese dust or fume over a long period of time can result in "manganism," a disease of the central nervous system similar to Parkinson's Disease, gait impairment, muscle spasms and behavioral changes.
 Lead may damage kidney function, the blood forming system and the reproductive system.

Additional health effects from elevated temperature processing (e.g., if heated to decomposition): 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.

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

Information on toxicological effects

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

Components	Species	Test Results
Aluminum (CAS 7429-90-5)		
Acute		
<i>Inhalation</i>		
LC50	Rat	> 2.3 mg/l 7.6 mg/l
<i>Oral</i>		
LD50	Rat	> 2000 mg/kg
Nickel‡ (CAS 7440-02-0)		
Acute		
<i>Oral</i>		
LD50	Rat	> 9000 mg/kg
Zinc (CAS 7440-66-6)		
Acute		
<i>Oral</i>		
LD50	Rat	630 mg/kg
Compounds Formed During Processing	Species	Test Results
Aluminum oxide (non-fibrous) (CAS 1344-28-1)		
Acute		
<i>Inhalation</i>		
LC50	Rat	> 2.3 mg/l 7.6 mg/l
<i>Oral</i>		
LD50	Rat	> 5000 mg/kg
Iron oxide (CAS 1309-37-1)		
Acute		
<i>Oral</i>		
LD50	Rat	> 10000 mg/kg
Nitric oxide (CAS 10102-43-9)		
Acute		
<i>Inhalation</i>		
LC50	Rat	115 mg/l, 1 Hours 57.5 mg/l, 4 Hours

Compounds Formed During Processing	Species	Test Results
Nitrogen dioxide (CAS 10102-44-0)		
Acute		
Inhalation		
LC50	Guinea pig	30 ppm, 1 Hours
	Rat	88 ppm, 4 Hours
Silica, amorphous (CAS 69012-64-2)		
Acute		
Oral		
LD50	Mouse	> 15000 mg/kg
	Rat	> 22500 mg/kg
Zinc oxide (CAS 1314-13-2)		
Acute		
Inhalation		
LC50	Mouse	> 5.7 mg/l, 4 Hours
Oral		
LD50	Mouse	7950 mg/kg
	Rat	> 5000 mg/kg
		> 5 g/kg
Other		
LD50	Rat	240 mg/kg
Skin corrosion/irritation	Non-corrosive.	
Serious eye damage/eye irritation	Dust and fume from processing: Can cause mechanical irritation.	
Respiratory or skin sensitization		
Respiratory sensitization	Product as shipped: May cause sensitization by inhalation. Based on available data, the classification criteria are not met.	
	Dust and fumes from processing: Contains nickel. May produce an allergic reaction.	
Skin sensitization	Dust and fume from processing: Direct contact may irritate. Contains nickel. May produce an allergic reaction.	
	Contact with residual oil/oil coating: Prolonged or repeated exposure may cause: Mild dermatitis, allergic skin rash.	
Germ cell mutagenicity	Classification not possible. Due to lack of data the classification is not possible.	
Pre-existing conditions aggravated by exposure	Asthma, chronic lung disease, Secondary Parkinson's disease and skin rashes.	
Carcinogenicity		
	Product as shipped: Does not present any cancer hazards.	
	Dust from mechanical processing: Can present a cancer hazard (Nickel, Lead).	
	Dust and fumes from welding or elevated temperature processing: Can present a cancer hazard (Hexavalent chromium compounds, Nickel compounds, Lead compounds, Welding fumes).	
ACGIH Carcinogens		
Aluminum (CAS 7429-90-5)	A4 Not classifiable as a human carcinogen.	
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	A4 Not classifiable as a human carcinogen.	
Chromium (CAS 7440-47-3)	A4 Not classifiable as a human carcinogen.	
Chromium (III) compounds (CAS No. Not available)	A4 Not classifiable as a human carcinogen.	
Chromium (VI) compounds (CAS 18540-29-9)	A1 Confirmed human carcinogen.	
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	A1 Confirmed human carcinogen.	
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	A1 Confirmed human carcinogen.	
Iron oxide (CAS 1309-37-1)	A4 Not classifiable as a human carcinogen.	
Lead compounds, inorganic (CAS No. Not available)	A3 Confirmed animal carcinogen with unknown relevance to humans.	
Lead† (CAS 7439-92-1)	A3 Confirmed animal carcinogen with unknown relevance to humans.	

Magnesium oxide (CAS 1309-48-4)
Manganese (CAS 7439-96-5)
Nickel compounds, insoluble (CAS No. Not available)
Nickel‡ (CAS 7440-02-0)
Nitrogen dioxide (CAS 10102-44-0)
Oil mist, mineral (CAS 8012-95-1)

A4 Not classifiable as a human carcinogen.
A4 Not classifiable as a human carcinogen.
A1 Confirmed human carcinogen.
A5 Not suspected as a human carcinogen.
A4 Not classifiable as a human carcinogen.
A2 Suspected human carcinogen.
A4 Not classifiable as a human carcinogen.
A4 Not classifiable as a human carcinogen.

Ozone (CAS 10028-15-6)

IARC Monographs. Overall Evaluation of Carcinogenicity

Chromium (CAS 7440-47-3)	3 Not classifiable as to carcinogenicity to humans.
Chromium (III) compounds (CAS No. Not available)	3 Not classifiable as to carcinogenicity to humans.
Chromium (VI) compounds (CAS 18540-29-9)	1 Carcinogenic to humans.
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	1 Carcinogenic to humans.
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	1 Carcinogenic to humans.
Iron oxide (CAS 1309-37-1)	3 Not classifiable as to carcinogenicity to humans.
Lead compounds, inorganic (CAS No. Not available)	2A Probably carcinogenic to humans.
Lead† (CAS 7439-92-1)	2B Possibly carcinogenic to humans.
Nickel compounds, insoluble (CAS No. Not available)	1 Carcinogenic to humans.
Nickel‡ (CAS 7440-02-0)	1 Carcinogenic to humans.
Silica, amorphous (CAS 69012-64-2)	3 Not classifiable as to carcinogenicity to humans.

US. National Toxicology Program (NTP) Report on Carcinogens

Chromium (VI) compounds (CAS 18540-29-9)	Known To Be Human Carcinogen.
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	Known To Be Human Carcinogen.
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	Known To Be Human Carcinogen.
Lead compounds, inorganic (CAS No. Not available)	Reasonably Anticipated to be a Human Carcinogen.
Lead† (CAS 7439-92-1)	Reasonably Anticipated to be a 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.

Reproductive toxicity

Product as shipped: Does not present any reproductive hazards.

Dust from mechanical processing: Can present a reproductive hazard (Lead).

Additional health effects from elevated temperature processing (e.g., welding, melting): Dust and fume from processing: Can present a reproductive hazard (Lead compounds, Manganese compounds).

Routes of exposure

Eye contact. Skin contact. Inhalation.

Teratogenicity

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

Specific target organ toxicity - single exposure

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

Specific target organ toxicity - repeated exposure

Dust and fume from processing: Causes damage to organs through prolonged or repeated exposure by inhalation.

Aspiration hazard

Not applicable.

Chronic effects

Dust and fumes from processing: Chronic overexposures: Contains nickel, which can cause lung or nasal cancer. Long-term breathing of this material may cause chronic lung disease. Risk of sensitization or allergic reactions among sensitive individuals. Lead may damage kidney function, the blood forming system and the reproductive system. Lead is accumulated in the body and may cause damage to the brain and nervous system after prolonged exposure.

Further information

None known.

12. Ecological information

Ecotoxicity

This material is not expected to be harmful to aquatic life.

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

Components		Species	Test Results
Copper (CAS 7440-50-8)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	0.036 mg/l, 48 hours
Fish	LC50	Fathead minnow (Pimephales promelas)	0.0319 - 0.0544 mg/l, 96 hours
Iron (CAS 7439-89-6)			
Aquatic			
Crustacea	LC50	Cockle (Cerastoderma edule)	100 - 330 mg/l, 48 hours
		Common shrimp, sand shrimp (Crangon crangon)	33 - 100 mg/l, 48 hours
Fish	LC50	Channel catfish (Ictalurus punctatus)	> 500 mg/l, 96 hours
Lead† (CAS 7439-92-1)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	1.17 mg/l, 96 hours
Manganese (CAS 7439-96-5)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	40 mg/l, 48 hours
Nickel‡ (CAS 7440-02-0)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	1 mg/l, 48 hours
Fish	LC50	Fathead minnow (Pimephales promelas)	2.923 mg/l, 96 hours
Zinc (CAS 7440-66-6)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	2.8 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.56 mg/l, 96 hours
Compounds Formed During Processing		Species	Test Results
Nitrogen dioxide (CAS 10102-44-0)			
Aquatic			
Fish	LC50	Tench (Tinca tinca)	19.6 mg/l, 96 hours
Ozone (CAS 10028-15-6)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.0081 - 0.0106 mg/l, 96 hours
Zinc oxide (CAS 1314-13-2)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	2246 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability	The product contains inorganic compounds which are not biodegradable.
Bioaccumulative potential	The product is not bioaccumulating.
Mobility in soil	Not considered mobile.
Mobility in general	Not considered mobile.
Other adverse effects	None known.

13. Disposal considerations

Disposal instructions	Reuse or recycle material whenever possible. If reuse or recycling is not possible, disposal must be made according to local or governmental regulations.
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Waste codes	RCRA Status: Must be determined at the point of waste generation. If material is disposed as a waste, it must be characterized under RCRA according to 40 CFR, Part 261, or state equivalent in the U.S. TCLP testing is recommended for Chromium and Lead in a waste disposal scenario. D007: Waste Chromium D008: Waste Lead
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.
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TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Chromium (VI) compounds (CAS 18540-29-9)	0.1 % Annual Export Notification required.
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	0.1 % Annual Export Notification required.
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	0.1 % Annual Export Notification required.

CERCLA Hazardous Substance List (40 CFR 302.4)

Chromium (CAS 7440-47-3)	LISTED
Chromium (II) compounds (CAS No. Not available)	LISTED
Chromium (III) compounds (CAS No. Not available)	LISTED
Chromium (VI) compounds (CAS 18540-29-9)	LISTED
Copper (CAS 7440-50-8)	LISTED
Lead compounds, inorganic (CAS No. Not available)	LISTED
Lead† (CAS 7439-92-1)	LISTED
Manganese (CAS 7439-96-5)	LISTED
Manganese compounds, inorganic (CAS No. Not available)	LISTED
Nickel compounds, insoluble (CAS No. Not available)	LISTED
Nickel‡ (CAS 7440-02-0)	LISTED
Zinc (CAS 7440-66-6)	LISTED
Zinc oxide (CAS 1314-13-2)	LISTED

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

Chromium (VI) compounds (CAS 18540-29-9)	Cancer
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	Cancer
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	Cancer
Lead compounds, inorganic (CAS No. Not available)	Reproductive toxicity
Lead† (CAS 7439-92-1)	Reproductive toxicity
Chromium (VI) compounds (CAS 18540-29-9)	Eye irritation
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	Eye irritation

Chromium (VI) compounds, water soluble forms (CAS No. Not available)	Eye irritation
Lead compounds, inorganic (CAS No. Not available)	Central nervous system
Lead† (CAS 7439-92-1)	Central nervous system
Chromium (VI) compounds (CAS 18540-29-9)	Skin sensitization
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	Skin sensitization
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	Skin sensitization
Lead compounds, inorganic (CAS No. Not available)	Kidney
Lead† (CAS 7439-92-1)	Kidney
Lead compounds, inorganic (CAS No. Not available)	Blood
Lead† (CAS 7439-92-1)	Blood
Lead compounds, inorganic (CAS No. Not available)	Acute toxicity
Lead† (CAS 7439-92-1)	Acute toxicity

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Section 311/312 hazard categories	Immediate Hazard - Yes	If particulates/fumes generated during processing
	Delayed Hazard - Yes	If particulates/fumes generated during processing
	Fire Hazard - No	
	Pressure Hazard - No	
	Reactivity Hazard - Yes	If molten
SARA 302 Extremely hazardous substance	No	
SARA 311/312 Hazardous chemical	Yes	

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Aluminum	7429-90-5	>90
Zinc	7440-66-6	<4.0
Manganese	7439-96-5	<1.5
Copper	7440-50-8	<1.4
Lead†	7439-92-1	0 - 0.4
Nickel‡	7440-02-0	0 - 0.2
Nickel compounds, insoluble	No. Not available	1
Zinc oxide	1314-13-2	1
Manganese compounds, inorganic	No. Not available	1
Chromium (II) compounds	No. Not available	1
Chromium (III) compounds	No. Not available	1
Chromium (VI) compounds, certain water insoluble forms	No. Not available	1
Chromium (VI) compounds, water soluble forms	No. Not available	1
Chromium (VI) compounds	18540-29-9	1
Lead compounds, inorganic	No. Not available	1
Ozone	10028-15-6	1

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

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)
Iron oxide (CAS 1309-37-1)
Lead† (CAS 7439-92-1)
Magnesium (CAS 7439-95-4)
Magnesium oxide (CAS 1309-48-4)
Manganese (CAS 7439-96-5)
Nickel‡ (CAS 7440-02-0)
Nitric oxide (CAS 10102-43-9)
Oil mist, mineral (CAS 8012-95-1)
Silicon (CAS 7440-21-3)
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)	500 LBS
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	500 LBS
Chromium (CAS 7440-47-3)	500 LBS
Chromium (II) compounds (CAS No. Not available)	500 LBS
Chromium (III) compounds (CAS No. Not available)	500 LBS
Chromium (VI) compounds (CAS 18540-29-9)	500 LBS
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	500 LBS
Copper (CAS 7440-50-8)	500 LBS
Lead compounds, inorganic (CAS No. Not available)	500 LBS
Lead† (CAS 7439-92-1)	500 LBS
Manganese (CAS 7439-96-5)	500 LBS
Manganese compounds, inorganic (CAS No. Not available)	500 LBS
Nickel compounds, insoluble (CAS No. Not available)	500 LBS
Nickel‡ (CAS 7440-02-0)	500 LBS
Zinc (CAS 7440-66-6)	500 LBS
Zinc oxide (CAS 1314-13-2)	500 LBS

US. Pennsylvania RTK - Hazardous Substances

Aluminum (CAS 7429-90-5)	
Aluminum oxide (non-fibrous) (CAS 1344-28-1)	
Chromium (CAS 7440-47-3)	
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	
Copper (CAS 7440-50-8)	
Iron oxide (CAS 1309-37-1)	
Lead† (CAS 7439-92-1)	
Magnesium (CAS 7439-95-4)	
Magnesium oxide (CAS 1309-48-4)	
Manganese (CAS 7439-96-5)	
Nickel‡ (CAS 7440-02-0)	
Oil mist, mineral (CAS 8012-95-1)	
Silica, amorphous (CAS 69012-64-2)	
Silicon (CAS 7440-21-3)	
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 No. Not available)	
Chromium (VI) compounds (CAS 18540-29-9)	
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	
Copper (CAS 7440-50-8)	
Lead compounds, inorganic (CAS No. Not available)	
Lead† (CAS 7439-92-1)	
Manganese (CAS 7439-96-5)	
Manganese compounds, inorganic (CAS No. Not available)	
Nickel compounds, insoluble (CAS No. Not available)	
Nickel‡ (CAS 7440-02-0)	
Zinc (CAS 7440-66-6)	
Zinc oxide (CAS 1314-13-2)	

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 (CAS 18540-29-9)	Listed: February 27, 1987
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	Listed: February 27, 1987
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	Listed: February 27, 1987
Lead compounds, inorganic (CAS No. Not available)	Listed: October 1, 1992

Lead† (CAS 7439-92-1)	Listed: October 1, 1992
Nickel compounds, insoluble (CAS No. Not available)	Listed: May 7, 2004
Nickel‡ (CAS 7440-02-0)	Listed: May 7, 2004

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

Chromium (VI) compounds (CAS 18540-29-9)	Listed: December 19, 2008
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	Listed: December 19, 2008
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	Listed: December 19, 2008
Lead compounds, inorganic (CAS No. Not available)	Listed: February 27, 1987
Lead† (CAS 7439-92-1)	Listed: February 27, 1987

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

Chromium (VI) compounds (CAS 18540-29-9)	Listed: December 19, 2008
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	Listed: December 19, 2008
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	Listed: December 19, 2008
Lead compounds, inorganic (CAS No. Not available)	Listed: February 27, 1987
Lead† (CAS 7439-92-1)	Listed: February 27, 1987

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

Chromium (VI) compounds (CAS 18540-29-9)	Listed: December 19, 2008
Chromium (VI) compounds, certain water insoluble forms (CAS No. Not available)	Listed: December 19, 2008
Chromium (VI) compounds, water soluble forms (CAS No. Not available)	Listed: December 19, 2008
Lead compounds, inorganic (CAS No. Not available)	Listed: February 27, 1987
Lead† (CAS 7439-92-1)	Listed: February 27, 1987

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
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

March 10, 2015: Change(s) in Section: 2, 3 and 16.
 June 14, 2013: Change(s) in Section: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15 and 16.
 December 1, 2009: New format. October 25, 2006: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 2, 3, 4, 5, 7, 8, 10, 11, 12 and 15
 August 14, 2003: Reviewed on a periodic basis in accordance with Alcoa policy. Change(s) in Section: 1, 2, 3, 8 and 15
 Origination date: March 16, 1990

SDS System Number: 115823

Revision date

March 10, 2015.

Version #

09

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.

Revision Information

Product and Company Identification: Product and Company Identification
Hazards Identification: US Hazardous
Accidental release measures: Environmental precautions
Handling and storage: Requirements for Processes Which Generate Dusts or Fines
Exposure controls/personal protection: <INDENT>Other
Physical & Chemical Properties: Multiple Properties
Toxicological information: 003 - Health effects associated with ingredients formed during processing
Toxicological information: Ingestion
Transport Information: Agency Name, Packaging Type, and Transport Mode Selection
Regulatory Information: Safety Phrases
Regulatory information: <INDENT>
Other information, including date of preparation or last revision: Other information 1
Other information, including date of preparation or last revision: References
GHS: Qualifiers

Disclaimer

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

Other information

- Guide to Occupational Exposure Values 2014, 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.
- TOXNET, U.S. National Library of Medicine
- 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 System

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 ***