

**Section 1 - IDENTIFICATION**

*Chemical Name and Synonyms:* Aluminum

*Formula:* Al

*Trade Name and Synonyms:* Aluminum metal, Aluminum Anodes.

*Manufacturer's Name:* M&M Industries, Inc. - *Address:* 800 W. Front Street; Chester, PA 19013, USA - *Telephone:* (610) 447 0663

*Emergency Information:* Chemtrec: (703) 527-3887 ; (800) 424-9300 (24 Hour Emergency Telephone)

*Product Use:* Aluminum is used in a huge variety of products including cans, foils, kitchen utensils, window frames, beer kegs and airplane parts. Aluminum metal is used as a sacrificial anode or corrosion inhibitor.

**Section 2 – HAZARD(S) IDENTIFICATION**

Signal Word: **Warning.**



Non-combustible as supplied. Small chips, fine turnings and dust from processing may be readily ignitable. Aluminum is a silvery-white, lightweight metal. It is soft and malleable. Aluminum is relatively non-toxic and poses little immediate health hazard to personnel or the environment in an emergency situation. IARC, NTP, and OSHA do not list aluminum as a carcinogen.

*Overview:* Contact with acids or alkalis generate flammable hydrogen gas which can accumulate in poorly-ventilated areas. Do Not Use Water or Halogenated Extinguisher Agents! Dry sodium chloride is most effective for containing particulate fires. Flux (KCl, MgCl<sub>2</sub>, CaF<sub>2</sub>) is effective in reducing the oxygen supply of the fire. See NFPA Code No. 65 for more information.

*Potential Health Effects:* 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).

*Potential Environmental Effects:* The product is not expected to be hazardous to the environment.

**HMIS HAZARD CLASSIFICATION:** Health: 0; Flammability: 1; Reactivity: 1

**Section 3 – COMPOSITION/ INFORMATION ON INGREDIENTS**

Ingredient: Aluminum

CAS No : 7429-90-5; 94 - 99% by weight

OSHA PEL - Aluminum TWA 5 mg/m<sup>3</sup> Respirable dust; 15 mg/m<sup>3</sup> (Total dust)

ACGIH TLV - 1.0 mg/m<sup>3</sup>

Ingredient	CAS Number	Percent
Iron (Fe)	7439-89-6	<0.01
Copper (Cu)	7440-50-8	<0.004
Silicon (Si)	7440-21-3	<0.20
Zinc (Zn)	7440-66-6	<6.5
Indium (In)	7440-74-6	<0.02
Magnesium (Mg)	1309-48-4	<0.01
Tin (Sn)	7440-31-5	<0.001
Gallium (Ga)	7440-55-3	<0.01
Cadmium (Cd)	7440-43-9	<0.001
Lead (Pb)	7439-92-1	<0.001
<b>Aluminum (Al)</b>	<b>7429-90-5</b>	<b>93 min.</b>

OSHA - Occupational Safety and Health Administration.

ACGIH - American Conference of Governmental Industrial Hygienists.

NIOSH - National Institute for Occupational Safety and Health.

OEL – Occupational Exposure Limit.

PEL – Permissible Exposure Limit.

TLV – Threshold Limit Value.

REL – Recommended Exposure Limit.

**Section 4 – FIRST AID MEASURES**

- *Eye Contact:* Immediately flush eyes with plenty of water for at least 15 minutes holding eyelids apart to ensure flushing of entire eye surface. Seek medical attention after flushing eyes with water. DO NOT attempt to manually remove anything stuck to the eye.
- *Skin Contact:* No health effects expected. Wash contaminated areas with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and wash before reuse. Seek medical attention if any irritation or redness occurs.
- *Inhalation:* If symptoms are experienced remove source of contamination or move victim to fresh air. Obtain medical advice. If breathing has stopped, give artificial respiration and seek medical attention immediately.
- *Ingestion:* Seek medical attention immediately. Never give anything by mouth to an unconscious person.

**Section 5 – FIRE FIGHTING MEASURES**

Flash Point (Method Used): NA ~ Flammable Limits: NA

Special Fire Fighting Procedures: DO NOT use water, carbon dioxide foam or powder.

Wear OSHA/NIOSH approved self-contained breathing apparatus and full protective clothing.

- *Fire and Explosion Hazards:* Massive metal is not considered a fire or explosion hazard. However, finely divided metallic dust or powder may form flammable or explosive dust clouds when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Bulk dust in a damp state may heat spontaneously and ignite on exposure to air. Contact with acids and alkali hydroxides results in evolution of hydrogen gas which is potentially explosive.
- *Extinguishing Media:* Do Not Use Water or Halogenated Extinguisher Agents! Dry sodium chloride is most effective for containing particulate fires. Flux (KCl, MgCl<sub>2</sub>, CaF<sub>2</sub>) is effective in reducing the oxygen supply of the fire. See NFPA Code No. 65 for more information
- *Fire Fighting:* Wear self-contained breathing apparatus with full face piece operated in positive pressure mode and full turn-out gear. Unusual Fire and Explosion Hazards: No fire or explosion hazard with solid metal alloys. A severe fire hazard may exist when fine turnings or chips are produced and during disposal of scrap containing chips or fines. Dry Aluminum alloy powder (NFPA 65) can be ignited by a match or small spark. Toxic metal fumes of aluminum, silicon, magnesium, copper, iron, nickel, zinc, titanium, and beryllium may be emitted. Molten alloy and water can cause an explosion. *Upper and Lower Flammable Limit:* Lower Flammable Limit (Zinc Dust): 500 g/m<sup>3</sup>; Upper Flammable Limit: Not Applicable.
- *Auto-ignition Temperature:* Auto ignition will not occur for solid metal alloy. Dust cloud may be explosive (NFPA 65).

**Section 6 – ACCIDENTAL RELEASE MEASURES**

- *Procedures for Cleanup:* Solid metal is recyclable. Vacuuming recommended for accumulated metal dust. Molten metal should be allowed to solidify prior to clean-up. Return uncontaminated spilled material to the process if possible. Place contaminated and non-recyclable material in suitable labeled containers for later disposal. Treat or dispose of waste material in accordance with all local, regional and national requirements, as applicable.
- *Personal Precautions:* Protective clothing, gloves, and a respirator are recommended for persons responding to an accidental release (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with aluminum dust or powder. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash.
- *Environmental Precautions:* Aluminum has no known biological role in the metallic form, has limited bioavailability and poses no immediate ecological risk.

**Section 7 – HANDLING AND STORAGE**

- *Steps to be taken in case material is released or spilled:* Aluminum can be safely swept, shoveled or picked up by hand. Wear protective clothing. Return spilled material in accordance with applicable regulations.
- *Waste Disposal Method:* Dispose of in accordance with Federal, State, and Local laws and regulations.
- *Precautions to be taken in handling and storage:* Store in a dry area, in properly labeled containers. *Other Precautions:* Not applicable.
- *EU Safety Phrase(s):* Not applicable - Aluminum in ingot form is not listed as a dangerous substance. Store zinc in a DRY covered area, separate from incompatible materials. Aluminum ingots suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Ingots may contain cavities that collect moisture. Entrained moisture will expand explosively when immersed in a molten bath. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate designated areas. No special packaging materials are required.

**Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION**

- *Protective Clothing:* Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when aluminum is processed. Eye protection should be worn where fume or dust is generated. Respiratory protection may be required where aluminum dust is generated. Where hot or molten metal is handled, heat resistant gloves, face shield, and clothing to protect from hot metal splash should be worn. Safety type boots are recommended.
- *Ventilation:* Use adequate local or general ventilation to maintain the concentration of aluminum dust in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Where metallic dust particles of zinc metal are being collected and transported by a ventilation system, use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Locate dust collectors and fans outdoors if possible and provide dust collectors with explosion vents or blow out panels.
- *Respirators:* Where aluminum dust is generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (.

**Section 9 – PHYSICAL AND CHEMICAL PROPERTIES**

- *Appearance:* Silver metal
- *Odor:* None
- *Physical State:* Solid
- *pH:* Not Applicable
- *Vapor Pressure:* Not Applicable
- *Vapor Density:* Not Applicable
- *Boiling Point/Range:* Not determined
- *Freezing/Melting Point/Range:* 1200 °F (650 °C)
- *Specific Gravity:* 2.7
- *Evaporation Rate:* Not Applicable
- *Coefficient of Water/Oil Distribution:* Not Applicable
- *Odor Threshold:* None
- *Solubility:* Insoluble in Water

**Section 10 – STABILITY AND REACTIVITY**

*Stability & Reactivity:* Stable under normal conditions of use, storage, and transportation as shipped.

*Conditions to avoid:* Chips, fines, dust and molten metal are considerably more reactive with the following:

- Water: Slowly generates flammable/explosive hydrogen gas and heat. Generation rate is greatly increased with smaller particles (e.g., fines and dusts). Molten metal can react violently/explosively with water or moisture, particularly when the water is entrapped.
- Heat: Oxidizes at a rate dependent upon temperature and particle size.

*Possibility of hazardous reactions:* Hazardous polymerization does not occur.

*Incompatibilities:* Contact with acids and alkalis will generate highly flammable hydrogen gas. Contact with acidic solutions of arsenic and antimony compounds may evolve highly toxic ARSINE or STIBINE gas. Incompatible with strong oxidizing agents such as chlorine, fluorine, bromine, sodium potassium or barium peroxide, sodium or potassium chlorate, chromium trioxide and fused ammonium nitrate.

Also incompatible with elemental sulfur dust, halogenated hydrocarbons or chlorinated solvents and chlorinated rubber.

*Hazardous Decomposition Products:*

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.
- Iron powder and water: Explosive reaction forming hydrogen gas when heated above 1470°F (800°C).

Thermite reactions can occur with oxides of lead, copper, iron, bismuth and certain other metals.

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.

**Section 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).

Health effects associated with compounds formed during processing:

- *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.
- *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).
- 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). Plasma arc cutting of aluminum can generate oxides of nitrogen. Oxides of nitrogen (NO and NO<sub>2</sub>): 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 (NO<sub>2</sub>): Chronic overexposures: Can cause scarring of the lungs (pulmonary fibrosis).

**Section 12 – ECOLOGICAL INFORMATION**

*Persistence and degradability* ..... The product is not biodegradable.

*Bioaccumulative potential* ..... The product is not bioaccumulating.

*Mobility in soil* ..... Not considered mobile.

*Mobility in general* ..... Not applicable.

*Other adverse effects* ..... None known..

**Section 13 – DISPOSAL CONSIDERATIONS**

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

**Section 14 – TRANSPORT INFORMATION**

- PROPER SHIPPING NAME ..... Not applicable – not regulated.
- U.S. DOT AND TRANSPORT CANADA HAZARD CLASSIFICATION. Not applicable
- U.S. DOT AND TRANSPORT CANADA PID ..... Not applicable
- MARINE POLLUTANT ..... No
- IMO CLASSIFICATION..... Not regulated

**Section 15 – REGULATORY INFORMATION****U.S.**

- INGREDIENT LISTED ON TSCA INVENTORY ..... Yes
- HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD ..... No
- EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE ..... No
- EPCRA SECTION 311/312 HAZARD CATEGORIES ..... No Hazard Categories Apply
- EPCRA SECTION 313 Toxic Release Inventory:..... This product does not contain any toxic chemicals subject to the Toxic Release reporting requirements.
- 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.

**CANADIAN:**

- INGREDIENTS LISTED ON DOMESTIC SUBSTANCES LIST ..... Yes
- Canada Non-Domestic Substances List (NDSL) ..... No

**EUROPEAN UNION:**

- LISTED ON THE EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES (EINECS) ..... Yes
- European List of Notified Chemical Substances (ELINCS) ..... No

*Toxic Substance Control Act – TSCA; Comprehensive Response Compensation and Liability Act – CERCLA*

**Section 15 – OTHER INFORMATION**

The information in this Material Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition.
- American Conference of Governmental Industrial Hygienists, 2006, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

*Agents and Biological Exposure Indices.*

- American Conference of Governmental Industrial Hygienists, 2005, Guide to Occupational Exposure Values.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urban, Ed), 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) Hamilton, Ontario, CHEMINFO Record No. 239 – Zinc (Last Revision 2006-01).
- European Economic Community, Commission Directives 91/155/EEC and 67/548/EEC.
- Industry Canada, SOR/88-66, Controlled Products Regulations, as amended.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, 2003, Hazardous Substance Data Bank. (on-line version).
- Patty's Toxicology, Fifth Edition, 2001 E. Bingham, B. Cohns & CH Powell (Eds.).
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition (September 2005).
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, August 2005, Toxicological Profile for Zinc.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

**DISCLAIMER**

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