



## U.S. Department of Labor

Occupational Safety & Health  
Administration

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### OSHA/EPA Occupational Chemical Database

#### Chemical Identification

**Chemical Name:** ALUMINUM, as Al

**CAS #:** 7429-90-5

**UN No:** 1309

**Formula:** Al

**Synonyms:** Aluminium; Aluminum metal; Aluminum powder; Elemental aluminum

Physical Properties			
<b>Physical Description:</b> Silvery-white, malleable, ductile, odorless metal.			
<b>BP:</b> 4221°F	<b>MW:</b> 27.0	<b>LEL:</b> NA	<b>NFPA Fire Rating:</b> NA
<b>FRZ/MLT:</b> MLT: 1220°F	<b>VP:</b> 0 mmHg (approx)	<b>UEL:</b> NA	<b>NFPA Health Rating:</b> NA
<b>FP:</b> NA	<b>VD:</b> NA		<b>NFPA Reactivity Rating:</b> NA
<b>Sp. GR:</b> 2.70	<b>IP:</b> NA		<b>NFPA Sp. Inst.:</b> NA

Exposure Limits		
OSHA	NIOSH	Related Information
<b>PEL-TWA ppm:</b> NA	<b>REL-TWA ppm:</b> NA	<b>AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:</b> NA
<b>PEL-TWA mg/m3:</b> 5	<b>REL-TWA mg/m3:</b> 5	
<b>PEL-STEL ppm:</b> NA	<b>REL-STEL ppm:</b> NA	
<b>PEL-STEL mg/m3:</b> NA	<b>REL-STEL mg/m3:</b> NA	
<b>PEL-C ppm:</b> NA	<b>REL-C ppm:</b> NA	
<b>PEL-C mg/m3:</b> NA	<b>REL-C mg/m3:</b> NA	<b>Carcinogen Classifications:</b> NA
<b>Skin Notation:</b> No	<b>Skin Notation:</b> No	
<b>Notes:</b> RESPIRABLE FRACTION, 15mg/m3 TOTAL DUST	<b>Notes:</b> RESPIRABLE FRACTION, 10mg/m3 TOTAL DUST	
	<b>IDLH ppm:</b> NA	
	<b>IDLH mg/m3:</b> NA	
	<b>IDLH Notes:</b> NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)	
<b>Aluminum</b>	<b>CAS:</b> 7429-90-5
<b>Formula:</b> Al	<b>RTECS:</b> BD0330000
<b>Synonyms &amp; Trade Names:</b> Aluminium, Aluminum metal, Aluminum powder, Elemental aluminum	<b>DOT ID &amp; Guide:</b> 1309 170 (powder, coated) 1396 138 (powder, uncoated) 9260 169 (molten)
Exposure Limits	
<b>NIOSH REL:</b> TWA 10 mg/m3 (total) TWA 5 mg/m3 (resp)	<b>OSHA PEL:</b> TWA 15 mg/m3 (total) TWA 5 mg/m3 (resp)
<b>IDLH:</b> N.D.	<b>Conversion:</b> NA
Physical Description	
Silvery-white, malleable, ductile, odorless metal.	
<b>MW:</b> 27.0	<b>BP:</b> 4221F
	<b>MLT:</b> 1220F
	<b>Sol:</b> Insoluble

VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 2.70
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Combustible Solid, finely divided dust is easily ignited; may cause explosions. ( <a href="#">See flammable and combustible liquid classes</a> )			
<b>Incompatibilities &amp; Reactivities</b>			
Strong oxidizers & acids, halogenated hydrocarbons [Note: Corrodes in contact with acids & other metals. Ignition may occur if powders are mixed with halogens, carbon disulfide, or methyl chloride.]			
<b>Measurement Methods</b>			
NIOSH 7013, 7300, 7301, 7303; OSHA ID121			
<b>Personal Protection &amp; Sanitation</b>		<b>First Aid</b>	
Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Eye: Irr immed Breath: Fresh air  ( <a href="#">See procedures</a> )	
<b>NIOSH Respirator Recommendations</b>			
TBAL ( <a href="#">See symbols and codes</a> )			
<b>Exposure Routes</b>			
Inh Con			
<b>Symptoms</b>			
Irrit eyes, skin, resp sys ( <a href="#">See abbreviations</a> )			
<b>Target Organs</b>			
Eyes, skin, resp sys ( <a href="#">See abbreviations</a> )			

## DOT Emergency Response Guidebook (ERG 2004)

**Guide Number: 170**

**170 Metals (Powders, Dusts, Shavings, Borings, Turnings, or Cuttings, etc.)**

### POTENTIAL HAZARDS

#### FIRE OR EXPLOSION

- \* May react violently or explosively on contact with water.
- \* Some are transported in flammable liquids.
- \* May be ignited by friction, heat, sparks or flames.
- \* Some of these materials will burn with intense heat.
- \* Dusts or fumes may form explosive mixtures in air.
- \* Containers may explode when heated.
- \* May re-ignite after fire is extinguished.

#### HEALTH

- \* Oxides from metallic fires are a severe health hazard.
- \* Inhalation or contact with substance or decomposition products may cause severe injury or death.
- \* Fire may produce irritating, corrosive and/or toxic gases.
- \* Runoff from fire control or dilution water may cause pollution.

#### PUBLIC SAFETY

- \* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- \* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
- \* Stay upwind.
- \* Keep unauthorized personnel away.

#### PROTECTIVE CLOTHING

- \* Wear positive pressure self-contained breathing apparatus (SCBA).
- \* Structural firefighters' protective clothing will only provide limited protection.

#### EVACUATION

**Large Spill**

- \* Consider initial downwind evacuation for at least 50 meters (160 feet).

**Fire**

- \* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

**EMERGENCY RESPONSE****FIRE**

- \* DO NOT USE WATER, FOAM OR CO2.
- \* Dousing metallic fires with water may generate hydrogen gas, an extremely dangerous explosion hazard, particularly if fire is in a confined environment (i.e., building, cargo hold, etc.).
- \* Use DRY sand, graphite powder, dry sodium chloride based extinguishers, G-1 or Met-L-X powder.
- \* Confining and smothering metal fires is preferable rather than applying water.
- \* Move containers from fire area if you can do it without risk.

**Fire involving Tanks or Car/Trailer Loads**

- \* If impossible to extinguish, protect surroundings and allow fire to burn itself out.

**SPILL OR LEAK**

- \* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- \* Do not touch or walk through spilled material.
- \* Stop leak if you can do it without risk.
- \* Prevent entry into waterways, sewers, basements or confined areas.

**FIRST AID**

- \* Move victim to fresh air.
- \* Call 911 or emergency medical service.
- \* Apply artificial respiration if victim is not breathing.
- \* Administer oxygen if breathing is difficult.
- \* Remove and isolate contaminated clothing and shoes.
- \* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- \* Keep victim warm and quiet.
- \* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

**Additional Emergency Response Information (CAMEO Data)**

**Non-fire Spill Response:** Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Do not attempt to sweep up dry material. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Cover solids with a plastic sheet to prevent dissolving in rain or fire fighting water. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. Remove trapped material with suction hoses. ( AAR, 1999)

**Firefighting:** Do not use water. Use suitable dry powder. ( AAR, 1999)

**Reactivity:** AIR AND WATER REACTIONS: Napp Technologies explosion: the mixing of water with Sodium Hydrosulfite caused the generation of SO<sub>2</sub>, heat and more water. The Aluminum powder reacted with water and other reactants to generate more heat. The resulting explosion of the chemical reactor killed 5 employees and 300 residents were evacuated, (Case Study, Accident Investigation: Napp Technologies, presented by John Ferris, Paul Kahn, Mike Marshall, Fourteenth International Hazardous Material Spills Conference.)CHEMICAL PROFILE: Can be charged electrostatically by swirling, pneumatic transport or pouring; reacts violently with metal oxides (thermite process; during welding; rust with aluminum containing paints), metal salts, mercury and mercury compounds; reacts with nitrates, sulfates, halogens, and halogenated hydrocarbons to form compounds that are sensitive to mechanical shock.(Handling Chemicals Safely 1980. p. 135). A mixture of ammonium nitrate and aluminum powder can be used as an explosive. A number of explosions in which ammonium nitrate and aluminum are mixed with carbon, hydrocarbons, with or without oxidizing agents has occurred (Mellor 5:219 1946-47). A mixture of aluminum powder with ammonium persulfate powder and water may cause an explosion (NFPA 491M 1991). When bismuth trioxide is heated with powdered aluminum, the reduction occurs with explosive violence, Mellor 9:649 (1946-47). A combination of finely divided aluminum with finely divided bromates(also chlorates and iodates) of barium, calcium, magnesium, potassium, sodium or zinc can explode by heat, percussion, and friction, Mellor 2:310 (1946-47). Bromine vapor reacts with warm aluminum foil with incandescence. The reaction is vigorous even at 15 C., Chem. News 121:178 (1920). Powdered aluminum burns in the vapor of carbon disulfide, sulfur dioxide, sulfur dichloride, nitrous oxide, nitric oxide, or nitrogen peroxide, Mellor 5:209-212 (1946-47). Powdered aluminum and carbon tetrachloride exploded when heated(to 153 C.) and by impact, Chem. Eng. News 32:258 (1954); UL Bull. Research 34 (1945), ASESB Pot. Incid. 39 (1968). In the presence of carbon, the

combination of chlorine trifluoride with aluminum, copper, lead, magnesium, silver, tin, or zinc results in a violent reaction (Mellor 2 Supp. 1: 1956). A violent reaction or flaming is likely in the reaction of chromic anhydride and aluminum powder (Mellor 11:237 1946-47). A strong explosion occurred when aluminum was heated with copper oxide. With lead oxide, the crucible was broken and the doors of the furnace were blown off (Mellor 5:217-19 1946-47). Aluminum powder and iodine in close contact will ignite spontaneously, Fluorine with metals requires added heat for ignition (NFPA 491M 1991). Aluminum foil, after continued contact with iodine monochloride, ignites spontaneously and burns with a bluish-white flame, Mellor 2:119 (1946-47). There has been three industrial explosions involving a photoflash composition containing potassium perchlorate with aluminum and magnesium powder (ACS 146:210 1945), NFPA 491M 1991). Methyl bromide in a steel tank reacted with an aluminum tube (part of the level gauge) producing methyl aluminum bromide. When the latter was subsequently exposed to air, enough heat was produced to ignite the methyl bromide-compressed air mixture above the liquid layer. The ensuing explosion shattered the tank (Chem. Eng. Pro. 58(8):1962). Methyl chloride in the presence of small amounts of aluminum chloride will attack aluminum powder, forming spontaneously flammable (in air) aluminum trimethyl. Liquid oxygen gives a detonable mixture when combined with powdered aluminum (NFPA 491M 1991). A reaction between silver chloride and aluminum, once started, proceeds with explosive violence (Mellor 3:402 1946-47). A 25% sodium hydroxide solution was filtered into a tank trailer thought to be made of steel. By the time it was discovered that the tank was aluminum, copious amounts of hydrogen were already boiling off (MCA Case History 1115 1965). (REACTIVITY, 1999)

**First Aid:** Move victim to fresh air. Call emergency medical care. Apply artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. Keep victim warm and quiet. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. (DOT, 1996)

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