

Aluminium

Incident management

Key Points

Fire

- Highly flammable
- Reacts with water and alcohols, and violently with oxidants, strong acids, strong bases and chlorinated hydrocarbons causing fire and explosion hazard
- Emits toxic fumes of aluminium oxide when heated to decomposition
- In the event of a fire involving aluminium powder (coated), use dry agent and normal fire kit with breathing apparatus and for aluminium powder (uncoated), use dry agent liquid-tight chemical protective clothing in combination with breathing apparatus. Water MUST NOT be allowed to come into contact with substance

Health


- Toxic by ingestion, inhalation and eye exposure. Acute exposure is unlikely
- CHIP classification: highly flammable
- Inhalation may cause irritation and metal fume fever. Symptoms include cough, dyspnoea, sore throat, chest tightness, headache, fever, rigors, myalgia and arthralgia
- Ingestion causes nausea, vomiting and diarrhoea
- Ocular exposure to aluminium dust causes irritation. Aluminium fragments are generally non-irritating


Environment

- Avoid release into the environment
- Inform Environment Agency of substantial incidents

Hazard Identification

Standard (UK) Dangerous Goods Emergency Action Codes^(a)

UN		1309	Aluminium powder, coated	
EAC		4Y	Use dry agent – water MUST NOT be allowed to come into contact with substance. Wear normal fire kit in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		-	-	
Hazards	Class	4.1	Flammable solids, self reactive substances and solid desensitised explosives.	
	Sub risks	-	-	
HIN		40	Flammable solid, or self-reactive substance, or self-heating substance	

UN		1396	Aluminium powder, uncoated	
EAC		4W	Use dry agent. – water MUST NOT be allowed to come into contact with substance. Wear liquid-tight chemical protective clothing in combination with breathing apparatus**. Danger that the substance can be violently or explosively reactive. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		-	-	
Hazards	Class	4.3	Substances which in contact with water emit flammable gases	
	Sub risks	-	-	
HIN		423	Solid which reacts with water, emitting flammable gases	


UN – United Nations number; EAC – Emergency Action Code; APP – Additional Personal Protection; HIN - Hazard Identification Number

*Normal fire fighting clothing i.e. fire kit (BS EN 469), gloves (BS EN 659) and boots (HO specification A29 and A30) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).


**Liquid-tight chemical protective clothing (BS 8428) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).

^a Dangerous Goods Emergency Action Code List, The Stationery Office, 2009.

Chemical Hazard Information and Packaging for Supply Classification^(a)*Aluminium powder, pyrophoric*

Classification	F	Highly flammable	
Risk phrases	R15	Contact with water liberates extremely flammable gases	
	R17	Spontaneously flammable in air	
Safety phrases	S2	Keep out of the reach of children	
	S7/8	Keep container tightly closed and dry	
	S43	In case of fire, use dry agent. Never use water.	

Aluminium powder, stabilised



Classification	F	Highly flammable	
Risk phrases	R11	Highly flammable	
	R15	Contact with water liberates extremely flammable gases	
Safety phrases	S2	Keep out of the reach of children	
	S7/8	Keep container tightly closed and dry	
	S43	In case of fire, use dry agent. Never use water	

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.2.



<http://ecb.jrc.ec.europa.eu/classification-labelling/clp/> (accessed 08/2010).

Globally Harmonised System of Classification and Labelling of Chemicals (GHS)^{(a)}*

Aluminium powder, pyrophoric

Hazard Class and Category	Water-react. 2		
	Pyr. Sol. 1		
Hazard Statement	H261	In contact with water releases flammable gases	
	H250	Catches fire spontaneously if exposed to air	
Signal Word	DANGER		

Aluminium powder, stabilised

Hazard Class and Category	Water-react. 2		
	Flam. Sol. 1		
Hazard Statement	H261	In contact with water releases flammable gases	
	H228	Flammable solid	
Signal Word	DANGER		

*Implemented in the EU on 20 January 2009

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.1.
<http://ecb.jrc.ec.europa.eu/classification-labelling/clp/> (accessed 08/2010).

Physicochemical Properties

CAS number	7429-90-5
Molecular weight	26.98
Empirical formula	Al
Common synonyms	Aluminum, A 00, AD1M, Alumina fibre
State at room temperature	Solid
Volatility	Vapour pressure = 1 mmHg at 1284°C, non-volatile at room temperature.
Specific gravity	Not available.
Flammability	Flammable
Lower explosive limit	Not available.
Upper explosive limit	Not available.
Water solubility	Insoluble
Reactivity	Reacts with water and alcohols, and violently with oxidants, strong acids, strong bases and chlorinated hydrocarbons causing fire and explosion hazard.
Reaction or degradation products	Decomposes to form toxic fumes of aluminium oxide.
Odour	Odourless

References ^(a,b,c)

^a Hazardous Substances Data Bank (HSDB). Entries for Aluminium, Elemental.

^b Aluminium (HAZARDTEXT® Hazard Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 08/2009)

^c International Chemical Safety Card (ICSC) entry for Aluminium. ICSC 0988. International Occupational Safety and Health Information Centre (CIS), 2001.

Threshold Toxicity Values

EXPOSURE VIA INGESTION/INHALATION	
mg	SYMPTOMS
-	No data identified

Published Emergency Response Guidelines

Emergency Response Planning Guideline (ERPG) Values

	Listed value (ppm)	Calculated value (mg m ⁻³)
ERPG-1*	Data not available	
ERPG-2**		
ERPG-3***		

* Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odour.

** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

*** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects.

Acute Exposure Guideline Levels (AEGLs)

	ppm				
	10 min	30 min	60 min	4 hr	8 hr
AEGL-1 [†]	Data not available				
AEGL-2 ^{††}					
AEGL-3 ^{†††}					

[†] The level of the chemical in air at or above which the general population could experience notable discomfort.

^{††} The level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape.

^{†††} The level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

Exposure Standards, Guidelines or Regulations

Occupational Standards

WEL^(a)	LTEL (8 hour reference period): Inhalable dust: 10 mg m ⁻³ (ppm not given) Respirable dust: 4 mg m ⁻³ (ppm not given)
	STEL (15 min reference period): No guideline value specified

Public Health Guidelines

DRINKING WATER QUALITY GUIDELINE^(b)	200 µg L ⁻¹
AIR QUALITY GUIDELINE	No guideline value specified
SOIL GUIDELINE VALUE AND HEALTH CRITERIA VALUES	No guideline value specified

WEL – Workplace exposure limit; LTEL - Long-term exposure limit; STEL – Short-term exposure limit

^a List of approved workplace exposure limits (as consolidated with amendments October 2007). <http://www.hse.gov.uk/cosHH/table1.pdf> (An update to EH40/2005: Workplace Exposure Limits 2005. The Stationery Office, London) (accessed 08/2009).

^bThe Water Supply (Water Quality) Regulations 2000 (England) and the Water Supply (Water Quality) Regulations 2001 (Wales).

Health Effects

Major Route of Exposure^(a)

- Toxic by ingestion, inhalation and eye exposure, although acute toxicity is unlikely.

Immediate Signs or Symptoms of Acute Exposure^(b,c)

- Inhalation may cause irritation and metal fume fever. Symptoms may occur within 3-10 hours of exposure and usually resolve within 24-48 hours. Cough, dyspnoea, sore throat, chest tightness, headache, fever, rigors, myalgia and arthralgia may occur and sometimes a metallic taste, nausea, vomiting and blurred vision.
- Ingestion causes gastrointestinal upset with nausea, vomiting and diarrhoea.
- Ocular exposure to aluminium dust causes irritation. Aluminium fragments are generally non-irritating

TOXBASE - <http://www.toxbase.org>

^a TOXBASE: Aluminium, 2004.

^b TOXBASE: Aluminium soluble salts, 2004.

^c TOXBASE: Metal fume fever, 2005.

Decontamination and First Aid

Important Notes

- Ambulance staff, paramedics and emergency department staff treating chemically-contaminated casualties should be equipped with Department of Health approved, gas-tight (Respirex) decontamination suits based on EN466:1995, EN12941:1998 and prEN943-1:2001, where appropriate.

Dermal Exposure^(a)

- Remove patient from exposure.
- The patient should remove all clothing and personal effects.
- Double-bag soiled clothing and place in a sealed container clearly labelled as a biohazard.
- Brush away any adherent solid particles and gently blot away any adherent liquid from the patient.
- Wash hair and all contaminated skin with copious amounts of water (preferably warm) and soap for at least 10-15 minutes. Decontaminate open wounds first and avoid contamination of unexposed skin.
- Pay special attention to skin folds, axillae, ears, fingernails, genital areas and feet.

Ocular Exposure^(b)

- Remove patient from exposure.
- Remove contact lenses if necessary and immediately irrigate the affected eye thoroughly with water or 0.9% saline for at least 10-15 minutes.
- Patients with corneal damage or those whose symptoms do not resolve rapidly should be referred for urgent ophthalmological assessment.

Inhalation^(c)

- Remove patient from exposure.
- Ensure a clear airway and adequate ventilation.
- Give oxygen by face mask if there is evidence of respiratory distress.
- Apply other supportive measures as indicated by the patient's clinical condition.

Ingestion^(c)

- Ensure a clear airway and adequate ventilation.
- Give oxygen to symptomatic patients.
- Apply other supportive measures as indicated by the patient's condition.

This document will be reviewed not later than 3 years or sooner if substantive evidence becomes available.

TOXBASE - <http://www.toxbase.org>

^a TOXBASE: Skin decontamination - irritants, 1996.

^b TOXBASE: Eye irritants, 2002.

^c TOXBASE: Aluminium soluble salts, 2004.