



UK Health
Security
Agency

Aluminium

Incident management

Contents

Main points.....	3
General.....	3
Health	3
Casualty decontamination at the scene.....	3
Environment	3
Hazard identification	4
Physicochemical properties	10
Reported effect levels from authoritative sources	11
Published emergency response guidelines.....	12
Exposure standards, guidelines or regulations	13
Health effects	14
Major route of exposure.....	14
Decontamination at the scene.....	15
Disrobe	15
Improvised decontamination.....	15
Improvised dry decontamination.....	16
Improvised wet decontamination	16
Additional notes	16
Interim wet decontamination.....	17
Decontamination at the scene references	17
Clinical decontamination and first aid.....	18
Important notes	18
Clinical decontamination following surface contamination.....	18
Dermal exposure	19
Ocular exposure	19
Ingestion.....	19
Inhalation.....	20
Clinical decontamination and first aid references	20
About the UK Health Security Agency	21

Main points

General

Aluminium is an odourless, lightweight, bluish, greyish, whitish metal.

Aluminium powder is flammable, it ignites on contact with air. A dust explosion is possible if powder or granular form mixes with air.

Aluminium powder reacts with alcohols and water, and violently with, oxidants, strong acids, strong bases and chlorinated hydrocarbons causing fire and explosion hazard.

Health

Major routes of exposure include ingestion and inhalation.

Inhalation of aluminium dust may cause irritation.

Ingestion of aluminium salts may result in burning in the mouth and throat and mild gastrointestinal upset

In severe cases ulceration of the lips and mouth, rarely haemorrhagic gastritis, circulatory collapse and multi-organ failure may occur

Casualty decontamination at the scene


Following disrobe, improvised dry decontamination should be considered for an incident involving aluminium unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances.

Environment

Inform the [Environment Agency](#) where appropriate and avoid release into the environment.

Hazard identification

Table 1a. Standard (UK) dangerous goods emergency action codes for aluminum powder coated

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 [note 1]. 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	

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.


Note to Table 1a

[note 1] Normal firefighting clothing is appropriate, namely: breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, firefighters’ gloves conforming to BS EN 659 and firefighters’ boots conforming to home office specification A29 or A30.

Reference

‘[Dangerous Goods Emergency Action Code List](#)’. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2021)

Table 1b. Standard (UK) dangerous goods emergency action codes for aluminium carbide, aluminium powder uncoated and sodium aluminium hydride

UN		1394	Aluminium carbide	
		1396	Aluminium powder, uncoated	
		2835	Sodium aluminium hydride	
EAC		4W	Use dry agent – water must not be allowed to come into contact with substance. Wear chemical protective clothing with liquid tight connections for whole body in combination with breathing apparatus [note 1]. 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	

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.


Note to Table 1b

[note 1] Chemical protective clothing with liquid tight connections for whole body (type 3) conforming to the relevant standards such as BS 8428 or EN 14605, in combination with breathing apparatus BS EN 137.

Reference

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2021)

Table 1c. Standard (UK) dangerous goods emergency action codes for aluminium nitrate

UN		1438	Aluminium nitrate	
EAC		1Z	Use dry agent – water must not be allowed to come into contact with substance. Wear normal fire kit in combination with breathing apparatus [note 1]. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		–	–	
Hazards	Class	5.1	Oxidising substances	
	Sub-risks	–	–	
HIN		50	Oxidising (fire-intensifying) substance	

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.


Note to Table 1c

[note 1] Normal firefighting clothing is appropriate, namely: breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, firefighters’ gloves conforming to BS EN 659 and firefighters’ boots conforming to home office specification A29 or A30.

Reference

‘[Dangerous Goods Emergency Action Code List](#)’. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2021)

Table 1d. Standard (UK) dangerous goods emergency action codes for aluminium bromide and aluminium chloride

UN		1725	Aluminium bromide, anhydrous	
		1726	Aluminium chloride, anhydrous	
EAC		4W	Use dry agent – water must not be allowed to come into contact with substance. Wear chemical protective clothing with liquid tight connections for whole body in combination with breathing apparatus [note 1]. 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	8		
	Sub-risks	–	–	
HIN		80	Corrosive or slightly corrosive substance	

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.



Note to Table 1d

[note 1] Chemical protective clothing with liquid tight connections for whole body (type 3) conforming to the relevant standards such as BS 8428 or EN 14605, in combination with breathing apparatus BS EN 137.

Reference

'[Dangerous Goods Emergency Action Code List](#)'. National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. The Stationery Office (2021)



Table 2a. The GB classification, labelling and packaging (CLP) regulation for aluminium powder, pyrophoric

Hazard class and category	Pyr. Sol. 1	Pyrophoric solid, category 1	
	Water-react. 2	Substances and mixtures, which in contact with water, emit flammable gases, category 2	
Hazard statement	H250	Catches fire spontaneously if exposed to air	
	H261	In contact with water releases flammable gases	
Signal words	DANGER		

Reference

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed June 2022)


Table 2b. The GB classification, labelling and packaging (CLP) regulation for aluminium powder, stabilised

Hazard class and category	Flam. Sol. 1	Flammable solid, category 1	
	Water-react. 2	Substances and mixtures, which in contact with water, emit flammable gases, category 2	
Hazard statement	H228	Flammable solid	
	H261	In contact with water releases flammable gases	
Signal words	DANGER		

Reference

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed June 2022)

Table 2c. The GB classification, labelling and packaging (CLP) regulation for aluminium chloride, anhydrous

Hazard class and category	Skin Corr. 1B	Skin corrosion/irritation, category 1	
Hazard statement	H314	Causes severe skin burns and eye damage	
Signal words	DANGER		

Reference

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed June 2022)

Physicochemical properties

Table 3. Physicochemical properties

CAS number	7429-90-5
Molecular weight	26.98
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	2.70
Flammability	Aluminium powder is flammable
Lower explosive limit	Not available
Upper explosive limit	Not available
Water solubility	Insoluble
Reactivity	Aluminium powder is flammable, it ignites on contact with air. A dust explosion is possible if powder or granular form mixes with air. Aluminium powder reacts with alcohols and water, and violently with, oxidants, strong acids, strong bases and chlorinated hydrocarbons causing fire and explosion hazard.
Odour	Odourless

References

- International Programme on Chemical Safety. '[International chemical safety card entry for Aluminium](#)'. ICSC 0988, 2019. World Health Organization (WHO) Geneva
- PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information (2004-). '[PubChem Compound Summary for CID 5359268, Aluminium](#)' (viewed June 2022)

Reported effect levels from authoritative sources

Table 4. Exposure by ingestion

g	Signs and symptoms	Reference
5	Death (aluminium ammonium sulphate)	a

Reference

[TOXBASE](#). Aluminium ammonium sulphate. June 2019 (viewed June 2022)

Published emergency response guidelines

Table 5. Acute exposure guideline levels (AEGLs)

	Concentration				
	10 minutes	30 minutes	60 minutes	4 hours	8 hours
AEGL-1 [note 1]	Data not available	Data not available	Data not available	Data not available	Data not available
AEGL-2 [note 2]	Data not available	Data not available	Data not available	Data not available	Data not available
AEGL-3 [note 3]	Data not available	Data not available	Data not available	Data not available	Data not available

Notes to Table 5

[note 1] Level of the chemical in air at or above which the general population could experience notable discomfort.

[note 2] 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.

[note 3] 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

Table 6. Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m ³	ppm	mg/m ³
Aluminium Metal	-	Inhalable dust: 10 Respirable dust: 4	No guideline specified	
Aluminium Oxides	-	Inhalable dust: 10 Respirable dust: 4	No guideline specified	
Aluminium salts, soluble	-	2	No guideline specified	

Abbreviations

WEL = workplace exposure limit.

LTEL = long-term exposure limit.

STEL = short-term exposure limit.

Reference

HSE. '[EH40/2005 Workplace Exposure Limits](#) . Fourth Edition' (2020)

Table 7. Public health standards and guidelines

UK drinking water standard	200 µg/L
WHO guideline for drinking water quality	No guideline value specified
WHO air quality guideline	No guideline value specified

References

- [The Private Water Supplies \(England\) Regulations \(2016\)](#) and [The Private Water Supplies \(Wales\) Regulations \(2017\)](#)
- [The Water Supply \(Water Quality\) Regulations \(2018\)](#) (Water, England and Wales)

Health effects

Major route of exposure

Inhalation or ingestion are the main routes of exposure

Table 8. Immediate signs or symptoms of acute exposure

Route	Signs and symptoms
Inhalation	Inhalation of aluminium dust may cause irritation
Ingestion	Accidental ingestion of small amounts of dilute preparations of aluminium salts may cause mild gastrointestinal upset only. Ingestion of larger amounts of aluminium salts may lead to ulceration of the lips and mouth, rarely haemorrhagic gastritis, circulatory collapse and multi-organ failure. Increased aluminium absorption and retention in bone has been reported following acute ingestion without apparent adverse sequelae.

Reference

[TOXBASE](#). Aluminium soluble salts. June 2019 (viewed June 2022)

Decontamination at the scene

Chemical specific advice

The approach used for decontamination at the scene will depend upon the incident, location of the casualties and the chemicals involved. Therefore, a risk assessment should be conducted to decide on the most appropriate method of decontamination.

Following disrobe, improvised dry decontamination should be considered for an incident involving aluminium unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances.

People who are processed through improvised decontamination should subsequently be moved to a safe location, triaged and subject to health and scientific advice. Based on the outcome of the assessment, they may require further decontamination.

Emergency services and public health professionals can obtain further advice from the UK Health Security Agency (UKHSA) Radiation, Chemicals and Environment Directorate using the 24-hour chemical hotline number: 0344 892 0555.

Disrobe

The disrobe process is highly effective at reducing exposure to HAZMAT/CBRN material when performed within 15 minutes of exposure. (HAZMAT is the abbreviation for 'hazardous materials'; CBRN is the abbreviation for 'chemical, biological, radiological and nuclear'.)

Therefore, disrobe must be considered the primary action following evacuation from a contaminated area.

Where possible, disrobe at the scene should be conducted by the casualty themselves and should be systematic to avoid transferring any contamination from clothing to the skin. Consideration should be given to ensuring the welfare and dignity of casualties as far as possible.

Improvised decontamination

Improvised decontamination is an immediate method of decontamination prior to the use of specialised resources. This should be performed on all contaminated casualties, unless medical advice is received to the contrary. Improvised dry decontamination should be considered for an incident involving chemicals unless the agent appears to be corrosive or caustic.

Improvised dry decontamination

Any available dry absorbent material can be used such as kitchen towel, paper tissues (for example, blue roll) and clean cloth.

Exposed skin surfaces should be blotted and rubbed, starting with the face, head and neck and moving down and away from the body.

Rubbing and blotting should not be too aggressive, or it could drive contamination further into the skin.

All waste material arising from decontamination should be left in situ, and ideally bagged, for disposal at a later stage.

Improvised wet decontamination

Water should only be used for decontamination where casualty signs and symptoms are consistent with exposure to caustic or corrosive substances such as acids or alkalis.

Wet decontamination may be performed using any available source of water such as taps, showers, fixed installation hose-reels and sprinklers.

When using water, it is important to try and limit the duration of decontamination to between 45 and 90 seconds and, ideally, to use a washing aid such as cloth or sponge.

Improvised decontamination should not involve overly aggressive methods to remove contamination as this could drive the contamination further into the skin.

Where appropriate, seek professional advice on how to dispose of contaminated water and prevent run-off going into the water system.

Additional notes

Following improvised decontamination, remain cautious and observe for signs and symptoms in the decontaminated person and in unprotected staff.

If water is used to decontaminate casualties this may be contaminated, and therefore hazardous, and a potential source of further contamination spread.

All materials (paper tissues and so on) used in this process may also be contaminated and, where possible, should not be used on new casualties.

The risk from hypothermia should be considered when disrobe and any form of wet decontamination is carried out.

People who are contaminated should not eat, drink or smoke before or during the decontamination process and should avoid touching their face.

Consideration should be given to ensuring the welfare and dignity of casualties as far as possible. Immediately after decontamination the opportunity should be provided to dry and dress in clean robes or clothes.

Interim wet decontamination

Interim decontamination is the use of standard fire and rescue service (FRS) equipment to provide a planned and structured decontamination process prior to the availability of purpose-designed decontamination equipment.

Decontamination at the scene references

- Home Office. '[Initial operational response to a CBRN incident.](#)' Version 2.0 (July 2015)
- NHS England. '[Emergency Preparedness, Resilience and Response \(EPRR\): guidance for the initial management of self-presenters from incidents involving hazardous materials.](#)' (February 2019)

Clinical decontamination and first aid

Clinical decontamination is the process where trained healthcare professionals, using purpose-designed decontamination equipment, treat contaminated persons individually.

[Detailed information on clinical management](#) can be found on TOXBASE.

Important notes

Once body surface contaminants have been removed or if your patient was exposed by ingestion or inhalation, the risk that secondary care givers may become contaminated is very low. Secondary carers should wear standard hospital PPE as a precaution against secondary contamination from vomit and body fluids.

If the patient has not been decontaminated following surface contamination, secondary carers must wear appropriate NHS PPE for chemical exposure to avoid contaminating themselves.

The area should be well ventilated.

Clinical decontamination following surface contamination

Carry out decontamination after resuscitation.

This should be performed in a well-ventilated area, preferably with its own ventilation system.

Avoid contaminating yourself with this product and wash any exposed area.

Contaminated clothing should be removed, double-bagged, sealed and stored safely.

Decontaminate open wounds first and avoid contamination of unexposed skin.

Any particulate matter adherent to skin should be removed and the patient washed with soap and copious amounts of water under low pressure for at least 10 to 15 minutes.

Pay particular attention to mucous membranes, moist areas such as skin folds, fingernails and ears.

The earlier irrigation begins, the greater the benefit.

Dermal exposure

Decontaminate (as above) the patient following surface contamination.

Other supportive measures as indicated by the patient's clinical condition

Ocular exposure

Remove contact lenses if present.

Anaesthetise the eye with a topical local anaesthetic (for example, oxybuprocaine, amethocaine or similar). However, do not delay irrigation if local anaesthetic is not immediately available.

Immediately irrigate the affected eye thoroughly with 1,000mL 0.9% saline or equivalent crystalloid (for example, by an infusion bag with a giving set) for a minimum of 10 to 15 minutes irrespective of initial conjunctival pH. A Morgan Lens may be used if anaesthetic has been given.

Aim for a final conjunctival pH of 7.5 to 8.0. The conjunctivae may be tested with indicator paper. Retest 20 minutes after irrigation and use further irrigation if necessary.

Any particles lodged in the conjunctival recesses should be removed.

Repeated instillation of local anaesthetics may reduce discomfort and help more thorough decontamination. However, prolonged use of concentrated local anaesthetics is damaging to the cornea.

Patients with corneal damage, those who have been exposed to strong acids or alkalis and those whose symptoms do not resolve rapidly should be discussed urgently with an ophthalmologist.

Other supportive measures as indicated by the patient's clinical condition.

Ingestion

Gut decontamination (including activated charcoal) is unlikely to be of benefit.

Monitor vital signs and check the capillary blood glucose.

Check and record pupil size.

Perform a 12-lead ECG in all patients who require assessment.

Other supportive measures as indicated by the patient's clinical condition.

Inhalation

Specific management is unlikely to be required. Treat symptomatically.

Other supportive measures as indicated by the patient's clinical condition.

Clinical decontamination and first aid references

- [TOXBASE](#) (viewed in June 2022).
- TOXBASE: 'Aluminium soluble salts – features and management' (2019)
- TOXBASE: 'Chemicals splashed or sprayed into eyes – features and management' (2020)
- TOXBASE: 'Skin decontamination – irritants' (2019)

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

UKHSA is an executive agency, sponsored by the Department of Health and Social Care.

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