Public Health England

Protecting and improving the nation's health

Acrylamide

Incident Management

Key Points

Fire

- combustible in its solid form
- reacts spontaneously with compounds containing amino, hydroxyl, and sulph-hydryl groups and is incompatible with ammonia, isocyanates, mineral acids, strong acids, oleum and oxidisers
- emits toxic fumes and oxides of nitrogen when heated to decomposition; pure acrylamide can also give off ammonia, hydrogen and carbon monoxide
- in the event of a fire involving acrylamide, use fine water spray and wear chemical protective clothing with liquid-tight connections in combination with breathing apparatus

Health

- skin contact is the main route of exposure
- skin exposure can cause irritation, numbness, tingling, excessive sweating, rash and peeling of skin
- ingestion may cause burning and ulceration of the mouth and throat, vomiting and abdominal pain
- inhalation can cause sore throat and cough
- ocular exposure can cause irritation and visual disturbances

Environment

- avoid release to the environment; inform the Environment Agency of substantial incidents

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Hazard Identification

Standard (UK) dangerous goods emergency action codes

Acrylamide, solid

UN		2074	Acrylamide, solid	
EAC		2X	Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses	
APP		–	–	
Hazards	**Class**	6.1	Toxic substance	
	Sub-risks	–	–	
HIN		60	Toxic or slightly toxic substance	

Acrylamide, solution

UN		3426	Acrylamide solution	
EAC		2X	Use fine water spray. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses	
APP		–	–	
Hazards	**Class**	6.1	Toxic substance	
	Sub-risks	–	–	
HIN		60	Toxic or slightly toxic substance	

UN – United Nations number, EAC – emergency action code, APP – additional personal protection, HIN – hazard identification number

* 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, 2015.

Classification, labelling and packaging (CLP)*

Hazard class and category	Carc. 1B	Carcinogenicity, category 1B	
	Muta. 1B	Germ cell mutagenicity, category 1B	
	Repr. 2	Reproductive toxicity, category 2	
	Acute Tox. 3	Acute toxicity (oral), category 3	
	STOT RE 1	Specific target organ toxicity following repeated exposure, category 1	
	Acute Tox. 4	Acute toxicity (dermal, inhalation), category 4	
	Eye Irrit. 2	Eye irritation, category 2A	

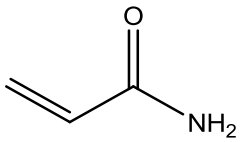
	Skin Irrit. 2	Skin irritation, category 2	
	Skin Sens. 1	Skin sensitisation, category 1	
Hazard statement	H350	May cause cancer	
	H340	May cause genetic defects	
	H361f	Suspected of damaging fertility	
	H301	Toxic if swallowed	
	H372	Causes damage to organs through prolonged or repeated exposure	
	H332	Harmful if inhaled	
	H312	Harmful in contact with skin	
	H319	Causes serious eye irritation	
	H315	Causes skin irritation	
	H317	May cause an allergic skin reaction	
Signal words	DANGER		

* Implemented in the EU on 20 January 2009

Reference

European Commission. Harmonised classification – Annexe VI to Regulation (EC) No. 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures. http://echa.europa.eu/information-on-chemicals/cl-inventory-database (accessed 07/2015).

Physicochemical Properties

CAS number	79-06-1
Molecular weight	71.1
Formula	C_3H_5NO / CH_2=CHCONH$_2$
Common synonyms	Acrylamide monomer, 2-propenamide, acrylic acid amide, vinyl amide, propanoic acid amide, etheylene carboxamide
State at room temperature	Colourless to white crystalline powder
Volatility	Vapour pressure = 0.007 mmHg at 25°C
Specific gravity **Vapour density**	1.05 at 25°C (water = 1) 2.45 (air = 1)
Flammability	Acrylamide is combustible in its solid form
Lower explosive limit	Not available
Upper explosive limit	Not available
Water solubility	Soluble in water
Reactivity	Polymerises violently due to heating above 85°C or under the influence of light and oxidants
Reaction or degradation products	Fumes and toxic oxides of nitrogen are released when acrylamide is heated to decomposition. Pure acrylamide can decompose at temperatures of 175–300°C and give off ammonia, hydrogen and carbon monoxide. Reacts spontaneously with compounds containing amino, hydroxyl, and sulph-hydryl groups and is incompatible with ammonia, isocyanates, mineral acids, strong acids, oleum and oxidisers
Odour	Odourless
Structure	

References

Acrylamide (HAZARDTEXT™ Hazard Management). In Klasco RK (Ed): TOMES® System. Truven Healthcare Analytics Inc, Greenwood Village CO, US. RightAnswer.com Inc, Midland MI, US. http://www.rightanswerknowledge.com (accessed 07/2015).

International Programme on Chemical Safety. International Chemical Safety Card entry for acrylamide. ICSC 0091, 2013. World Health Organization: Geneva.

Reported Effect Levels from Authoritative Sources

Exposure by ingestion

mg/kg	Signs and symptoms	Reference
400	Has resulted in death	a

These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values

Reference

a TOXBASE. Acrylamide, 2015. http://www.toxbase.org (accessed 07/2015).

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 hour 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 hour 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 hour without experiencing or developing life-threatening health effects

Acute exposure guideline levels (AEGLs)

	Concentration (ppm)				
	10 min	30 min	60 min	4 hours	8 hours
AEGL-1*	Data not available				
AEGL-2†					
AEGL-3‡					

* Level of the chemical in air at or above which the general population could experience notable discomfort

† 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

‡ 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

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m^3	ppm	mg/m^3
WEL	Not given	0.3	Not given	

WEL – workplace exposure limit, LTEL – long-term exposure limit, STEL – short-term exposure limit

Reference

HSE. EH40/2005 Workplace Exposure Limits, 2nd Edition, 2011.

Public health guidelines

Drinking water quality guideline	0.1 µg/L
Air quality guideline	No guideline value specified
Soil guideline values and health criteria values	No guideline value specified

Reference

The Water Supply (Water Quality) Regulations 2000 (England) and the Water Supply (Water Quality) Regulations 2001 (Wales)

Health Effects

Major route of exposure

- contact with the skin is the most common route of exposure, ingestion the least common

Immediate signs or symptoms of acute exposure

	Signs and symptoms
Acute exposure	Symptoms of acute exposure may be delayed for several hours, and include confusion, hallucinations, tremors, convulsions, tachycardia, cardiovascular collapse and respiratory depression. Encephalopathy may occur. Thrombocytopenia and ecchymosis have been reported. Metabolic acidosis may occur in severe cases. Peripheral neuropathy may occur several weeks after a significant exposure
Subacute exposure (days to weeks)	May cause drowsiness, ataxia, loss of concentration, anorexia, urinary retention, nystagmus and dysarthria; peripheral neuropathy may follow several weeks later
Inhalation	Can cause sore throat and cough
Ingestion	May cause burning and ulceration of the mouth and throat, vomiting and abdominal pain
Dermal	Can cause irritation, numbness, tingling, excessive sweating, erythematous rash and peeling of skin
Ocular	May cause irritation and visual disturbances

Reference

TOXBASE. Acrylamide, 06/2015. http://www.toxbase.org (accessed 11/2016).

Decontamination at the Scene

Summary

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 acrylamide **unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances.**

Emergency services and public health professionals can obtain further advice from Public Health England (Centre for Radiation, Chemical and Environmental Hazards) 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.

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 (eg 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 etc) 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/clothes
- 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

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

National Ambulance Resilience Unit. Joint Emergency Services Interoperability Programme (JESIP). Initial operational response to a CBRN incident. Version 1.0, September 2013.

NHS England. Emergency Preparedness, Resilience and Response (EPRR). Chemical incidents: planning for the management of self-presenting patients in healthcare settings. April 2015.

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 – www.toxbase.org.

Important notes

- if the patient has not been decontaminated following surface contamination, secondary carers must wear appropriate NHS PPE for chemical exposure to avoid contaminating themselves
- carry out decontamination after resuscitation; resuscitate the patient according to standard guidelines

Clinical decontamination following surface contamination

- remove all soiled clothing
- wash contaminated area thoroughly with soap and water

Dermal exposure

- decontaminate (as above) the patient following surface contamination
- for other measures see inhalation below

Ocular exposure

- if symptomatic, immediately irrigate the affected eye thoroughly
- for patients at home, use lukewarm tap water, trickled into the eye or in a small cup held over the eye socket; an eye dropper is an alternative
- if symptoms persist seek medical assistance
- in hospital immediately irrigate the affected eye thoroughly with 0.9% saline 1000 mL (for example via an infusion bag with a giving set). A Morgan Lens may be used if anaesthetic has been given. Irrigate for 10-15 minutes
- refer for ophthalmological assessment if there is doubt regarding the management of corneal damage
- other supportive measures as indicated by the patient's clinical condition

Inhalation

- give oxygen if required
- maintain a clear airway and adequate ventilation

- respiratory support may be required, invasive or non-invasive; monitor BP and pulse
- other supportive measures as indicated by the patient's clinical condition

Ingestion

- maintain a clear airway and adequate ventilation
- other supportive measures as indicated by the patient's clinical condition

Clinical decontamination and first aid references

TOXBASE http://www.toxbase.org (accessed 11/2016)

TOXBASE Acrylamide, 06/2015

TOXBASE Eye irritants, 01/ 2016

This document from the PHE Centre for Radiation, Chemical and Environmental Hazards reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

For queries relating to this document, please contact: generaltox@phe.gov.uk

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