




Acrylonitrile

Incident management

Physicochemical properties

CAS number	107-13-1
Molecular weight	53
Formula	C ₃ H ₃ N
Common synonyms	2-Propenenitrile; Cyanoethylene; Vinyl cyanide
State at room temperature	Liquid
Volatility	Vapour pressure: 109 mm Hg at 25°C
Specific gravity	0.8 (water = 1)
Vapour density	1.8 (air = 1)
Flammability	Flammable
Lower explosive limit	3.1%
Upper explosive limit	17.0%
Water solubility	Soluble in water
Reactivity	Polymerises when heated and under the influence of light and bases which generates a fire and explosion. Reacts violently with strong acids and strong oxidants. Attacks plastics and rubber
Reaction or degradation products	Releases toxic fumes including hydrogen cyanide and nitrogen oxides when heated to decomposition
Odour	Pungent/sweet odour
Structure	



References

International Programme on Chemical Safety. International Chemical Safety Card entry for Acrylonitrile. ICSC 0092, 2001. World Health Organization: Geneva.








National Center for Biotechnology Information. PubChem Database. Acrylonitrile, CID=7855, <https://pubchem.ncbi.nlm.nih.gov/compound/Acrylonitrile> (accessed on Mar. 2, 2020).


Hazard identification

Standard (UK) dangerous goods emergency action codes

UN	1093	Acrylonitrile, stabilised		
EAC	●3WE	Use alcohol resistant foam but, if not available, normal foam can be used. Wear chemical protective clothing with liquid-tight connections for whole body in combination with breathing apparatus*. Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and watercourses. There may be a public safety hazard outside the immediate area of the incident [†]		
APP	A(fl)	Gas-tight chemical protective suit with breathing apparatus [‡] . Fire kit intended to protect against flammable liquid		
Hazards	Class	3	Flammable liquid	
	Sub-risks	6.1	Toxic substance	
HIN	336	Highly flammable liquid, toxic		
<p>UN – United Nations number, EAC – emergency action code, APP – additional personal protection, HIN – hazard identification number</p> <p>*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</p> <p>[†] People should be warned to stay indoors with all windows and doors closed, preferably in room upstairs and facing away from the incident. Ignition sources should be eliminated, and ventilation stopped. Non-essential personnel should move at least 250 m away from the incident</p> <p>[‡] Normal fire kit in combination with gas-tight chemical protective clothing conforming to BS EN943 part 2</p> <p>Reference Dangerous Goods Emergency Action Code List, National Chemical Emergency Centre (NCEC) Part of Ricardo-AEA. The Stationery Office, 2019.</p>				

Classification, labelling and packaging (CLP)*

Hazard class and category	Flam. Liq. 2	Flammable liquid, category 2	
	Acute Tox. 3	Acute toxicity (oral, dermal, inhalation), category 3	
	Skin Irrit. 2	Skin irritation, category 2	
	Skin Sens. 1	Skin sensitizer, category 1	
	Eye Dam. 1	Serious eye damage/eye irritation	
	STOT SE 3	Specific target organ toxicity following single exposure, category 3	
	Carc. 1B	Carcinogenicity, category 1B	

	Aquatic Chronic 2	Chronic hazard to the aquatic environment, category 2	
Hazard statement	H225	Highly flammable liquid and vapour	
	H301	Toxic if swallowed	
	H311	Toxic in contact with skin	
	H315	Causes skin irritation	
	H317	May cause an allergic skin reaction	
	H318	Causes serious eye damage	
	H331	Toxic if inhaled	
	H335	May cause respiratory irritation	
	H350	May cause cancer	
	H411	Toxic to aquatic life with long lasting effects	
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 03/2020).			

Reported effect levels from authoritative sources

Exposure by ingestion

ppm	mg/m ³	Signs and symptoms	Reference
16-100	35-220	Headache, fullness in the chest and irritation of eyes, nose, throat and skin (20 – 45 minutes)	a
230-921	500-2,000	Presumed to be fatal (0.5 – 3-hour exposure)	a
<p>These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values</p> <p>Note: Simultaneous exposure to organic solvents may significantly enhance toxicity</p> <p>References</p> <p>a International Programme on Chemical Safety. Environmental Health Criteria 28: Acrylonitrile. WHO, Geneva, 1983.</p>			

Published emergency response guidelines

Acute exposure guideline levels (AEGLs)

	ppm				
	10 min	30 min	60 min	4 hours	8 hours
AEGL-1*	1.5	1.5	NR	NR	NR
AEGL-2†	8.6	3.2	1.7	0.48	0.26
AEGL-3‡	130	50	28	9.7	5.2

* Level of the chemical in air at or above which the general public 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 an impaired ability to escape

‡ Level of the chemical in air at or above which the general public could experience life-threatening health effects or death

NR Not recommended due to insufficient data

Reference

US Environmental Protection Agency. Acute Exposure Guideline Levels. <http://www.epa.gov/oppt/aegl/pubs/chemlist.htm> (accessed 03/2020).

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	2	4.4	-	-

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

Reference
Health and Safety Executive (HSE). EH40/2005 Workplace Exposure Limits, 4th Edition, 2020.

Public health guidelines

UK drinking water standard WHO guideline for drinking water quality	Values not given
WHO air quality guideline	1 µg/m ³ equates to an estimated lifetime cancer risk of 2×10^{-5}

Reference
Air Quality Guidelines for Europe. World Health Organization Regional Office for Europe, Copenhagen WHO Regional Publications, European Series, No. 91, Second Edition, 2000.

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.

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