



UK Health  
Security  
Agency

# Chromium and chromium (III) compounds

## Incident management

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## Main points

### General

Chromium and chromium (III) compounds are solids.

Chromium can react with some organic and inorganic compounds which can cause a fire and explosion hazard.

Chromium (III) compounds are generally not combustible but may enhance the combustion of other substances.

### Health

Chromium (III) salts are not very toxic because of low absorption.

Chromium metal is considered relatively non-toxic.

Symptoms are unlikely to occur from acute exposure other than irritant effects from particulate matter.

## Casualty decontamination at the scene

Following disrobe, improvised dry decontamination should be considered for an incident involving chromium metal or chromium (III) compounds. A number of chromium (VI) compounds are corrosive (see compendium incident management section for chromium (VI) compounds). Therefore, if casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances then, following disrobe, consider improvised wet decontamination.

### Environment

Hazardous to the environment; inform the [Environment Agency](#) where appropriate. Spillages and decontamination run-off should be prevented from entering watercourses.

## Hazard identification

**Table 1. Standard (UK) dangerous goods emergency action codes**

<b>UN</b>		2720	Chromium (III) Nitrate	
<b>EAC</b>		1Z	Use coarse water spray. Wear normal fire clothing in combination with breathing apparatus [note 1]. Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and watercourses.	
<b>APP</b>		–	–	
<b>Hazards</b>	<b>Class</b>	5.1	Oxidising substance	
	<b>Sub-risks</b>	–	–	
<b>HIN</b>		50	Oxidising (fire-intensifying) effect	

### Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

### Note to Table 1

[note 1] Chemical protective clothing with liquid-tight connections for whole body (type 3) conforming to 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)

### The GB classification, labelling and packaging (The GB CLP) regulation

It was not possible to identify any hazard classification.

## Physicochemical properties

**Table 2. Physicochemical properties of chromium**

<b>CAS number</b>	7440-47-3
<b>Molecular weight</b>	52
<b>Empirical formula</b>	Cr
<b>Common synonyms</b>	Chrome
<b>State at room temperature</b>	Grey metal
<b>Volatility</b>	-
<b>Density</b>	7.14 at 20°C
<b>Flammability</b>	Combustible under specific conditions
<b>Lower explosive limit</b>	-
<b>Upper explosive limit</b>	-
<b>Water solubility</b>	Insoluble in water
<b>Reactivity</b>	Dust explosion possible if in powder or granular form, mixed with air. Catalytic substance – may cause reaction on contact with many organic and inorganic substances causing fire and explosion hazard
<b>Reaction or degradation products</b>	-
<b>Odour</b>	None

### References

International Programme on Chemical Safety. '[International chemical safety card entry for chromium](#)'. ICSC 0029, 2004. World Health Organization (WHO) Geneva.

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information; 2004-. '[PubChem Compound Summary for CID 23976 Chromium](#)' (viewed February 2022).

Below are some examples of chromium (III) compounds.

**Table 3. Chromium (III) chloride**

<b>CAS number</b>	10025-73-7
<b>Molecular weight</b>	158
<b>Formula</b>	CrCl <sub>3</sub>
<b>Common synonyms</b>	Chromic chloride, chromium trichloride
<b>State at room temperature</b>	Purple crystals
<b>Volatility</b>	-
<b>Density</b>	2.87 at 2.5°C
<b>Flammability</b>	Not combustible
<b>Lower explosive limit</b>	-
<b>Upper explosive limit</b>	-
<b>Water solubility</b>	Insoluble in water
<b>Reactivity</b>	Incompatible with strong oxidising agents
<b>Reaction or degradation products</b>	Emits fumes of chlorine when heated to decomposition
<b>Odour</b>	None

## References

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information; 2004 – '[PubChem Compound Summary for CID 24808 Trichlorochromium](#)' (viewed February 2022).

International Programme on Chemical Safety: '[International Chemical Safety Card entry for Chromium \(III\) chloride](#)'. ICSC 1316, 2004. WHO Geneva.

**Table 4. Chromium (III) nitrate**

<b>CAS number</b>	7789-02-8
<b>Molecular weight</b>	400
<b>Formula</b>	Cr(NO <sub>3</sub> ) <sub>3</sub>
<b>Common synonyms</b>	Chromic nitrate, chromium trinitrate
<b>State at room temperature</b>	Deep violet crystals
<b>Volatility</b>	-
<b>Density</b>	1.8
<b>Flammability</b>	Not combustible but enhances combustion of other substances
<b>Lower explosive limit</b>	-
<b>Upper explosive limit</b>	-
<b>Water solubility</b>	Very soluble in water
<b>Reactivity</b>	Strong oxidant – reacts with combustible and reducing materials
<b>Reaction or degradation products</b>	-
<b>Odour</b>	-

#### Reference

International Programme on Chemical Safety. '[International Chemical Safety Card entry for Chromium \(III\) nitrate](#)'. ICSC 1530, 2004. WHO Geneva.

**Table 5. Chromium (III) oxide**

<b>CAS number</b>	1308-38-9
<b>Molecular weight</b>	152
<b>Formula</b>	Cr <sub>2</sub> O <sub>3</sub>
<b>Common synonyms</b>	Chromic oxide, dichromium trioxide
<b>State at room temperature</b>	Light to dark green powder
<b>Volatility</b>	-
<b>Density</b>	5.22 at 25°C
<b>Flammability</b>	Not combustible
<b>Lower explosive limit</b>	-
<b>Upper explosive limit</b>	-
<b>Water solubility</b>	Practically insoluble in water
<b>Reactivity</b>	-
<b>Reaction or degradation products</b>	-
<b>Odour</b>	-

## References

International Programme on Chemical Safety: '[International Chemical Safety Card entry for Chromium \(III\) chloride](#)'. ICSC 1531, 2004. WHO Geneva.

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information; 2004. [PubChem Compound Summary for CID 517277 Chromium \(III\) oxide](#) (viewed February 2022).

## Reported effect levels from authoritative sources

No data available.

## Published emergency response guidelines

**Table 6. Acute exposure guideline levels (AEGLs) (interim)**

	ppm				
	10 min	30 min	60 min	4 hours	8 hours
<b>AEGL-1 [note 1]</b>	Not available				
<b>AEGL-2 [note 2]</b>					
<b>AEGL-3 [note 3]</b>					

### Notes to Table 6

[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

## Occupational standards

**Table 7. Chromium and chromium (III) compounds (as Cr)**

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>
<b>WEL</b>	-	0.5	-	-

### 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 8. Public health guidelines**

<b>UK drinking water standard</b>	50 µg/L (chromium)
<b>WHO provisional drinking water quality guideline value</b>	50 µg/L (total chromium)

### References

[The Water Supply \(Water Quality\) Regulations 2018](#).

[The Private Water Supplies \(England\) \(Amendment\) Regulations 2018](#) and [The Private Water Supplies \(Wales\) Regulations 2017](#).

[‘WHO Guidelines for drinking water quality’](#). Fourth Edition, incorporating the 1st Addendum. WHO Geneva (2017).

## Health effects

Immediate signs or symptoms of acute exposure.

Chromium (III) salts are not very toxic because of low absorption.

Chromium metal is considered relatively non-toxic.

Symptoms are unlikely to occur from acute exposure other than irritant effects from particulate matter.

### Reference

[TOXBASE](#). 'Chromium metal and chromium salts'. February 2019 (viewed October 2018)

## 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 chromium metal or chromium (III) compounds. A number of chromium (VI) compounds are corrosive (see [Compendium incident management section for chromium \(VI\) compounds](#)). Therefore, if casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances then, following disrobe, consider improvised wet decontamination.

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 UK Health Security Agency (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.

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

Disrobing at the scene should be, where possible, 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.

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

## 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.

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

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

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, or until the pH of the skin is normal (pH of the skin is 4.5 to 6, although it may be closer to 7 in children, or after irrigation). The earlier irrigation begins, the greater the benefit.

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

## Dermal exposure

Decontaminate (as above) the patient following surface contamination.

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

## 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.

In hospital, using 1,000 mL 0.9% saline at room temperature by an infusion bag with a giving set is appropriate, irrigate for 10 to 15 minutes. Amphoteric solutions are available and may be used. A Morgan Lens may be used if anaesthetic has been given.

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 or ingestion

Supportive measures as indicated by the patient's clinical condition.

## Clinical decontamination and first aid references

[TOXBASE](#) (viewed February 2022):

- chromium metal and chromium salts (2019)
- chromium: features and management (February 2019)
- eye irritants (January 2016)
- skin decontamination: irritants (May 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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