

Vinyl Chloride

General information

Key Points

Fire

- Flammable
- Reactive under light, contact with air, oxidising agents or metals
- Emits toxic vapours of hydrogen chloride and phosgene when heated to decomposition
- In the event of a fire involving vinyl chloride, use fine water spray and normal fire kit with breathing apparatus

Health

- Toxic by all routes of exposure – inhalation, ingestion, skin contact
- Carcinogenic in humans
- Inhalation of vinyl chloride causes coughing, wheezing and breathlessness, headache, ataxia, drowsiness and coma
- Ingestion of vinyl chloride causes nausea, vomiting, diarrhoea, abdominal pain, and haematemesis may occur.
- Skin contact causes irritation, pain, burns and contact dermatitis. Rapid evaporation of compressed gas may produce local frostbite.
- Ocular exposure to the gas causes moderate irritation and pain. Exposure to liquid may possibly cause frostbite and corneal injury.

Environment

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

Background

Vinyl chloride is a colourless, flammable gas, which has a slightly sweet odour. It is not known to occur naturally, but has been found at very low levels in landfill gas due to it being the breakdown product of various chlorinated hydrocarbons and in ground water. Vinyl chloride is also present in cigarette smoke.

The International Agency for Research on Cancer (IARC) has classified vinyl chloride as carcinogenic to humans.

The majority of the world production of vinyl chloride is used for the production of polyvinyl chloride (PVC). It is also used in the production of chlorinated solvents, primarily 1,1,1-trichloroethane. Vinyl chloride was previously used as a refrigerant and as a propellant in aerosol sprays for a variety of products, such as pesticides, drugs and cosmetics. These uses have been banned in many countries.

Vinyl chloride is only used as a chemical intermediate and exposure of the general public is unlikely. In the past there was significant occupational exposure but now it is only used in closed systems with minimal exposure of the workers.

Vinyl chloride is toxic to humans who are exposed to it either by inhalation, ingestion or skin contact. Exposure to vapours can cause coughing, wheezing and breathlessness, headache and drowsiness. Ingestion of vinyl chloride may cause sickness, diarrhoea and stomach pain. Contact of the skin or eyes with vinyl chloride liquid or vapour could cause irritation and dermatitis. Exposure to escaping gas from compressed (liquid) vinyl chloride may cause frostbite.

Repeated exposure to vinyl chloride may cause liver damage.

Children exposed to vinyl chloride are expected to show similar adverse health effects to those seen in exposed adults; such exposures are unlikely because it is not used in consumer products. There is no evidence to suggest that exposure to vinyl chloride during pregnancy may cause adverse effects to the unborn child.

Production and Uses

Key Points

- Vinyl chloride does not occur naturally in the environment
- It is a synthetic chemical obtained either by hydrochlorination of acetylene or by halogenation of ethylene
- Vinyl chloride undergoes exothermic polymerization in the presence of light, or air and heat, or a catalyst
- Approximately 95% of the world's vinyl chloride production is used for the production of PVC

Vinyl chloride does not occur naturally in the environment. It is produced for use as a chemical intermediate in the manufacture of other compounds, particularly PVC. Trace amounts of vinyl chloride may be formed unintentionally, for instance in land fills, as degradation products of chlorinated hydrocarbon solvents. The subsequent presence of vinyl chloride in emitted gas may give rise to traces levels also in ground water.

Approximately 95% of the world production of vinyl chloride is used for the production of PVC. The remainder is used for the production of chlorinated solvents, primarily 1,1,1-trichloroethane, via the more toxic 1,1,2-trichloroethane and 1,1,2-trichlorethane and 1,1-dichloroethane.

Vinyl chloride was previously used as a refrigerant and as a propellant in aerosols sprays for a variety of products, such as pesticides, drugs and cosmetics. These uses have been banned since 1974.

Frequently Asked Questions

What is Vinyl chloride?

Vinyl chloride is a colourless, flammable gas which is not stable at high temperatures. It has a mild, sweet odour. It does not occur naturally but is manufactured and used to make PVC, which is used in a variety of plastic products, including pipes, wire and cable coatings, and packaging materials. Very small amounts can be formed when other substances such as trichloroethane, trichloroethylene and tetrachlorethylene are broken down.

How does vinyl chloride get into the environment?

Vinyl chloride does not occur naturally in the environment. It is only used as an industrial intermediate under strictly controlled conditions, with minimal exposure of workers or to the environment. Trace amounts may be formed as degradation products of chlorinated solvents in landfills or hazardous waste sites but any exposure is likely to be minimal.

Liquid vinyl chloride evaporates easily in air, and in water and soil evaporates rapidly if it is near the surface. In the air it breaks down in a few days to other substances, which may be harmful. Small amounts of vinyl chloride can dissolve in water.

How could I be exposed to vinyl chloride?

As vinyl chloride is only used in the workplace under strictly controlled conditions, it is unlikely that you will be exposed to significant amounts unless you work with it.

Tobacco smoke however contains low levels of vinyl chloride.

If there is vinyl chloride in the environment will I have any adverse health effects?

The presence of vinyl chloride in the environment does not always lead to exposure. Clearly, in order for it to cause any adverse health effects you must come into contact with it. You may be exposed by breathing, eating, or drinking the substance or by skin contact. Following exposure to any chemical, the adverse health effects you may encounter depend on several factors, including the amount to which you are exposed (dose), the way you are exposed, the duration of exposure, the form of the chemical and if you were exposed to any other chemicals.

Short-term exposure to vinyl chloride vapours can cause coughing, wheezing and breathlessness, headache and drowsiness. Ingestion of vinyl chloride may cause sickness, diarrhoea and stomach pain. Contact of the skin or eyes with vinyl chloride liquid or vapour could cause irritation and dermatitis. Exposure to escaping gas from compressed (liquid) vinyl chloride may cause frostbite. Repeated exposure to vinyl chloride may cause liver damage.

Can vinyl chloride cause cancer?

The International Agency for Research on Cancer (IARC) has classified vinyl chloride as being carcinogenic to humans.

Does vinyl chloride affect children or damage the unborn child?

Children exposed to vinyl chloride are expected to show similar adverse health effects to those seen in exposed adults. Experimental data indicates that no effect would be expected at exposure levels that are not markedly toxic to the mother.

What should I do if I am exposed to vinyl chloride?

It is very unlikely that the general population will be exposed to a level of vinyl chloride high enough to cause adverse health effects.

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