

Nitrobenzene

General information

Key Points

Fire

- Flammable
- Violently reacts with strong oxidants, acids and nitrogen oxides
- Emits toxic fumes of nitrogen oxides when heated to decomposition
- In the event of a fire involving nitrobenzene, use fine water and liquid tight chemical protective clothing with breathing apparatus

Health

- Toxic by inhalation, ingestion and skin absorption
- Possibly carcinogenic in humans
- May cause reproductive toxicity
- The onset of symptoms may be delayed 1-4 hours after exposure to nitrobenzene
- Inhalation can cause irritation of the respiratory tract, nausea, headache, dizziness, shortness of breath and in extreme cases could lead to coma and death
- Ingestion of nitrobenzene may cause gastrointestinal irritation with nausea, vomiting and diarrhoea, as well as symptoms similar to those for inhalation
- Inhalation and ingestion may also cause vertigo and bluish colouration of the skin due to a condition called methaemoglobinaemia, with drowsiness, high blood pressure, convulsions, anaemia, jaundice and kidney failure
- Skin contact with nitrobenzene may result in mild skin irritation and eye contact may lead to mild eye irritation

Environment

- Dangerous for the environment
- Inform Environment Agency of substantial incidents

Background

Nitrobenzene is a colourless or yellow oily liquid, with an odour of bitter almonds and is flammable following moderate heating.

Nitrobenzene does not occur naturally and is therefore only produced synthetically for industrial applications. One of the major uses for nitrobenzene is for the production of aniline, which is a chemical intermediate used during the manufacture of polyurethane. Nitrobenzene is also used industrially in the manufacture of some pharmaceuticals, dyes and rubbers, as a constituent in some polishes and paint solvents and as a solvent in the refining of petroleum.



Exposure of the general public to nitrobenzene is extremely unlikely as it is not commonly used in the home in substantial quantities. The most common source of exposure to considerable amounts of nitrobenzene is in the workplace, either where it is produced, or during the production of other materials.

Nitrobenzene is very toxic and irritant to humans who are exposed to it either by inhalation, ingestion or skin contact.

Exposure to vapours or splashes of nitrobenzene will cause irritation of the skin, eyes and respiratory tract. The main effect of inhaling or ingesting nitrobenzene is a condition called methaemoglobinaemia, which affects the ability of the blood to carry oxygen. The effect of this includes headache, nausea, vomiting, weakness, dizziness, vertigo, bluish discolouration of the skin, rapid heart rate and breathlessness. These symptoms may be delayed for up to 1 to 4 hours following exposure. In some cases,

nitrobenzene may cause jaundice (yellow discolouration of the skin), failure of the kidneys, coma and even death.



Contact of the skin or eyes with vapours or liquid nitrobenzene can cause irritation at the site of contact. Nitrobenzene can also be absorbed through the skin and contact with large quantities could result in adverse effects similar to those seen following inhalation or ingestion.

Repeated exposure to nitrobenzene by any route may cause damage to the liver in addition to the effects resulting from a single exposure.



Children exposed to nitrobenzene are expected to show similar adverse health effects to those seen in exposed adults, although the effects are expected to be more severe, as children are particularly susceptible to the adverse effects of exposure to nitrobenzene. There is evidence to suggest that exposure to nitrobenzene during pregnancy, at concentrations that may harm the mother, may possibly cause adverse effects to the unborn child.

Nitrobenzene has been classified as possibly having the ability to cause cancer in humans, by the International Agency for Research on Cancer.

Production and Uses

Key Points

- Nitrobenzene does not occur naturally in the environment
- It is produced industrially by reacting benzene with sulphuric acid, nitric acid and water
- Nitrobenzene is used in the production of aniline, a chemical used to manufacture polyurethane foams
- Nitrobenzene is also used to manufacture pharmaceuticals, rubbers, dyes, polishes and paint solvents

Nitrobenzene does not occur naturally in the environment. It is produced industrially by reacting benzene with sulphuric acid, nitric acid and water.

One of the major uses for nitrobenzene is for the production of aniline, which is a chemical intermediate used during the manufacture of polyurethane foams. Nitrobenzene is also used industrially in the manufacture of some dyes, rubbers and pharmaceuticals (it is an important component in the production of paracetamol). Nitrobenzene is also used as a constituent in some polishes and paint solvents and as a solvent in the refining of petroleum.

Historically nitrobenzene was used in perfumes and as a flavouring known as 'artificial oil of bitter almonds' due to its strong odour. This use of nitrobenzene has long been discontinued due to its toxicity.

Frequently Asked Questions

What is nitrobenzene?

Nitrobenzene is a colourless or yellow oily liquid, with an odour of bitter almonds and is flammable following moderate heating. The main use of nitrobenzene is in the chemical synthesis of aniline, which is a chemical used in the manufacture of polyurethane foams.

How does nitrobenzene get into the environment?

Nitrobenzene does not occur naturally in the environment and as such is most likely to enter the environment from workplaces where it is manufactured or used.

How will I be exposed to nitrobenzene?

As nitrobenzene is only used industrially, it is unlikely that you will be exposed to significant amounts unless you work with it. Nitrobenzene will form a vapour at room temperature, and therefore anyone working with it is at risk of inhaling the vapours if adequate protective equipment is not used. People working with nitrobenzene are also at risk of getting splashes of it on their skin if they are not adequately protected.

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

The presence of nitrobenzene 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.

Nitrobenzene is an irritant and exposure to vapours or splashes will cause irritation of the skin, eyes and respiratory tract. Nitrobenzene is toxic by inhalation, ingestion and skin contact. The main symptom of exposure to nitrobenzene is a condition called methaemoglobinaemia, which affects the ability of the blood to carry oxygen. This condition is associated with headache, nausea, vomiting, weakness, dizziness, vertigo, bluish discolouration of the skin, rapid heart rate and breathlessness. The symptoms may be delayed for up 1 to 4 hours following exposure. In some cases, nitrobenzene may cause jaundice (yellow discolouration of the skin), failure of the kidneys, coma and even death.

Can nitrobenzene cause cancer?

Nitrobenzene has been classified by the International Agency for Research on Cancer as possibly causing cancer in humans.

Does nitrobenzene affect children or damage the unborn child?

Children exposed to nitrobenzene are expected to show similar adverse health effects to those seen in exposed adults, although the effects are expected to be more severe, as children are particularly susceptible to the adverse effects of exposure to nitrobenzene.

There is evidence to suggest that exposure to nitrobenzene during pregnancy, at concentrations that may harm the mother, may possibly cause adverse effects to the unborn child.

What should I do if I am exposed to nitrobenzene?

It is very unlikely that the general population will be exposed to a level of nitrobenzene 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.