Chemical Profiles

Benzene

On this page

What are other names or identifying information for benzene?

CAS Registry No.: 71-43-2
Other Names: Benzol, Phenyl hydride
Main Uses: Manufacture of other chemicals, laboratory solvent.
Appearance: Clear colourless to light yellow liquid.
Odour: Aromatic

Canadian TDG: UN1114

What is the WHMIS classification?

According to the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST), benzene can be classified as:

Flammable liquids - Category 2

Acute toxicity - oral - Category 4

Skin corrosion/irritation - Category 2

Serious eye damage/eye irritation - Category 2

Germ cell mutagenicity - Category 1B

Carcinogenicity - Category 1A

Specific target organ toxicity - single exposure (narcotic effects) - Category 3 - Narcotic effect

Specific target organ toxicity - repeated exposure - Category 1

Aspiration hazard - Category 1

The signal word is danger.

The hazard statements include:

- Highly flammable liquid and vapour
- Harmful if swallowed
- Causes skin irritation
- Causes serious eye irritation
- May cause genetic defects
- May cause cancer
- May cause drowsiness or dizziness

- Causes damage to organs through prolonged or repeated exposure
- May be fatal if swallowed and enters airways

Please note that this classification was retrieved from the CNESST site on August 13, 2024 and was established by CNESST personnel to the best of their knowledge based on data obtained from scientific literature and it incorporates the criteria contained in the *Hazardous Products Regulations* (SOR/2015-17). It does not replace the supplier's classification which can be found on its Safety Data Sheet.

What are the most important things to know about benzene in an emergency?

Emergency Overview: Clear colourless or light yellow liquid. Aromatic odour. HIGHLY FLAMMABLE LIQUID AND VAPOUR. Distant ignition and flashback are possible. Can accumulate static charge. Can float on water and spread fire. IRRITANT. Causes moderate or severe eye and skin irritation. ASPIRATION hazard. May be fatal if swallowed and enters the airways. VERY TOXIC. Prolonged or repeated exposure causes damage to blood and the immune system. CANCER HAZARD. May cause cancer. MUTAGEN. May cause genetic defects.

What are the potential health effects of benzene?

Main Routes of Exposure: Inhalation. Skin contact. Eye contact.

- **Inhalation:** Can irritate the nose and throat. Can harm the nervous system. Symptoms may include headache, nausea, dizziness, drowsiness and confusion. A severe exposure can cause unconsciousness.
- **Skin Contact:** SKIN IRRITANT. Causes moderate to severe irritation. Symptoms include pain, redness, and swelling. Can be absorbed through the skin, but harmful effects are not expected. Any skin contact will also involve significant inhalation exposure.
- **Eye Contact:** EYE IRRITANT. Causes moderate to severe irritation. Symptoms include sore, red eyes, and tearing. The vapour also irritates the eyes.
- **Ingestion:** Harmful. Can cause effects as described for inhalation. Aspiration hazard. May be drawn into the lungs if swallowed or vomited, causing severe lung damage. Death can result.
- **Effects of Long-Term (Chronic) Exposure:** Can cause dry, red, cracked skin (dermatitis) following skin contact.

> VERY TOXIC. Can harm the blood. Can cause a decrease in the number or size of red blood cells (anemia). Can cause a decrease in white blood cells and platelets, and harm the immune system. Blood tests may show abnormal results.
>
> May harm the nervous system. Conclusions cannot be drawn from the limited studies available.

- **Carcinogenicity:** CARCINOGEN. Known to cause: cancer of the blood or blood system. Has been associated with: other types of cancer.
  - International Agency for Research on Cancer (IARC): Group 1 - Carcinogenic to humans.
  - American Conference for Governmental Industrial Hygienists (ACGIH): A1 - Confirmed human carcinogen.
- **Teratogenicity / Embryotoxicity:** Not known to harm the unborn child.
- **Reproductive Toxicity:** Not known to be a reproductive hazard.
- **Mutagenicity:** MUTAGEN. May cause genetic damage. Exposure of the parent may cause effects in children.

What are first aid measures for benzene?

Inhalation: Take precautions to prevent a fire (e.g., remove sources of ignition). Take precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment). Move the person to fresh air. Get medical attention as soon as possible.

Skin Contact: Avoid direct contact. Wear chemical protective clothing as necessary. Quickly take off contaminated clothing, shoes, and leather goods (e.g., watchbands, belts). Immediately flush with gently flowing water for 15-20 minutes. Wash with soap and water. If irritation or pain persists, get medical attention immediately. Double bag, seal, label and leave contaminated clothing, shoes, and leather goods at the scene for safe disposal.

Eye Contact: Avoid direct contact. Wear chemical protective gloves as necessary. Immediately flush the contaminated eye(s) with gently flowing water for 15-20 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay flushing or attempt to remove the lens. Take care not to rinse contaminated water into the unaffected eye or onto the face. Get medical attention immediately.

Ingestion: If vomiting occurs naturally, have the person lean forward to reduce the risk of aspiration. Get medical attention immediately.

First Aid Comments: If exposed or concerned, see a doctor for medical advice. All first aid procedures should be periodically reviewed by a doctor familiar with the chemical and its conditions of use in the workplace.

Note to Physicians: Some jurisdictions specifically regulate benzene and require a complete medical surveillance program. Specific information should be sought from the appropriate government agency in your jurisdiction.

What are fire hazards and extinguishing media for benzene?

Flammable Properties: FLAMMABLE LIQUID. Can ignite at room temperature. Releases vapour that can form an explosive mixture with air. Can be ignited by static discharge.

Suitable Extinguishing Media: Carbon dioxide, dry chemical powder, appropriate foam, water spray or fog. Foam manufacturers should be consulted for recommendations regarding types of foams and application rates.

Specific Hazards Arising from the Chemical: Liquid can float on water and may travel to distant locations and/or spread fire. Liquid can accumulate static charge by flow, splashing or agitation. Vapour may travel a considerable distance to a source of ignition and flash back to a leak or open container. Vapour may accumulate in hazardous amounts in low-lying areas especially inside confined spaces, resulting in a toxicity hazard. Closed containers may rupture violently when heated, releasing contents. In a fire, the following hazardous materials may be generated: very toxic carbon monoxide, carbon dioxide; toxic, flammable aldehydes; and other chemicals.

What are the stability and reactivity hazards of benzene?

- **Chemical Stability:** Normally stable.
- **Conditions to Avoid:** Open flames, sparks, static discharge, heat and other ignition sources.
- **Incompatible Materials:** Reacts explosively with: halogens (e.g. chlorine). Increased risk of fire and explosion on contact with: nitric acid, oxidizing agents (e.g. peroxides). Not corrosive to: carbon steel, aluminum alloys.
- **Hazardous Decomposition Products:** None known.
- **Possibility of Hazardous Reactions:** None known.

What are unintentional release measures for benzene?

Personal Precautions: Evacuate the area immediately. Keep unnecessary and unprotected personnel out of the spill area.

Methods for Containment and Clean-up: Stop or reduce leak if safe to do so. Small spills or leaks: contain and soak up spill with absorbent that does not react with spilled product. Place used absorbent into suitable, covered, labelled containers for disposal. Flush spill area. Large spills or leaks: contact emergency services and manufacturer/supplier for advice.

Other Information: Report spills to local health, safety and environmental authorities, as required.

What handling and storage practices should be used when working with benzene?

Handling: In event of a spill or leak, immediately put on escape-type respirator and exit the area. Eliminate heat and ignition sources such as sparks, open flames, hot surfaces and static discharge. Post "No Smoking" signs. Prevent unintentional contact with incompatible chemicals. Avoid generating vapours or mists. Keep containers tightly closed when not in use or empty.

Storage: Store in an area that is: cool, well-ventilated, out of direct sunlight and away from heat and ignition sources, separate from incompatible materials, an approved, fire-resistant area, clear of combustible and flammable materials (e.g., old rags, cardboard). Electrically bond and ground containers. Ground clips must contact bare metal. Avoid bulk storage indoors.

What is the American Conference of Governmental Industrial Hygienists (ACGIH®) recommended exposure limit for benzene?

ACGIH® TLV® - TWA: 0.02 ppm Skin A1 BEI®

Exposure Guideline Comments: TLV® = Threshold Limit Value. TWA = Time-Weighted Average. A1 = Confirmed human carcinogen. BEI® = Biological Exposure Index.

Adapted from: 2024 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH)

NOTE: In many (but not all) Canadian jurisdictions, the exposure limits are similar to the ACGIH® TLVs®. Since legislation varies by jurisdiction, contact your local jurisdiction for exact details. A list is available in the OSH Answers on Canadian Governmental Occupational Health & Safety Departments.

A list of which acts and regulations that cover exposure limits to chemical and biological agents is available on our website. Please note that while you can see the list of legislation for free, you will need a subscription to view the actual documentation.

What are the engineering controls for benzene?

Engineering Controls: Use stringent control measures such as process enclosure to prevent product release into the workplace. Use backup controls (e.g., double mechanical pump seals) to prevent the release of this material due to equipment failure. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored.

What Personal Protective Equipment (PPE) is needed when working with benzene?

Eye/Face Protection: Wear chemical safety goggles and face shield when contact is possible.

Skin Protection: Wear chemical protective clothing e.g., gloves, aprons, boots. Suitable materials include (8 hours): Viton®, AlphaTec® (02-100, 4000, EVO, VPS), Silver Shield® - PE/EVAL/PE, ChemMAX® (3, 4 Plus), Frontline® 500, Tychem®(5000, 6000, 6000 FR, 9000, Responder® CSM, 10000, 10000 FR), Zytron® (300, 500)

Respiratory Protection:

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode; or Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

The NIOSH Recommended Exposure Limit (REL) is 0.1 ppm (8-hour time-weighted average concentration) and 1 ppm (15-minute time-weighted average).

APF = Assigned Protection Factor; REL = Recommended Exposure Limit

Recommendations apply only to National Institute for Occupational Safety and Health (NIOSH) approved respirators. Refer to the NIOSH Pocket Guide to Chemical Hazards for more information.

NOTE: NIOSH has classified this substance as a potential occupational carcinogen, according to specific NIOSH criteria. See Appendix E of the NIOSH Pocket Guide to Chemical Hazards for more information. This classification is reflected in these recommendations for respiratory protection, which specify that only the most reliable and protective respirators be worn at any detectable concentration. The requirements in Canadian jurisdictions may vary.

Fact sheet last revised: 2024-08-14

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