

BENZENE Product Stewardship Summary

CAS number

71-43-2

Chemical formula

C₆H₆

What is benzene?

Benzene is a cyclical, six carbon, six hydrogen molecule. It is a clear, colourless, volatile liquid with a characteristic 'aromatic' smell. Benzene is extracted from two primary sources: from pyrolysis gasoline (pygas) which is a co-product of ethylene manufacture, or from reformat, a stream resulting from the catalytic reforming process used to produce high octane gasoline. Benzene can also be derived from toluene via two on-purpose routes: hydrodealkylation and disproportionation.

How is benzene used?

Benzene is an important basic chemical, produced in large quantities and traded internationally. It is widely used in the industrial sector, where it is combined and processed with other basic chemicals (such as ethylene or propylene) to produce countless consumer goods.

The largest derivative outlet for benzene is ethylbenzene, an intermediate used in the production of styrene, which is further converted into materials such as polystyrene. It is also widely used to produce cumene, which in turn leads to phenol, a component in phenolic resins and adhesives; cyclohexane, a precursor of caprolactam and adipic acid, both used in nylon; and aniline, a material needed to produce methylene diphenyl diisocyanate (MDI) which is used in urethanes and other speciality applications.

The end result is a variety of products that we all use everyday: clothing, packaging, paints, adhesives, unbreakable windows, plywood, computer casings, compact discs, dyes, agrochemicals, pharmaceuticals and many more.

Health, Safety and Environmental considerations

In liquid form, benzene is irritating to the skin and eyes. If vapours are inhaled, irritation to the respiratory tract may be experienced. Single exposure to very high concentrations can cause disorientation, euphoria and unconsciousness. Prolonged moderate exposure can cause toxic effects on the blood and blood-forming organs.

Benzene is listed as a human carcinogen by the International Agency for Research on Cancer (IARC). Exposure is associated with the potential to develop acute myelogenous leukaemia. This results automatically in its inclusion in the EC “Marketing and Use” Directive (Council Directive of 27 July 1976 on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations 76/769/EEC), which prohibits its supply to the general public.

Benzene is extremely flammable and there is a risk of vapour ignition at normal handling temperatures. The vapour is heavier than air and will spread along the ground if released, so care needs to be taken to ensure that the vapour is not ignited by a distant source. It will float on water and can be ignited on surface water. Electrostatic charges may be generated during handling.

In the work environment, the occupational exposure limit for benzene globally ranges from 0.5 – 10 ppm, with 1 ppm being used across most of the world.

If spilled in water, benzene is toxic to fish, but it is very volatile and evaporates rapidly. It is not soluble in water and rapidly biodegrades.

Storing and transporting benzene

Benzene should be stored in mild steel or stainless steel.

Benzene is transported mainly by sea or inland waterway and is subject to a number of international guidelines for safe handling of cargoes. These include the International Maritime Dangerous Goods (IMDG) from the International Maritime Organisation (IMO), the International Safety Guidelines for Oil Tankers and Terminals (ISGOTT) and the ADNR (Accord europeen relatif au transport international des marchandises Dangereuses par voie de Navigation interieure au Rhine) regulations. In the US, marine transport must be in compliance with the US Coast Guard Benzene Standard. Precautionary measures must be taken to prevent static discharges during loading and unloading and all operators must wear personal protective equipment.

Risk Characterization Summary

Risks associated with exposure to this product have been evaluated for the following “chain-of-commerce” activities: manufacture, storage, product transfer, transportation, and customers/markets. Due to health, safety and environmental considerations, it is only manufactured, stored and transported to customers in closed systems. Likewise, customers are limited to those who only use the product in closed systems as an intermediate for the manufacture of other chemicals. Control measures including equipment design and

handling procedures have been established to minimize the exposure potential to workers, community and the environment. As such, the risks associated with the product are judged to be low.

This product stewardship summary is intended to give general information about the chemical or categories of chemicals addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the chemical's applicable Material Safety Data Sheet, which should be consulted before use of the chemical. This product stewardship summary does not supplant or replace required regulatory and/or legal communication documents.