

POLLUTION CONTROL AND SAFETY

ENVIRONMENTAL PROTECTION:

The U.S. EPA considered imposing a national emission standard for benzene emissions from ethylbenzene-styrene plants, but concluded that the health risks were too small to warrant federal regulatory action under Clean Air Act provisions [8]. Nevertheless, producers of ethylbenzene have taken steps to reduce benzene emissions, mainly by incinerating vent streams and installing improved pump seals. The health hazards of benzene are discussed elsewhere (→Benzene, A3, pp.501-503).

Alkylation plants that use aluminum chloride alkylation technology produce an aqueous waste stream from the reactor effluent wash section. In the mid 1970s, plants produced a wet aluminum hydroxide sludge, which was deposited in a landfill (Class 1). More modern plants recover a concentrated aluminum chloride solution that has found use in municipal water treatment or industrial floc applications. However, where demand from such applications does not exist, disposal can present a problem.

Studies have shown ethylbenzene to be toxic to aquatic life in relatively low concentration (10-100 mg/kg). Therefore, runoff from spills, fire control, etc. should be liked to prevent it from entering streams or water supplies.

HANDLING, STORAGE, AND TRANSPORTATION

Ethylbenzene is a flammable liquid. It is stored and transported in steel containers and is subject to the control of the appropriate regulatory agencies. The U.S. DOT identification number is UN1175, and the reportable quantity is 454 kg. Details on regulations concerning the transport of ethylbenzene can be found in the CFR or from DOT's Material Transportation Bureau. Other countries have regulations and safety practices similar to those of the United States.

Foam, carbon dioxide, dry chemical, halon, and water (fog pattern) extinguishing media are used in fighting ethylbenzene fires.

Adequate ventilation is necessary in handling and storage areas. The use of NIOSH approved respirators is recommended at high concentration. Skin contact should be avoided. Chemical gloves and safety glasses should be worn if contact is possible.

Exposure of ethylbenzene to heat, ignition sources, and strong oxidizing agents should be avoided.

TOXICOLOGY AND OCCUPATIONAL HEALTH

Ethylbenzene is a moderately toxic compound that is also an irritant to the skin, eyes, and upper respiratory tract. Systemic absorption can cause depression of the central nervous system, with narcosis at very high concentrations.

Current knowledge of the toxic effects puts this compound in a category quite separate from related compounds, such as benzene, and therefore, processing requirements are not nearly as stringent. However, it is sufficiently hazardous to warrant extreme vigilance in its handling and proper medical treatment in the event of exposure.

Direct contact with liquid ethylbenzene causes irritation to the skin and mucous membranes. This may be followed by erythema and inflammation of the skin unless treated immediately. Skin rash may develop after prolonged or repeated exposure.

Acute exposure to vapor concentrations of up to 0.1% in air causes noticeable irritation to the eyes: increasing the concentration to 0.2% produces extreme irritation and lachrymation of the eyes, in addition to irritation of the nose and throat followed by dizziness and constriction of the chest. Exposures of up to 1% are sufficient to cause death (through respiratory failure) in guinea pigs [12].

Although many of the effects of acute exposure are documented, no specific data on the symptoms of chronic exposure are available.

Chronic poisoning can result through inhalation, ingestion, and by rapid absorption through the skin. The LD₅₀ is sufficiently high (3.5 g/kg) for ingestion to be of no practical concern [12], but TLV-TWAs of 100 ppm, 435 mg/m³, determined by the

ACIGH, dictate strict monitoring of vapor emissions [13]. The short – term exposure limits (TWA-STEL) for vapors, specified by the ACIGH are only slightly higher at 125 ppm, 1100 mg/m³. The MAK values for ethylbenzene quoted by the DFG are 100 mL/m³, 440 mg/m³ [14].

Ethylbenzene absorbed in the blood, either by inhalation or absorption through the skin, is readily metabolized. It is excreted mainly as mandelic acid and phenylglyoxylic acid in the urine [15].

There are no reports of ethylbenzene being carcinogenic; both the ACGIH and the DFG exclude it from their list of identified carcinogens. Similarly, no specific kidney, liver, respiratory, or skin diseases have been found to be associated with ethylbenzene [13]. In terms of other long-term illnesses, reference has been made to possible teratogenic effects in the fetus.