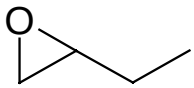
SIDS INITIAL ASSESSMENT PROFILE

CAS No.	106-88-7
Chemical Name	1,2-epoxybutane
Structural Formula	C_4H_8O 

RECOMMENDATIONS

For use in closed systems the substance is currently of low priority for further work.

For other uses the substance is a candidate for further work.

SUMMARY CONCLUSIONS OF THE SIAR

Human Health

1,2-Epoxybutane caused acute toxic effects in mammals: LD_{50} rat (oral) 900 mg/kg body weight, LC_{50} rat (inhalative, 4 h) > 6,300 < 20,000 mg/m^3, LD_{50} rabbit (dermal) 1,757 (1,255 - 2,546) mg/kg body weight.

It was irritating to the eyes. Irritating effects to the skin were severe (corrosion) if evaporation was minimised due to occlusive application, but there was no effect by semi-occlusive application. 1,2-Epoxybutane was not sensitising in a guinea pig maximisation test. In 90-day inhalation studies with rats and mice 1,2-epoxybutane mainly caused nasal lesions (NOAEC 600 and 150 mg/m^3, respectively). Systemic effects occurred at higher concentrations (rat 2400 mg/m^3: decreased mean body weight gain; mice 2400 mg/m^3: e.g. renal tubular necrosis).

1,2-Epoxybutane was genotoxic *in vitro*. However, it caused neither chromosomal aberrations in bone marrow nor dominant-lethal mutations in germ cells of rats.

There is clear evidence for 1,2-epoxybutane being a locally acting carcinogen in male rats (inhalation of 600 mg/m^3 caused no tumours and 1,200 mg/m^3 caused neoplasms of the nasal cavity and the lung of male rats) and there is equivocal evidence for a carcinogenic activity in female rats. There was no evidence for carcinogenic activity in male or female mice. However, the mortality of females was increased in this study due to an infection and this raises difficulties in the interpretation of the result. Regarding the overall database on genotoxicity and structural relationship to epoxyethane and -propane, epoxybutane seems to be a genotoxic compound, showing a carcinogenic activity at the site of application only at high concentrations. However, irritating properties of the compound may cause cell proliferation and contribute thereby to tumor induction.

With respect to reproductive toxicity the 90 day studies with rat and mice did not reveal adverse effects on the reproductive organs up to 2400 mg/kg body weight. Additionally, the lack of an effect from pre-gestational exposure in the developmental toxicity study and a negative dominant-lethal test may indicate that 1,2-epoxybutane does not reach male and female germ cells in effective concentrations.

No developmental toxicity or teratogenicity was detected in rats after inhalation of up to 3,000 mg/m^3 throughout gestation. From the rabbit study no conclusions can be drawn due to high mortality in the high dose group.

Environment

1,2-Epoxybutane has a water solubility of 59 g/l, a vapor pressure of 227 hPa and a log Kow of 0.68.

According to Mackay I air is the main target compartment for 1,2-epoxybutane (89 %), while 11 % partitions to water. The substance has no considerable potential for bio- and geoaccumulation (log P_{ow} = 0.68). The half-life for photochemical degradation in air is calculated to 7.6 days. 1,2-Epoxybutane is classified as readily biodegradable, failing the 10d-window criterion. In sewage treatment plants the substance will be eliminated by stripping and biodegradation. Hydrolysis and photolysis are slowly under environmental conditions.

The following aquatic effects concentrations are available:

Leuciscus idus: LC_{50} (96 h) = 100 - 215 mg/l, *Daphnia magna*: EC_{50} (48h) = 69.8 mg/l, *Scenedesmus subspicatus*: ErC_{50} (72 h) > 500 mg/l, *Pseudomonas putida:* EC_{50} (17 h) = 4,840 mg/l. All values are related to nominal concentrations. Due to the volatility of the substance the real effect values may be lower. QSAR estimations give effect values of 20 mg/l for fish and 32 mg/l for daphnia and show that the effect values are indeed lower than those found in the test but not by orders of magnitude. Based on the measured and predicted effect data the substance can be classified as moderately toxic. A PNEC of 20 µg/l can be derived based on the predicted effect value for fish using an assessment factor of 1000. No data are available on terrestrial organisms.

Exposure

In the European Union there is only one known producer of 1,2-epoxybutane. The production volume of this chemical in BASF Aktiengesellschaft Ludwigshafen was 5,000-10,000 t in 1999. The total production volume is mainly used at the production site as an intermediate (non-disperse use) for synthesis in closed systems of fuel additives, non-ionic surfactants, defoamers and various other products. Monitoring data showed no emission into the air during production and processing. There is no information on emission of 1,2-epoxybutane into the hydrosphere. In the USA the substance is used as a stabilizer in hydrocarbon solvents. Therefore emissions into the environment cannot be excluded during formulation and use of the solvents.

NATURE OF FURTHER WORK RECOMMENDED

For use in closed systems no further work is recommended.

For other uses there is a need for an exposure assessment.