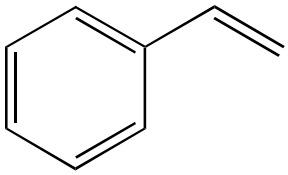
SIDS INITIAL ASSESSMENT PROFILE

CAS No.	100-42-5
Chemical Name	Styrene
Structural Formula	

CONCLUSIONS AND RECOMMENDATIONS

The chemical is a candidate for further work.

SHORT SUMMARY WHICH SUPPORTS THE REASONS FOR THE CONCLUSIONS AND RECOMMENDATIONS

Worldwide production of styrene was approximately 14 million tonnes in 1992. Industry has estimated styrene production and use in Western Europe in 1993 as 3.7 million tonnes. Styrene is used primarily as an intermediate in the chemical industry. Specific uses include as a monomer in the production of polystyrene and styrene copolymers, styrene-butadiene rubbers and in unsaturated polyester resins.

Styrene reacts readily with hydroxyl radicals and with ozone in the atmosphere, with an estimated half-life of 4 hours. It has a low potential for the generation of low-level ozone. Styrene is readily biodegradable under aerobic conditions. Due to its high vapour pressure and low to moderate solubility, volatilisation from water is likely to be an important distribution process. From its octanol-water partition coefficient (K_{ow}) value, styrene is predicted to be moderately mobile in soils. The K_{ow} value also indicates a potential for bioaccumulation, but by analogy with other substances such as toluene, xylene and ethylbenzene it does not appear likely that styrene will accumulate in aquatic organisms.

Styrene has moderate toxicity to aquatic organisms. Different organisms show a similar sensitivity to styrene in acute tests: fathead minnow 96 hour LC_{50} 4.02 mg/l; *Daphnia magna* 48 hour EC_{50} 4.7 mg/l; amphipod *Hyallela azteca* 96 hour LC_{50} 9.5 mg/l; algae *Selenastrum capricornutum* 72 hour EC_{50} 4.9 mg/l. Following a detailed risk assessment in the European Union, this chemical is currently considered of low priority for further work for the environment.

Styrene is generally of low acute toxicity in experimental animals (with the exception of the mouse) and humans. Single exposure to styrene has the potential to produce CNS depression at high concentrations (800 ppm) in animals and humans. Liquid styrene is irritating to the skin and both the liquid and vapour are irritating to the eyes. The animal sensitisation data are inadequate. However, given that widespread exposure to styrene has led to only one reported possible case of skin sensitisation, this extensive experience appears to indicate that styrene is not a skin sensitiser. Similarly, there has been extensive inhalation exposure in humans, which has resulted in only two case reports of asthma, each of which has unconvincing aspects to it. This suggests that styrene is not a respiratory sensitiser.

There is a considerable database on the effects of repeated exposure to styrene in humans and experimental models. Neurotoxicity is a key issue and no agreement was reached at the SIAM on the interpretation of neurotoxicity studies

in humans. The database is of mixed quality and a precise threshold for health effects cannot be easily identified from human studies. The animal data indicate a NOAEL of 200 ppm in repeated exposure studies in the rat. A histopathological change in the olfactory epithelium indicating respiratory tract irritation was observed at concentrations of 500 ppm and above. At a higher concentration (800 ppm) damage to the auditory system (hair cell loss), with associated functional impairment, was observed. Although extensive information is available on genotoxicity and carcinogenicity, no agreement of the interpretation could be reached at the SIAM. However, it was recommended that a second *in vivo* genotoxicity study would perhaps provide reassurance.

No adequate fertility studies are available. The only available study indicated no effects on fertility were observed at low doses. However, a well conducted 90-day repeated exposure study in rats revealed no evidence of testicular effects at airborne concentrations up to 1500 ppm. In a well-conducted developmental toxicity study, inhalation exposure to styrene at level causing maternal toxicity in the rat and up to 600 ppm in the rabbit was not associated with significant effects on the fetus. In other studies, delayed fetal development or increases in minor anomalies in rat and mouse were only observed at doses causing maternal toxicity. A range of epidemiological studies focussing on developmental effects has been conducted but most of these investigations have been too small to be conclusive. Overall, there is no evidence of an effect of styrene on human reproduction.

NATURE OF FURTHER WORK RECOMMENDED

A further *in vivo* study in a second tissue is recommended (an *in vivo* unscheduled DNA synthesis test is recommended as post-SIDS work). Consumer exposure information is needed. A national human health risk assessment is recommended to identify the need for risk reduction.