MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: para-Methylstyrene file (CAS # 622-97-9)

FROM: Gary Butterfield

SUBJECT: Screening level for para-Methylstyrene

DATE: August 4, 2006

para-Methylstyrene is also known as 4-vinyltoluene, or 1-ethenyl-4-methyl benzene. It is a liquid at ambient temperatures. This material is a liquid and has a molecular weight of 118.2 g/mol. The melting point is -34C. The boiling point is 173C. The vapor pressure is less than 0.8 mmHg at 20C.

The following references or databases were searched to identify data to determine the screening level: U.S. Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS), National Institute for Occupational Safety and Health (NIOSH) Registry for Toxic Effects of Chemical Substances (RTECS), American Conference of Governmental and Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), Michigan Department of Environmental Quality (DEQ) library, International Agency for Research on Cancer (IARC) Monographs, Chemical Abstract Service (CAS) Online (1968 – May 2006), National Library of Medicine (NLM) - Toxline, and National Toxicology Program (NTP) Status Report.

The CAS and NLM on-line literature searches were conducted on May 9, 2006. There is a very limited amount of published toxicity information on this chemical. Several of those studies on methylstrene evaluate other isomers, or a mixture of isomers. A search located two acute studies on p-methylstyrene which reported oral LD50 in rats and mice. A chronic 2-year gavage study was located during the literature searching.

The chronic gavage study reported by Conti et al (1988) administered 97% pure p-methylstyrene to rats and mice. Groups of 30 male and 30 female Sprague-Dawley rats were given 0, 10, 50, 250 or 500 mg/kg 5 days a week for 104 weeks. Groups of 60 male and 60 female Swiss mice were given 0, 10, 50, or 250 mg/kg 5 days a week for 78 weeks. Rats had reduced survival at doses of 250 and 500 mg/kg. The male mice had reduced survival at all dose levels in the second year of the study. Survival of female mice was unaffected by treatment. However, specific details on rates of survival and mortality were not given in this article. They only were reported in the text as being reduced by 25%. In the rats and female mice there were no dose related effects observed on body weight gain, organ weights, food consumption, hematology, urinalysis, or clinical chemistry. There was no treatment related increases in carcinogenicity, for either benign or malignant tumors. The male mice increased mortality was associated with primary amyloidosis (deposition of extracellular glycoprotein) – details of incidence of pathology also not given. The decreased survivorship observed is considered a frank toxic effect. Therefore, this study was considered not appropriate to use as a basis for screening level calculation due to too few details given.

The only other toxicity information located was the acute studies. In the acute rat oral LD50 reported by Yang and Mackerer (1990), male and female F344 rats, 10 of each sex per dose group, were gavaged with para-methylstyrene dissolved in corn oil. A 14-day observation period followed dosing. The LD50 was calculated by probit analysis as described by Finney (1971). The combined sex LD50 was reported to be 2523 mg/kg with a 95% confidence interval of 2311 to 2755.

In the acute mouse oral LD50 study reported by Yang and Mackerer (1990), male and female CD-1 mice, 5 of each sex per dose group, were gavaged with para-methylstyrene dissolved in cottonseed oil. A 14-day observation period followed dosing. The LD50 was calculated by the method described by Weil (1952) and Thompson and Weil (1952). The combined sex LD50 was reported to be 1072 mg/kg with a 95 % confidence interval of 835 to 1375.

Due to the limited reporting from the 2-year study, the screening level will be based on the acute LD50 in mice, which appear to be more sensitive than rats. The ITSL can be calculated using the equation from R232(1)(h) as follows.

$$\text{ITSL} = \frac{1072\ \text{mg/kg}}{500\text{x}40\text{x}100\text{x}0.167} \times \frac{1\ \text{kg}}{1.7\ \text{m}^3} = 1.9\ \text{ug/m}^3$$ rounded to 2 ug/m^3 with annual average

The mouse default inhalation rate of 1.7 m^3/kg was used in the above calculation.

References

Conti et al. 1988. Long-term carcinogenicity bioassays on styrene administered by inhalation, ingestion and injection and styrene oxide administered by ingestion in sprague-dawley rats, and para-methylstyrene administered by ingestion in sprague-dawley rats and swiss mice. Annals New York Academy of Sciences 534:203-234.

Yang and Mackerer. 1990. Acute toxicologic testing of para-methylstyrene using mice. Acute Toxicity Data, J Am Coll Toxicol (part B) Vol 1, page 76.

Yang and Mackerer. 1990. Acute toxicologic testing of para-methylstyrene using rats and dogs. Acute Toxicity Data, J Am Coll Toxicol (part B) Vol 1, page 77.

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