

MICHIGAN DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT

INTEROFFICE COMMUNICATION

TO: File for Dimethyl carbonate (CAS # 616-38-6)

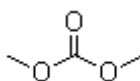
FROM: Doreen Lehner, Toxics Unit, Air Quality Division

DATE: September 17, 2010

SUBJECT: Screening Level for Dimethyl carbonate (CAS # 616-38-6)

The initial threshold screening level (ITSL) for dimethyl carbonate (CAS # 616-38-6) 300 µg/m³ based on an annual averaging time.

Dimethyl carbonate (MW 90.08) is a clear solvent with a flash point of 18°C, a boiling point of 90°C, melting point at 2-4°C, and vapor pressure of 53 mbar @ 20°C, is a carbonate ester which is used as a methylating reagent for anilines, phenols, and carboxylic acids. Dimethyl carbonate has a substantial polar nature and moderate hydrogen bonding strength, which is effective in replacing esters, glycol ethers, and ketones in formulations.



A literature review was conducted to determine a PAI for dimethyl carbonate. The following references and databases were searched to derive the above screening level: EPBCCD, United States Environmental Protection Agency (US EPA) Integrated Risk Information System (IRIS), National Institute for Occupational Safety and Health (NIOSH), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices (TLV/BEI) 2008 guide, National Toxicology Program (NTP) Study Database, International Agency for Research on Cancer (IARC), Acute Database, Chemical Abstract Service (CAS) Online (search was performed on 7/26/2010), National Library of Medicine (NLM)-online, EPA Aggregated Computational Toxicology Resource (ACToR) Database, US EPA TSCATS database, and Hazardous Substances Data Bank (HSDB).

There is little toxicity data available for dimethyl carbonate. There is an acute oral rat LD₅₀ of 5 g/kg (Amoco Oil, 1992). There is also a study (Exxon Chemical, 1992) that involves 4 groups of 96 pregnant CD-1 mice exposed by inhalation to 0, 300, 1,000, or 3,000 ppm dimethyl carbonate during gestational days (GD) 6-15. Maternal body weights, clinical observations, and food consumption were recorded throughout gestation. At scheduled euthanization of GD 18, fetuses were weighed, sexed, and examined for external, visceral, and skeletal alterations. There were no treatment-related deaths or clinical findings. Maternal body weights and body weight gains were significantly reduced at 3,000 ppm. Food consumption was also significantly reduced in the 1,000 and 3,000 ppm groups. Gestational parameters affected at 3,000 ppm included post-implantation loss due to increased resorptions and altered sex ratio (decreased males). Fetal body weights/litter were reduced at 3,000 ppm, with increased number of stunted fetuses (<1 g body weight). Total incidences of fetal malformations (external, visceral, and skeletal) were significantly increased at 3,000 ppm and included cleft palate, microtia, low set ears, multiple skull bone malformations, and fused vertebral arches. There was also a

treatment-related increase in skeletal variations at 3,000 ppm. The NOAEL for maternal and developmental toxicity was 1,000 ppm.

Using the NOAEL for the mouse study in Exxon Chemical, 1992 study, Rule 232 (1) (d) uses a 7-day inhalation NOAEL to determine an ITSL using the following equation:

$$ITSL = \frac{NOAEL}{35 \times 100} \times \frac{\text{hours...exposed...per...day}}{24 \text{...hours...per...day}}$$

Since the NOAEL is 1,000 ppm, this value needs to be converted to $\mu\text{g}/\text{m}^3$ in order to be used for the above equation.

$$\frac{\text{mg}}{\text{m}^3} = \frac{\text{ppm} \times MW}{24.45} = \frac{1,000 \text{ ppm} \times 90.08}{24.45} = 3,684.253579 \frac{\text{mg}}{\text{m}^3} = 3,684,253.579 \frac{\mu\text{g}}{\text{m}^3}$$

Using the above value for the NOAEL and plugging it into the ITSL equation above:

$$ITSL = \frac{3,684,253.579 \frac{\mu\text{g}}{\text{m}^3}}{35 \times 100} \times \frac{6 \text{ hours}}{24 \text{ hours}} = 263.1610 \frac{\mu\text{g}}{\text{m}^3} = 300 \frac{\mu\text{g}}{\text{m}^3}$$

Using Rule 232 (2) (c) the averaging time is annual. So the ITSL for dimethyl carbonate is $300 \mu\text{g}/\text{m}^3$ annual averaging time.

References:

Act 451 of 1994, Natural Resources and Environmental Protection Act and Air Pollution Control Rules, Michigan Department of Environmental Quality.

Amoco Oil Co. 1992. Acute Oral Toxicity Study of Dimethyl Carbonate in Rats (Final Report) with Cover Letter dated 042392. National Technical Information Service. Springfield, VA 22161. NTIS. 1992. OTS0539164.

Exxon Chemical. 1992. Inhalation Developmental Toxicity Study in Mice with Dimethyl-carbonate with Cover Letter Dated 020295. National Technical Information Service. Springfield, VA 22161. NTIS. 1995. OTS0001086.

DL:lh