

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

February 4, 1998

TO: File for 1,1'-methylene bisisocyanatobenzene
(CAS No. 26447-40-5)

FROM: Michael Depa, Toxics Unit, Air Quality Division

SUBJECT: Screening Level Determination

The initial threshold screening level (ITSL) for 1,1'-methylene bisisocyanatobenzene (also methylenediphenylene ester of isocyanic acid) is ~~0.2~~ ^{0.16} $\mu\text{g}/\text{m}^3$ based on a 24-hr averaging time.

The following references or databases were searched to identify data to determine the ITSL: IRIS, RTECS, ACGIH Threshold Limit Values, NIOSH Pocket Guide to Hazardous Chemicals, Environmental Protection Bureau Library, IARC Monographs, National Library of Medicine Toxline, 1997 Health Effects Assessment Summary Tables, and NTP Status Report. Review of these sources found that EPA has not established an RfD or RfC for 1,1'-methylene bisisocyanatobenzene. The ACGIH and NIOSH have not established occupational exposure limits (OELs).

Physical Properties

The molecular weight of 1,1'-methylene bisisocyanatobenzene is 250 g with empirical formula of $\text{C}_{15}\text{H}_{10}\text{N}_2\text{O}_2$. This compound is actually a mixture of three different methylene diphenyl isocyanates: 4,4'-, 2,4'-, and 2,2'-methylene diphenyl isocyanate (International Isocyanate Institute, 1994). All the isomers of 1,1'-methylene bisisocyanatobenzene have the same empirical formula and molecular weight. The structural formula for 1,1'-methylene bisisocyanatobenzene is represented in Figure 1. Figure 2 shows the compound 4,4'-methylene diphenyl isocyanate (CAS No. 101-68-8) which makes up 95% of the 1,1'-methylene bisisocyanatobenzene mixture. The remaining 5% of the mixture contains the 2,2' and 2,4' isomers (CAS No. 2536-05-2 and 5873-54-1, respectively).

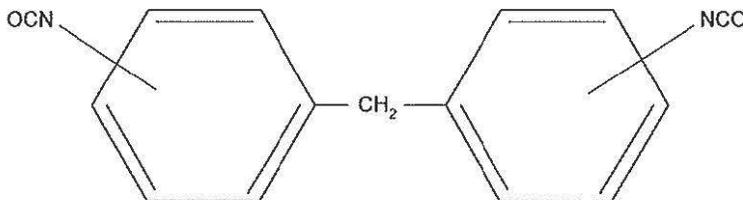


Figure 1. General Structure of Methylene Diphenyl Isocyanate

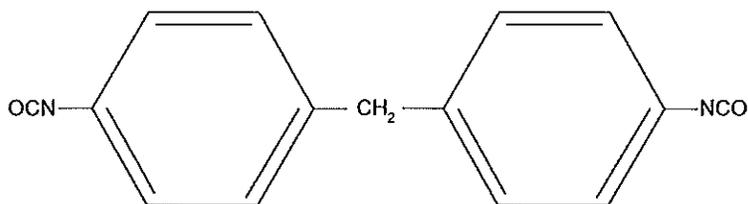


Figure 2. 4,4'-Methylene Diphenyl Isocyanate

General Note on Diisocyanates

Diisocyanates irritate the respiratory tract and can act as respiratory sensitizers, producing asthma-like symptoms in sensitized individuals with exposure at very low concentrations. Exposure to diisocyanates may also result in chronic impairment of pulmonary function (NIOSH, 1978). Sensitization describes an allergic response where preexposure of the chemical is required to produce the toxic effect. The ITSL for 4,4'-methylene diphenyl isocyanate (101-68-8) is ~~0.2~~ ^{0.6} $\mu\text{g}/\text{m}^3$ (24-hr averaging time). Toluene diisocyanate, also called TDI (CAS No. 26471-62-5), is another example of diisocyanate that is also a strong sensitizer. EPA established an RfC for TDI at $0.07 \mu\text{g}/\text{m}^3$.

ITSL Development

No toxicological data was found on the mixture of 1,1'-methylene bisisocyanatobenzene. As mentioned above, the mixture of 1,1'-methylene bisisocyanatobenzene is 95% 4,4'-methylene diphenyl isocyanate. Since this mixture of diisocyanates called 1,1'-methylene bisisocyanatobenzene is mostly 4,4'-methylene diphenyl isocyanate (i.e. 95%) it was deemed appropriate to apply the ITSL for 4,4'-methylene diphenyl isocyanate to this mixture. Therefore, the ITSL for 1,1'-methylene bisisocyanatobenzene (CAS No. 26447-40-5) was based on the ITSL for 4,4'-methylene diphenyl isocyanate (CAS No. 101-68-8).

The ITSL for 1,1'-methylene bisisocyanatobenzene (also methylenediphenylene ester of isocyanic acid) is ~~0.2~~ ^{0.6} $\mu\text{g}/\text{m}^3$ based on a 24-hr averaging time.

REFERENCES

International Isocyanate Institute. 1994. Initial submission: letter form Intl Isocyanate Inst Inc to submitting info on monomeric and polymeric MDI (isocyanic acid, polymethylene polyphenylene ester), dated 3/14/84. Obtained from EPA Office of Technical Support. FYI-OTS-0794-1027.

NIOSH. 1978. Criteria for a recommended standard...occupational exposure to diisocyanates. National institute for occupational safety and health, Cincinnati, OH, U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control. NIOSH Pub. No 78-215. Reproduced by National Technical information Service, U.S. Department of Commerce, Springfield, VA 22161. NTIS Pub No. PB-81-226615.

MD:SLB

cc: Mary Lee Hultin, AQD