

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

January 22, 2002

TO: File for Germane (germanium tetrahydride) (7782-65-2)
FROM: Marco Bianchi, Toxics Unit, Air Quality Division
SUBJECT: Initial Threshold Screening Level

The initial threshold screening level (ITSL) for germane (germanium tetrahydride) is $6 \mu\text{g}/\text{m}^3$ based on an 8 hour averaging time.

The following references or databases were searched to identify data to determine the ITSL: IRIS-online, HEAST, NTP Management Status Report-online, RTECS, EPB-CCD, EPS library, GAS-online, NLM-online, IARC-online, NIOSH Pocket Guide, and ACGIH Guide.

A complete chemical literature search was conducted for germane, but information was limited to sparse data provided by the American Conference of Governmental Industrial Hygienists (ACGIH) documentation for germanium tetrahydride. The ACGIH documentation stated that germane is a colorless gas that is insoluble in water and is used in the doping of solid-state devices. Acute toxicity data showed that a rabbit survived inhalation exposure to germane at 100 ppm for 1 hour; 150 or 185 ppm were fatal to mice; a guinea pig showed signs of intoxication at 150 ppm and another died after exposure at 185 ppm, all 1-hour exposures. Hemoglobinuria was noted in guinea pigs exposed to germane for 1 hour.

According to the ACGIH recommendation for germanium tetrahydride, this compound is apparently a hemolytic agent similar in toxic properties to arsine and stibine. In the absence of toxicologic data on chronic, or even subacute exposure, the ACGIH based the threshold limit value (TLV) on acute toxicity. Since it appears that germane is about half as toxic as stibine a TLV of 0.2 ppm ($0.6 \text{ mg}/\text{m}^3$) was recommended.

The ITSL was determined as follows:

$$ACGIH \text{ TLV} = 0.6 \frac{\text{mg}}{\text{m}^3}$$

$$0.6 \frac{\text{mg}}{\text{m}^3} \div 100 = 0.006 \frac{\text{mg}}{\text{m}^3}$$

$$0.006 \frac{\text{mg}}{\text{m}^3} \times \frac{1000 \frac{\mu\text{g}}{\text{m}^3}}{1 \frac{\text{mg}}{\text{m}^3}} = 6 \frac{\mu\text{g}}{\text{m}^3}$$

The ITSL for germane (germanium tetrahydride) = $6 \mu\text{g}/\text{m}^3$ based on 8 hour averaging.

References:

1. Documentation of Threshold Limit Values and Biological Exposure Indices. 1992. Germanium Tetrahydride. American Conference of Governmental Industrial Hygienists (ACGIH), 6th Edition.

MB:DB

cc: Cathy Simon, AQD

Mary Lee Hultin, AQD

Sheila Blais, AQD