

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

October 27, 1988

TO: Cathy Simon, Air Quality Division

FROM: Gary Butterfield, Great Lakes & Environmental Assessment Section

SUBJECT: Air Permit 336-88 Chemicals

The following justifications should provide sufficient information to develop acceptable air concentrations (AAC) for methyltrimethoxysilane (CAS #1185-55-3) and vinyltrimethoxysilane (CAS #2768-02-7). There is insufficient toxicity information to determine an acceptable air concentration for dimethoxydimethylsilane (CAS #1112-39-6) and phenyltrimethoxy-silane (CAS #2996-92-1). The one available study with phenyltrimethoxysilane was of four week duration. However, no effects were observed at any of the dose levels. This study did not identify an NOAEL suitable for AAC calculation.

Methyl trimethoxysilane

An oral LD50 and a four week inhalation study was available for this material. The four week study, which was conducted by IBT 1977, found nervous system effects at the highest dose level (1250 ppm). However, histopathology was only conducted on the control and high dose animals. Therefore, the histological changes in the nervous system observed in the high dose animals cannot be used to identify a NOAEL or LOAEL, as lower doses were not examined. Eliminating the TBT study leaves the determination of an AAC to be based on the oral LD50 study conducted by Smyth, et al 1969. The rat oral LD50 was reported to be 12.5 ml/kg with a 95% confidence interval of 9.98 to 15.3 ml/kg. Using a density of 0.951 g/cm³, this LD50 can be converted to 11.9 g/kg or 11900 mg/kg. This LD50 results in an AAC of 80 µg/m³, which was calculated by $1/500 \times 1/40 \times 1/100 \times 11900/0.167 \times 0.380/0.173$.

References

- Industrial Biotest Laboratories (IBT). 1977. Four week subacute vapor inhalation toxicity study with TX—1294 in albino rats. Report #IBT No. 8562—09087 to Dow Corning.
- Smyth, M.F. Jr. et al. 1969. Range finding toxicity: list VII. Am. Indust. Hyg. Assoc. J. 30:470—476.

Vinyl trimethoxysilane

There is an oral LD50 in rats and a 13-week inhalation study in rhesus monkeys which could be used to calculate an AAC. In the monkey study, there were three monkeys of each sex exposed to vapors of 0, 10 or 100 ppm vinyltrimethoxysilane. Frank effects on hematology parameters were observed in the 100 ppm dose group. These effects included decreases in packed cell volume, amount of hemoglobin and number of red blood cells. The heart was also increased in size when compared to body weight of the 100 ppm monkeys. However, the authors saw no biological significance in the increased heart size. The authors also saw no biological significance in marginally statistically significant changes of the blood biochemistry parameters (SGOT and urea) which were different from controls at both 10 and 100 ppm. They reasoned that although the SCOT and urea values for 10 and 100 groups were different from control, the values were still within normal limits for monkeys. Use of the NOAEL of 10 ppm from a subchronic study is preferred over using an oral LD50 value in calculation of AAC. An uncertainty factor of 1000 should be used in calculation of the AAC as the monkey study only had three animals per sex in each dose, and there were some non-biologically significant effects at 10 ppm. Using U-1000 and NOAEL 10 ppm or 60.5 mg/m³ the resulting AAC is 10 µg/m³, which was calculated by 60.5/1000 x 6/24 x 5/7.

References

- Binns, R., et al. 1972. Vinyltrimethoxysilane primate inhalation study. Report 1972-10065-1283-2 of the Huntingdon Research Centre to Midland Silicones Ltd.
- Smyth, M.F. Jr. et al., 1969. Range finding toxicity: list VII. Am. Indust. Hyg. Assoc. J. 30:470—476.