

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

February 14, 1996

TO: Aluminum nitride file (CAS # 24304-00-5)  
FROM: Gary Butterfield  
SUBJECT: Screening level for aluminum nitride

A January 5, 1996 on-line search of CAS and NLM was not able to identify any published toxicity studies for aluminum nitride.

Aluminum nitride is believed to be very reactive with water which causes it to decompose to aluminum hydroxide and ammonia.

Dow Chemical has established their own occupational exposure limit of 0.1 mg/m<sup>3</sup> for aluminum nitride. This OEL is based on an unpublished 4 week rat inhalation toxicity study. Although the company's OEL is considered insufficiently peer reviewed to be the basis of the ITSL, the ITSL can be based on the same toxicity data that the OEL was. Although Dow Chemical was reluctant to provide a complete copy of the full 4 week study, they provided the AQD a short (one page) summary of this four week inhalation study in rats. Groups of ten rats (strain unspecified) of each sex were exposed to 0, 2, 10 or 70 mg/m<sup>3</sup> aluminum nitride aerosol with MMAD of 1.5 u and sigma-g of 1.6 for 6 hr/d, 5 day/wk for 4 weeks. Half of the animals were sacrificed at the end of the exposure period, while half were held for a 10 week recovery period. The summary identified mild adverse respiratory tract lesions (details of the lesions were not explained in the summary) that were apparent at all dose levels, even at the lowest dose tested. These effects were still observable even after the ten week recovery period.

This 4 week inhalation study is still of an insufficient duration to meet the requirements for calculation of an RFC by the methods utilized by EPA. However, a screening level can be calculated from the equation in Rule 232(1)(d), which only requires a 7 day study. The equation was modified by changing the 35 fold uncertainty factor to factor of 20 to account for the duration of the study being 4 weeks instead of a 7 day study. The lowest dose tested in the 4 week study, 2 mg/m<sup>3</sup>, was considered to be a LOAEL because of the production of adverse effects. The LOAEL can be converted to a NOAEL by dividing by 10. Resulting in calculation of the ITSL as follows.

$$\text{ITSL} = \frac{(2 \text{ mg/m}^3)/10}{20 \times 100} \times \frac{6}{24} = 0.03 \text{ ug/m}^3 \quad \text{with annual averaging}$$

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 22, 1996

TO: Aluminum nitride file (CAS # 24304-00-5)

FROM: Gary Butterfield

SUBJECT: Review of February 1996 screening level

The February 14, 1996 ITSL for aluminum nitride is based on mild adverse effects observed at the 2 mg/m<sup>3</sup>, as reported in an unpublished four week study conducted by Dow Chemical. In January 1996, Dow Chemical submitted a short summary of this study in order to provide the basis of the screening level, as no other toxicity data was available. After the ITSL was established, Dow Chemical submitted another one page summary of this study that had more of a detailed description of the effects observed. Dow Chemical then asked if the ITSL could be re-established at a higher level based on the most recently submitted summary.

The more thorough, second summary identifies mild inflammatory changes in the lungs of rats exposed to 2 mg/m<sup>3</sup> for 4 weeks. These effects were described as being slight alveolar type II cell proliferation and occasional neutrophils. At the higher dose levels, these effects are more severe, and expand in to proliferative pneumonitis at the 70 mg/m<sup>3</sup> dose level.

There still is insufficient data presented in the summary to lead to lead to reducing the safety factors used calculation of the February ITSL. There is no incidence levels given in the summary. It is not know if all rats at each dose level have responded equally, or if some have been affected more severely than the others. Although there was a discussion of alveolar type II cells being proliferated, the summary did not describe any damage to type I cells which can be one possible explanation or reasons why the type II cells are proliferating. The reactive BALT response is characteristic of general inflammation. It is also some concern that the lung responses after 10 weeks of no exposure seem to be more severe than those that occurred after 4 weeks of exposure. This leads to some concern over problems that might occur with a very long term exposure.

The February ITSL of 0.03 ug/m<sup>3</sup> is consistent with Dow's internal OEL of 0.1 mg/m<sup>3</sup> for the respirable fraction. The ITSL based on this OEL would be 1 ug/m<sup>3</sup> with an 8 hour average, which converts to an annual average number of 0.05 ug/3.

Unfortunately no other metal nitride ITSLs have been developed, for comparisons sake. Therefore, at this time, it is still considered that the February ITSL is the most scientifically appropriate screening level.