

Interoffice
Communication

To: R. L. Poe
From: S. L. Baxter
Date: August 9, 1989
Subject: TRIP REPORT - ASTM SUBCOMMITTEE E34.70
MEETING (SINGLE CRYSTAL CERAMIC WHISKERS) -
DENVER, CO - AUGUST 7 & 8, 1989

VISTA

MEETING SUMMARY

Representatives of corporations involved in silicon carbide (SiC) whisker production and use met to finalize an ASTM standard for a SiC whisker MSDS, and to outline a proposal for extensive SiC toxicity studies on SiC whiskers. Concern about SiC whisker toxicity continues. No new data on SiC was presented at this meeting; however, further studies on asbestos are revealing a relationship with mesothelioma, a rare lung cancer with a 100% mortality rate. Most organizations using whiskers have assumed the material to be like asbestos, and asbestos safety standards have been utilized. Tightening of asbestos standards would result in a tightening of whisker standards as well.

The subcommittee has a revised proposal for an MSDS. This revision will be circulated to committee members for balloting between now and the meeting in late November. This MSDS will provide a model which may be adopted by anyone in need of such a document. It is not binding, and may be modified. It appears to be a very sound document.

The remainder of the meeting was spent in developing proposal guidelines for a study on SiC whisker toxicity. The intent of this study is to provide toxicity data which can be used to establish a permissible exposure level which will be acceptable by government regulatory agencies. ASTM will oversee the study, but will turn to corporate and government sources for the \$6-10 MM cost of the study.

MEETING DETAILS

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Approximately 20 participants representing whisker producers, whisker consumers, government laboratories, academia, and occupational testing firms were in attendance. The majority of participants had a toxicology or regulatory background.

Results from balloting on a previous MSDS recommendation were reviewed and objections were (eventually) resolved, resulting in a further revised recommendation. Included

R. L. Poe
August 9, 1989
Page 2

in this proposal is appropriate wording for labeling purposes. A copy of the ASTM labeling proposal is attached. For now, ASTM is suggesting that these whiskers are best classified as IARC Class 2B suspected carcinogens (evidence of carcinogenicity in animals, no data yet for humans). ASTM is also generally assuming that the whiskers should be treated according to the guidelines outlined for asbestos. Everyone present agreed that this assumption is only temporarily acceptable, and that actual SiC whisker testing is needed to define a specific Permissible Exposure Level (PEL).

The relationship with asbestos is both a benefit and a liability. There are good reasons for expecting ceramic whiskers to operate through the cytotoxic and carcinogenic mechanisms of asbestos. There is a wealth of such data for asbestos; and, tragically, this includes human mortality data as well. If ceramic whiskers can be shown to operate by these same mechanisms, then the data collection required for responsibly setting exposure levels is simplified.

Unfortunately, there remains a lot of uncertainty about asbestos standards. Recent work has uncovered a link with mesothelioma, a rare lung cancer with a 100% mortality rate. Studies to date have found no dose-response relationship. This surprising and uncommon result means that very low exposures or single occurrence exposures can be risky for this cancer. More pressure for a downward revision of asbestos exposure limits is likely as this cancer is further explored. This would suggest that proposed ceramic whisker exposure limits would also be lowered. It was felt that industry is currently managing the 0.2 fiber/cm³ exposure ceiling, but that an order of magnitude decrease in the PEL might shut down the industry for all but the most exotic applications.

One complication in monitoring exposure levels is the lack of reliable rapid response techniques, especially when other airborne particulate material is present. This subcommittee selected a task group to recommend appropriate and reliable exposure monitoring techniques. A new monitor offered by MIE claims to have advantages in this regard. The MIE instrument will be reviewed by the task group.

The next major discussion topic was a testing program designed to identify an appropriate PEL for SiC whiskers. The consensus was that such testing must be initiated soon

R. L. Poe
August 9, 1989
Page 3

so that the validity of the "treat it like asbestos" view can be tested. It was further felt that inhalation studies must be included. Asbestos experience has shown that less expensive techniques fail to accurately reveal all of the health hazards of that material. A minimal test utilizing two whisker diameters, two concentrations, and both positive and negative controls is currently planned, along with other in vivo and in vitro studies. The test is an attempt to reveal the toxicity of current products and to establish at least some correlations between toxicity and structure which may be helpful in predicting the hazards of future products.

The mechanism for pursuing this testing is to invite reputable testing agencies to submit proposals for conducting the testing. Required funding, expected to be about \$6-10 MM, will be obtained from industrial and governmental sponsors. Vista may be asked for a commitment, probably somewhere between \$10,000 and \$50,000. Some participation by Vista is probably appropriate, even though alumina whiskers will not be tested. A growing body of information on any ceramic whisker will very likely influence the regulatory status of all new whiskers or fibers.

This ASTM subcommittee intends to finalize the "Invitation for Proposal of Research" by its next meeting in November. This Invitation will outline guidelines for those wishing to submit proposals.

A couple of items regarding whisker technology came out in the meeting:

1. Theoretical studies continue to suggest that larger diameter whiskers may be more effective reinforcing materials. Estimates of optimum diameters range from 2-8 microns.
2. In response to an inquiry regarding whisker pricing, a ballpark figure of \$700/Kg (about \$300/lb.) was offered. This figure is probably a generous list price figure. Nevertheless, no indication of price erosion came out.

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I recommend that we continue to participate in these meetings. It offers an opportunity to make sure our own treatment of alumina whiskers is responsible, and helps

R. L. Poe
August 9, 1989
Page 4

us keep abreast of ongoing developments in the toxicology of these materials. It is also a good forum for maintaining industry contacts. The next meeting, scheduled for November 28 and 29 in Orlando, Florida, will be especially informative since Gerald Vaughn and Neil Johnson will both be presenting results from their testing of SiC whiskers.



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SLB/lcp

cc: JTF, WRC, CME, WCT, JRR, RBM, OCK, RJA, GSH, JAH,
RJT, TG

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