



Research

MEMORANDUM

By R. J. Lee
Basic Research-Physics

Date May 11, 1977

Ref. No.

Subject: TRIP REPORT - SYMPOSIUM ON APPLICATIONS OF ELECTRON
AND X-RAY ANALYSIS IN ENVIRONMENTAL AND OCCUPATIONAL
HEALTH SPONSORED BY THE UNIVERSITY OF DENVER, DENVER,
COLORADO, APRIL 25-27, 1977

Summary

It seems probable that future OSHA regulations will lower permissible levels of asbestos emissions; however, the distinction between asbestos and non-asbestos varieties of the same mineral will likely be retained. Other topics covered during the symposium are also summarized below.

Discussion

The lead-off speaker, Aurel Goodwin of MESA, implied that he would like to see the term "asbestos" defined as any particle which has a 3:1 aspect ratio and is greater than 2 microns in length. This would make MESA's task much simpler. MESA's goal is to triple the rate of sampling at mines, quarries, and other operations under their purview and analyze these samples using electron microscopy. Under the present law, they are required to distinguish between asbestos and non-asbestos varieties in the same mineral.

During a visit to the MESA Laboratory in Denver, John Thatcher, of the technical support arm of MESA, indicated that MESA is aware of the difficulties involved in making a distinction between different species of the same mineral. He also indicated that MESA realizes it will need to develop better analytical methods for mineral identification than those used in the Reserve Mining litigation.

MESA is planning to purchase a 200 kV scanning electron transmission microscope with x-ray analysis capability for their monitoring program. They expect to automate this system and eventually to analyze 1,000 samples per year. At present they do not know of a method to distinguish between asbestos and non-asbestos varieties on a microscopic basis. The implication is that the use of electron microscopy for quantitative mineral particle identification will increase in the future; however, the degree of sophistication and

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automation needed to allow a high sample throughput will likely restrict such analysis to a few laboratories specializing in this type of analytical work. Furthermore, until an acceptable definition of "asbestos" is developed, either on the basis of medical data, analytical methods, or through litigation, it is likely that a controversy such as that surrounding the Reserve Mining trial will continue.

Dr. Kurt Heinrich of the National Bureau of Standards has been assigned the task of developing a definition of asbestos applicable to microscopic fragments. He feels that his group is not competent to develop such a definition; therefore, he is planning to hold a conference to which he will invite various medical authorities such as Dr. Selikoff of Mt. Sinai Hospital, Dr. Wright (currently consultant to Johns-Manville), representatives of the mining industry and government regulatory agencies, experts in the fields of mineralogy and geology (such as Dr. Tibor Zoltai of the University of Minnesota) and, finally, experts in the area of analytical techniques. It is Dr. Heinrich's hope that some type of definition can arise from this conference and that he can then concern himself with a critique of the analytical procedures used in identifying and counting as per that definition.

Dr. R. Scholl representing Illinois Institute of Technology Research Institute reported on the status of their EPA contract to develop a set of well-characterized asbestiform minerals. This contract was supposed to be completed at the end of this year and is approximately one year behind schedule. This is primarily due to the difficulty of finding sufficient quantities of pure mineral species of both the asbestiform and non-asbestiform varieties of the six asbestos minerals. IITRI has asked for an extension of their contract and expects to be conducting a round robin program to develop a reliable analytical method for the identification and counting of asbestos mineral particles. Material collected and characterized by IITRI will be used in animal studies of the health effects of the various minerals.

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After hearing the presentations on analytical methods for mineral identification, it was clear that the technique developed at U.S. Steel Research represents the state-of-the-art in this area. I had numerous requests for copies of our procedure and inquiries about future publication plans and the possibility of interpreting electron diffraction patterns on a commercial basis.

Other information not related to asbestos identification is as follows.

1. Dr. P. Schumaker of Battelle Laboratories described a method for sulphur determination in coals using x-ray fluorescence and x-ray diffraction techniques. Using their method they can obtain the total sulphur, sulphate and pyrite concentrations in approximately one-tenth the time required using conventional wet chemistry methods. Dr. Schumaker agreed to forward a report on their method to Ralph Gray of the Coal Petrography Group (also to be circulated to L.M. Melnick and G.P. Huffman).

2. Dr. J. Krauss of the Colorado School of Mines Research Institute indicated a strong interest in the automated reflectance analyzer currently being used by Coal Petrography. He was also referred to Ralph Gray. He further indicated that the CSMRI has about five people involved in the study of zeolites as molecular sieves.

3. I visited a small company called IONTEC which has developed a neutralized ion beam device. This device is capable of either developing surface texture by etching surfaces or of ion implantation. Applications of the device already developed include improved performance of biological implants after texturing the surface and improved corrosion resistance of silver and copper after helium implantation. It can also be used for precision machining with thicknesses controllable to depths of the order of tenths of angstroms. Potential applications in the steel industry may range from surface texturing of sheet products to improved corrosion resistance and adhesion of plated films to improved high intensity magnetic separators as a result of optimum surface texturing.

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4. The University of Denver Research Institute has developed a novel x-ray detector with high sensitivity and spatial resolution. They expect it to be suitable for nondestructive residual stress measurements. Their detector consists of a scintillator coupled to 10 micron diameter fiber optic bundles to conduct the x-ray visible light through appropriate electronic circuits to provide a position sensitive signal.

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