

(3)

FIBER LENGTH AND ASPECT RATIO OF SOME
SELECTED ASBESTOS SAMPLES*

Ann G. Wylie
Department of Geology
University of Maryland
College Park, Maryland 20742

Health Hazards of Asbestos Exposure,
Annals of the New York Academy of
Sciences. Volume 330, New York (1975)

The primary diagnostic characteristics of asbestos used by most microscopists studying environmental air and water samples are mineral identity and aspect ratio (length/width). These indices are used primarily because other asbestos characteristics, such as tensile strength, surface charge, and flexibility, are not practically demonstrable under the microscope for such samples. Therefore, microscopists rely heavily, and sometimes exclusively, on morphologic features. However, the choice of a 3:1 aspect ratio as the definition of a fiber¹ is an unfortunate one. Many minerals, including the amphiboles, pyroxenes, and aluminosilicates, such as sillimanite, readily cleave into fragments with this aspect ratio. It is especially inappropriate for distinguishing between fibrous and nonfibrous amphibole fibers.

Yet, the constraints of phase-contrast microscopy for particle counting require a reasonable aspect ratio criterion for asbestos. To help establish such an aspect ratio, we have characterized four samples of commercial asbestos by size distribution analysis and mineralogy. These data suggest that the choice of an aspect ratio on the order of 20:1 would ensure that most asbestos particles are counted. This aspect ratio would probably preclude the misidentification of nonfibrous silicates. However, aspect ratio cannot be used as the only criterion for the identification of asbestos.

SAMPLES

Four samples of asbestos were characterized in this study: a short-fiber chrysotile from the New Idria Serpentinite Body, Diablo Range, California (COF-25); a long-fiber chrysotile from the Jeffrey Mine, Asbestos, Quebec, Canada (Plastibest 20); an amosite sample that consists of about 95% grunerite asbestos and 5% actinolite asbestos from Africa (S-33); and a crocidolite sample (blue asbestos), also from Africa (ML 6). The two chrysotile samples had not been milled but had been processed to remove impurities. The amosite and crocidolite samples were both air-jet milled to reduce the average particles length.

ANALYSIS

Sample Preparation

All samples were prepared for observation in the scanning electron microscope (SEM) in the following manner. A few milligrams of the mineral were agitated in distilled water with a small amount of detergent added to aid in dispersion. This suspension was filtered onto a 0.1 μm Nucleopore[®] filter and washed several times with distilled water to remove the soap. Segments of the filter were then mounted

*Supported by a grant from the Bureau of Mines, Department of the Interior.