

## ***Analysis of Amosite Fibers*** *Amosite Fiber Count by Image Analysis*



Amosite, a brownish mineral in the Asbestos family of amphiboles, is most frequently used as a fire retardant in thermal insulation products and ceiling tiles. Like most minerals and gemstones, amosite has three cleavage planes. Unlike other minerals, two of its cleavage planes are much weaker than the third. Amosite tends to break along its weakest directions, resulting in a fibrous linear fragmentation pattern. Amosite fibers can be about 3.0-20.0 microns long and as thin as 0.01 micron. Commonly found in Africa, this mineral used to be exported the world over and producers must contend with rigorous safety precautions.

All types of asbestos have been associated with lung cancer, mesothelioma and peritoneum in people who were occupationally exposed to them and residents who lived close to asbestos factories and mines. Amosite and crocidolite are the most hazardous and have been banned in much of the Western world by the mid-1980s. Quality Control and Product Safety laboratories have specific guidelines to evaluate amosite and other fibrous minerals, one of which is a guideline developed by the IRSST called "Fiber Count 243-1".

Clemex was provided with fifteen (15) microscope slides containing amosite ready to be analyzed. The purpose of the analysis was to see if the software could detect and count the amosite fibers by using a particular grid pattern, eliminate superfluous particles, and produce a density report.

### **Purpose of the analysis**

To demonstrate that the Clemex Vision PE system can detect fibers in a particular pattern, eliminate certain particles, analyze the fibers that remain and produce a density result. The method we used is adapted from "Fiber Count 243-1", dated 1995.

### **Procedure**

Following an initial rough focus, an auto focus is performed on the background of each field of the pattern. The pattern is arrowhead-shaped, and the columns on the right are analyzed alternately with those on the left. Using the "Advanced Multilayer Grab" instruction, the image is captured in 4 layers and reconstructed to form a focused image with a thickness of 1 micron.

Several techniques are used and combined to detect as many fibers as possible. Several filters are then applied to eliminate, as far as possible, that which should not be counted. The remaining objects, identified as fibers, are ranked and assigned a specific value, and an assessment is made of the number of fibers per cluster. A full count of the target area is then performed on each field. Chrysotile are analyzed in the same manner.

### Results

In addition to an estimate of the number of fibers per circular area of 0.785 mm<sup>2</sup>, each object is stored individually, enabling easy validation of the results. A customized report is automatically generated, and the results are saved and

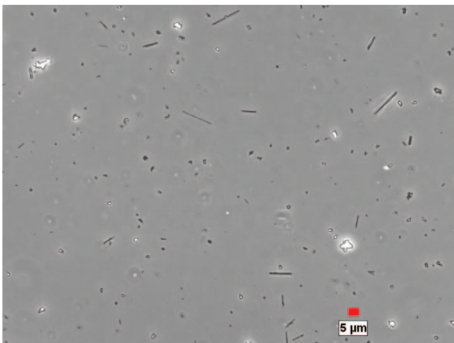
linked to the corresponding images and to each measured objects for future reference. Raw data can also be exported in Excel format.

### Discussion

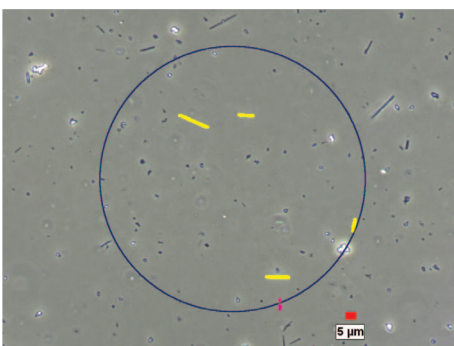
With slides containing many large particles of amosite, the auto focus tends to zero in on the top-most particles. To overcome this problem the auto focus was aimed on the surface of the slide and on small particles. Chrysotiles can be analyzed using this method with no discernable side-effects. Using this method, the thickness of Multi-layer grabs is decreased, reducing shadows, especially near white fibers.

### Amosite

Phase Contrast 400X



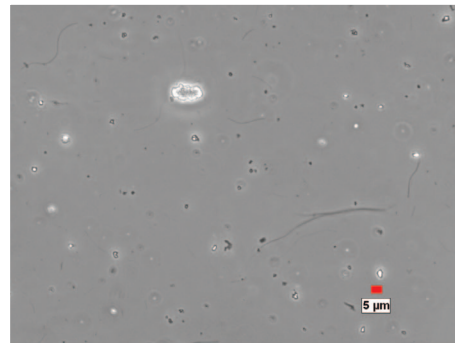
Live image



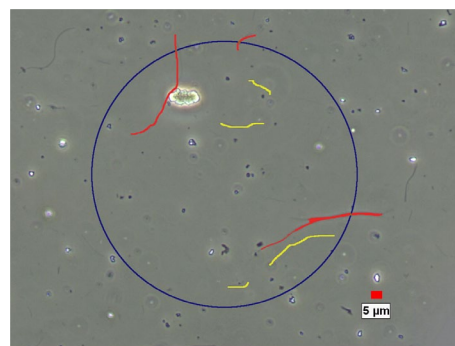
Detected image for counting

### Chrysotile

Phase Contrast 400X



Live image



Detected image for counting

### Asbestos Fiber Count

Total count of fibers*:	100.5 / 0.4495 mm <sup>2</sup>
Total number of analyzed fields:	46
Fiber density:	224/ mm <sup>2</sup>

\* Fiber: String Length > 5 microns, String Width < 3 microns, Ratio Length/Width > 3:1

