



Title: MODIFIED FDA OPTICAL FOR ASBESTOS IN TALC

1. The method is essentially similar to the procedure as outlined by A. E. Schulze and W. V. Eisenberg of the U. S. Food and Drug Administration, Washington, D.C., August 20, 1973. Considerable experience is necessary to obtain a uniformly well-dispersed sample on the slide.
2. Equipment, etc.:
  - A. Leitz Orthoplan Petrographic Microscope.
  - B. Magnification 500X. Resolution is 0.4 micron. (1)
  - C. Diameter of field at 500X is 0.350 mm.
  - D. Area of the field at 500X is  $0.096\text{mm}^2$ .
  - E. Area of 100 fields (which are taken at random) is equal to  $9.60\text{mm}^2$ .
  - F. Use 18 x 18 mm square cover slip over 1 mg of sample. Area of the cover slip is  $342\text{mm}^2$ .
  - G. For each fiber detected in 100 fields, multiply by 34 for total number of fibers in 1 mg sample.
  - H. If the population of asbestos is heavy, only 5 to 10 fields are necessary for counting which is then extrapolated to the entire sample under the cover glass.
  - I. Use OSHA definition of fiber: 5 microns or greater in length and a length-to-width aspect ratio of at least 3:1.

(1) Note: 500X magnification is recommended rather than the approximately 400X of the original procedure in order to (a) assure Becke Line determination; and (b) field contains fewer particles and is less confusing.

It should be recognized that theoretically we could observe at 500X some fibers which might not be determined at 400X, thus resulting in a slightly higher "asbestos fiber count" than for the same sample observed at 400X.

3. From a petrographic viewpoint, we prefer to go immediately after "culprits" with appropriate index oils rather than the two-slide method as proposed by Schulze and Eisenberg

in which asbestos fibers are counted relative to talc indices of refraction. This method presents too many technical (optical) problems and can be misleading. For example, if sepiolite fibers are present, and using the FDA 1.574 liquid slide, these fibers have to be counted as chrysotile.

4. Be sure the material is essentially talc. Use liquid with  $n$  of 1.590 for confirmation and at same time look for apparent gross contamination.
5. The Becke Line is extremely difficult to interpret on fibrous-appearing talc. More often than not, there is disagreement among petrographers in the same laboratory on precisely the same fibrous-appearing talc particle as to whether the Becke Line is moving in or out. With experience, however, the talc particles standing on edge can readily be determined by the relatively high interference order color. Also, in an oil of 1.556 under plane polarized light, the particles will match the oil from an angle of approximately  $45^{\circ}$  to  $80^{\circ}$ , but never in the N-S or E-W directions.
6. If not present as large bundles, the most difficult asbestos mineral to determine is chrysotile. The gamma index (X-direction) we use is 1.556. Prepare 1 mg slide with 1.556 oil and proceed with determination. Under conditions of crossed Nicols and near maximum light intensity, proceed to look for chrysotile showing maximum interference color at  $45^{\circ}$ . Now check for parallel extinction. Switch to plane polarized light, reduce the light intensity and iris diaphragm for contrast and check the gamma index. If fiber is chrysotile, it will nearly disappear or show Christiansen effect for gamma index. Rotate the stage  $90^{\circ}$  to get relative bearing of Alpha index. The fiber should now stand out in high relief with Becke Line going into the oil. Then check for positive elongation.
7. The most common asbestiform amphibole to be associated with talc is tremolite. Prepare 1 mg slide with 1.622 oil (gamma index for tremolite) and proceed with determination (now, all non-tremolitic particles stand out in high relief). Go for tremolite's most characteristic feature which is inclined extinction of about  $10^{\circ}$  to  $14^{\circ}$  (gamma index to the Z direction). At position of extinction check for gamma index. If these match, rotate stage  $90^{\circ}$  to get relative reading of Alpha index which is below 1.622. Confirm tremolite with positive elongation.

8. If Step 7 indicates the presence of amphibole fibers other than tremolite by differences in extinction angle or index of refraction, then these can be determined by routine petrographic methods. Once species is established use same procedure as in (7) (1 mg of sample on slide in a characteristic oil of the mineral for counting purposes) giving due allowance for differences in extinction angle and elongation.

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