



## National Institute of Standards & Technology

### Report of Investigation

### Research Material 8411

### Mixed Asbestos Research Filter

Research Material (RM) 8411 consists of a section approximately one centimeter square of collapsed mixed cellulose ester filter with a high concentration of chrysotile asbestos and a medium concentration of grunerite (Amosite asbestos. [Amosite is a commercial name and acronym for grunerite asbestos originating from Asbestos Mines of South Africa]. The filter section is attached to a glass microscope slide. This RM is intended for use in developing and refining sample preparation and analytical procedures for the determination of the asbestos concentration in ambient air samples by phase contrast light microscopy, scanning electron microscopy, and transmission electron microscopy.

RM 8411 is also useful for training personnel in the preparation of mixed cellulose ester filters as detailed in the Environmental Protection Agency's method for analysis of asbestos in air to determine completion-of-response actions (1) and in National Institutes of Occupational Safety and Health Method 7402. The filter material can also be used to train operators to distinguish between grunerite asbestos and chrysotile asbestos and to use x-ray spectrometry, electron diffraction, and morphology for asbestos identification.

#### Material Preparation

The chrysotile and grunerite asbestos samples were dispersed in water and filtered through a 0.1  $\mu\text{m}$  mixed cellulose ester filter. The filter was then collapsed onto a light microscope slide using dimethyl formamide, oxygen plasma etched, and coated with carbon (2) to prevent particle loss during storage and handling.

Measurements leading to the development and production of this RM were performed in the Gas & Particulate Science Division by E.B. Steel, J.J. Sheridan, and C.J. Poston.

The overall direction and coordination of the technical measurements leading to the development of this RM were performed by E.B. Steel.

Statistical analysis and interpretation of data was provided by S.D. Leigh of the Statistical Engineering Division.

The technical and support aspects involved in the preparation, certification, and issuance of this RM were coordinated through the Office of Standard Reference Materials by R.L. McKenzie.

#### Fiber Counts

The fiber concentration for 17 randomly selected filter sections are listed in Table 1. The concentrations of the two types of asbestos are determined by field-of-view counts using operators whose performance has been characterized to have an average accuracy of greater than 90% for fibers longer than 0.5  $\mu\text{m}$  by the verified counting method (3).

The average loading for the 17 analyzed filter sections is 138 chrysotile fibers per 0.01  $\text{mm}^2$  area of filter with one standard deviation for a single measurement of  $\pm 33$  chrysotile fibers. The average grunerite loading is 43 fibers per 0.01  $\text{mm}^2$  area of filter with one standard deviation for a single measurement for the 17 measurements of  $\pm 13$  amosite fibers. Approximately 5% of the chrysotile fibers and 8% of the grunerite fibers are greater than 5  $\mu\text{m}$  in length.

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Table 1.

Asbestos concentration in fibers per 0.01 mm<sup>2</sup>

Section	chrysotile	grunerite
1	97.24	55.19
2	86.73	42.05
3	173.46	57.82
4	115.64	44.68
5	159.26	50.73
6	183.97	52.56
7	157.69	49.93
8	162.94	18.40
9	141.92	21.02
10	78.84	44.68
11	128.78	18.40
12	134.03	36.79
13	139.29	44.68
14	99.87	44.68
15	177.40	63.07
16	141.92	39.42
17	171.62	49.93

Instructions for Preparing and Counting Filter Sections

The preparation of RM 8411 filter sections should follow the procedures outlined in the EPA Asbestos Containing Materials in Schools (1) for mixed cellulose ester filters starting after the carbon coating procedure (page 41881 section 8h) or those outlined by Burdette and Rood (2), again after the carbon coating step. The centimeter square area of the filter section is sufficient material to make several TEM grid preparations.

1. Asbestos-Containing Materials in Schools; Final Rule and Notice, 40CFR Part 763, Fed. Reg., 52, No. 210, pg 41857-41894, October 30, 1987.
2. G.J. Burdette and A.P. Rood, Environ. Sci. Technol., 17, pg 643-648, 1983.
3. E.B. Steel, J.A. Small, Anal. Chem., 57, pg 209-213, 1985.