

MICRODIFFRACTION ANALYSIS OF FIBROUS TALC: ASBESTOS IN CRAYONS

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In the spring of 2000 the popular press reported on possible asbestos contamination in crayons. The reported contamination resulted from fibers present in the talc component of the crayons. It has been known for at least 40 years that fibers can be found in talc that are either pure talc fibers, or that have the characteristics of an intergrowth of amphibole (tremolite or anthophyllite) and talc [1, 2]. The optical properties of the fibers are consistent with an intergrowth of amphibole and talc [3], and selected area electron diffraction (SAED) patterns can be obtained that show an overlap of the two phases. Asbestiform tremolite and anthophyllite are regulated as asbestos, but fibers of mixed mineral assemblages that have physical properties outside the range of asbestos are not.

Although the general characteristics of the fibers in talc have been known for decades, recent questions have arisen as to the potential for pure anthophyllite fibers to exist within the population of fibers from the talc deposits in New York. The composition of anthophyllite and talc are too similar to allow for a reliable chemical means of phase analysis of individual fibers. The variation in SAED patterns expected for the population of fibers is not well understood, therefore the distinction between mixed fibers and anthophyllite fibers by TEM is problematic. Bulk XRD patterns show the presence of both anthophyllite and talc, but not the relative percentages within individual fibers. Microbeam x-ray diffraction (MXRD) and SEM-based electron backscatter diffraction (EBSD) provide a unique opportunity to resolve some of the issues confounding the analyses of these materials. In this study, we have demonstrated that MXRD patterns can be obtained from single fibers to test for the presence of pure anthophyllite fibers. EBSD patterns were also obtained from single fibers, and the characteristics of these EBSD patterns are compared with those from anthophyllite fibers and talc (non-fibrous).

[1] Stemple, I.S. and Brindley, G.W. (1960) *J. Am. Ceram. Soc.* 43, 34-42.

[2] Virta, R.L. (1985) Bureau of Mines Report of Investigation 8923, 11 pages.

[3] Greenwood, W. (1998) M.S. Thesis, Department of Geology, University of MD, College Park, MD 20742.