The optical properties and x-ray data indicate that the fayalite is not pure Fe_2SiO_4 but probably contains small amounts of additional cations that have been admitted into the orthosilicate structure thereby slightly modifying the crystal structure and properties (Ford, 1935).

The fayalite is a very minor constituent of the pegmatite with only about 12 pounds of the mineral having been collected to date. The only other accessory mineral in the pegmatite is biotite, which occurs throughout both the microcline zone and the quartz core in plates and crystal sections up to 3 inches in diameter.

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THE GROWTH OF SYNTHETIC CHRYSOTILE FIBER

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In the course of numerous studies on the formation of inorganic fibrous material, considerable attention has been drawn to the synthesis of chrysotile asbestos because of the desirable properties of this material in technological applications. Chrysotile has been synthesized under hydrothermal conditions by Jander, W. and Wuhrer, J., (1938) and many others, but the crystals formed were generally in matted fibrils, about 1μ in length, which could be recognized only by examination with the electron microscope. This investigation was undertaken in our laboratory as part of a research program on the ternary system MgO-SiO_2-H_2O to increase knowledge of the genesis and the crystal structure of serpentine materials (Yang, 1960).

It was found that synthetic chrysotile fiber growth can be promoted by employing proper mineralizers, trace elements and controlled pH mediums in the hydrothermal synthesis. Fiber bundles formed under these conditions average 100μ or more in length, but individual fibers are about 15–20μ. These consist mainly of clinochrysotile with trace amounts of platy lizardite.

Experimental

Optimum conditions for hydrothermal synthesis are tabulated as follows:

Starting Materials:

Magnesium oxide (c.p) and special bulky silicic acid mixtures of MgO/SiO_2 molar ratio 1.5, water/solid ratio 10

Temperature (C)	300–350
Pressure (psi)	1230–1800
Time (days)	5– 10
pH of the system	10.3 to 10.7 controlled by adding Na_2CO_3 or Na_2CO_3-$NaHCO_3$ buffer
Mineralizer	An amount of F^- equivalent to 1–2% by weight of the starting material in the form of 0.01N NH_4F solution.

From rate of formation studies, it was found that bundles of fibers of maximum length 50μ together with tightly matted crystal aggregates were formed at the end of 6 hours. No unreacted magnesia, magnesium hydroxide or silica was detected by x-ray diffraction, but these compounds were found in trace amounts under microscopic examination.

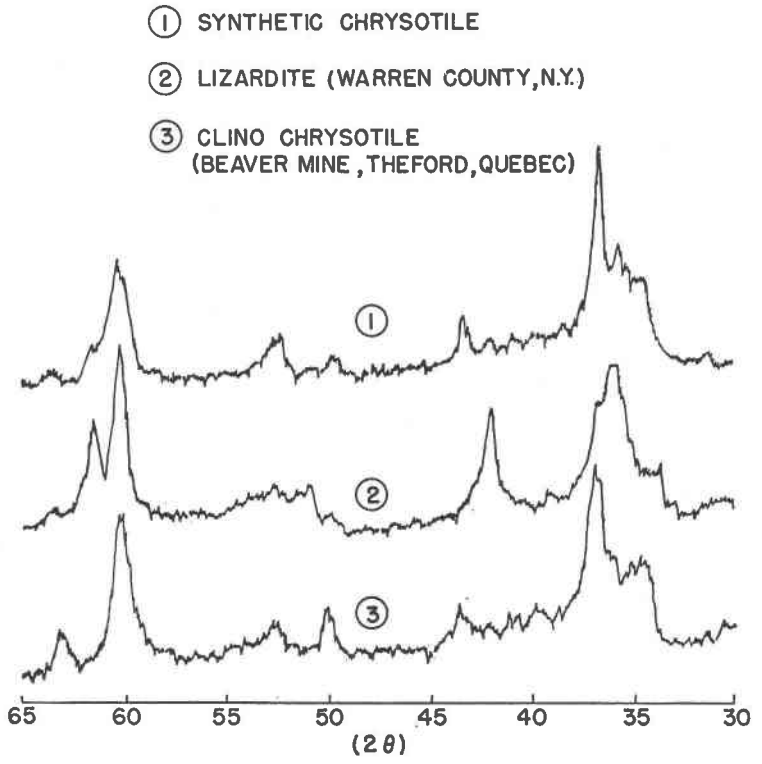


FIG. 1. X-ray diffraction patterns of synthetic clinochrysotile, lizardite and natural chrysotile.

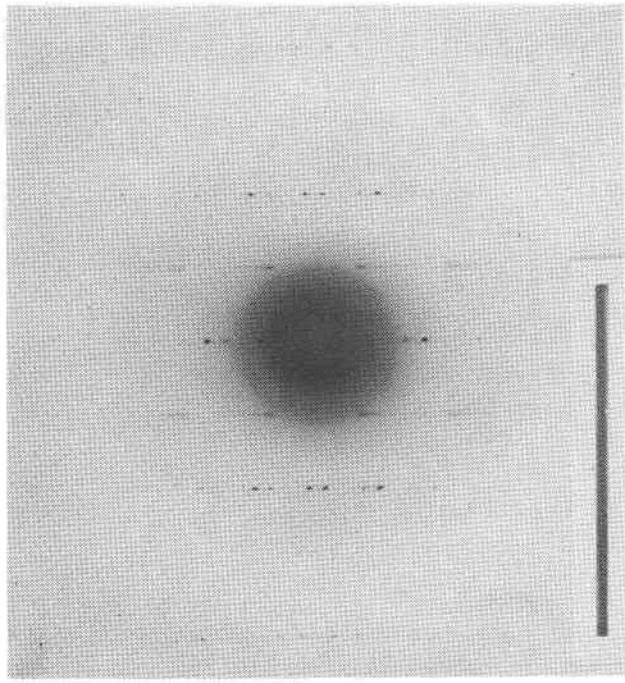


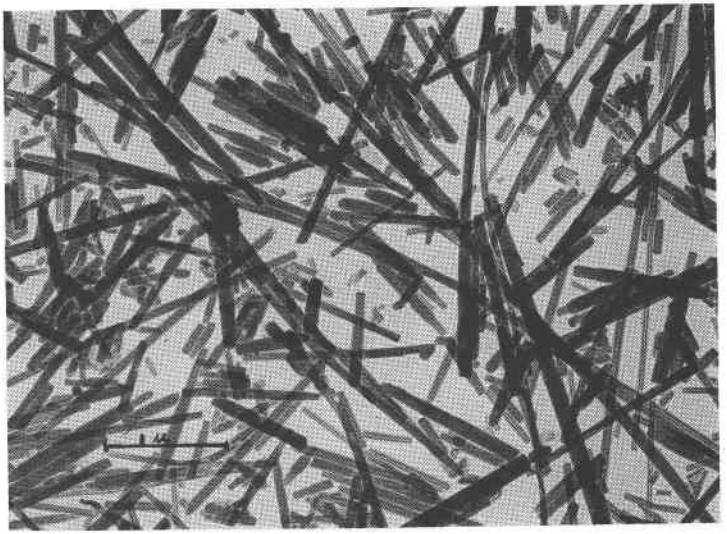
FIG. 2. Electron diffraction pattern of a single crystal of synthetic fiber of clinochrysotile.

The amount of crystal aggregates decreased as the reaction time was lengthened; eventually these aggregates converted entirely to fiber bundles.

CHARACTERIZATION

The synthetic chrysotile was subjected to chemical analysis, petrographic examination, *x*-ray diffraction, DTA and thermal dehydration studies. The chemical composition, crystal structure, and all its properties resemble those of natural chrysotile.

The fine resolution of the *x*-ray diffraction peak between diffracting angle 2θ 35–90° (Fig. 1) and the electron diffraction pattern of the single fiber crystal indicated the predominant species in the synthetic sample to be clinochrysotile (Fig. 2) as described by Whittaker, et al. (1956) and Zussman, et al. (1957). No antigorite was observed, but a trace amount of platy lizardite was also found to be present. Again, this frequently occurs as the major component in fibrous chrysotile, as is indicated in the findings of Whittaker and Zussman and from the observations made on samples from Bell mine, Thetford, Quebec and Jeffrey mine, Asbestos, Quebec.



(*a*)

(*b*)

FIG. 3. Electron Micrographs of Synthetic Chrysotile. *a*. Opened Fibers ×16,000. *b*. Bundles of Fibers ×4000.

Electron micrographs of the synthetic substance showed that the fibers are extremely thin but have thick tube walls, The pronounced "cone-in-cone" effect often observed in synthetic chrysotile described in the literature was greatly reduced, and the individual fibers appeared to be more or less uniform in size (Fig. 3). The outside diameter of the

fiber was about 300–400 Å, and the inside diameter averaged 50 Å. The inner voids were partially filled with amorphous material as is true of natural chrysotile (Bates, 1958).

Chemical analysis of the pure synthetic material indicated that no foreign ions from the mineralizer had entered the structure.

Acknowledgment

The author wishes to express her appreciation to Mr. Morrow C. Miller, who prepared the electron micrographs and electron diffraction pattern and Dr. Jurg W. Meyer for helpful suggestions regarding the electron diffraction work in this study.

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QUICK IDENTIFICATION OF POTASH FELDSPAR, PLAGIOCLASE, AND QUARTZ FOR QUANTITATIVE THIN SECTION ANALYSIS

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Describing his simple and useful point counter, Chayes (1949) rightly remarks (p. 9): "Only an operator whose bravery exceeds his wisdom will attempt analyses when he has reason to suspect that errors of identification will be more than a trifling component of the total precision error." He took a good step towards eliminating such errors when he simplified the procedure of staining potash feldspar with HF and cobaltinitrite (Chayes, 1952).

In this connection I want to describe a still simpler modification of the procedure, developed by several workers at the Geological Museum, Oslo, and successfully used by the present author and many others:

Pour a little HF into the bottom of a plastic coverglass box (such as