

be satisfactory. The third compound contained impurities which produced interfering diffractions. In addition, metallic lead diffraction patterns were observed in a few cases in which "silicone compound" from lead tubes was used. Spectrographic analysis of ignited residues of "silicone compound" from the lead tube and a glass jar supplied by a manufacturer indicated the lead was a contaminant introduced by the lead tube and that lead was not detectable in the "silicone compound" from the glass jar. "Silicone compound" was found to contain: (1) Si- a major constituent, (2) B-0.0X% and (3) Mg-0.000X%. The amount of lead contamination in the "silicone compound" from the lead tube was 0.0X%.

A satisfactory "silicone compound" (Silicone compound No. 8101 Transistor Z-5) is made by General Cement Manufacturing Company, 3225 Exposition Place, Los Angeles 18, California, U.S.A. or 400 South Wyman Street, Rockford, Illinois, U.S.A. The pure "silicone compound" in a glass jar was obtained by written request.

REFERENCE

- LEVINSON, A. A. AND C. H. HEWITT, (1952), Lead contamination in Duco cement. *Am. Mineral.*, **37**, 864-866.

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POLYTYPISM IN CRONSTEDTITE¹

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Cronstedtite from Kuttenberg, Bohemia, was shown by Hendricks (1939) to have a three-layer rhombohedral structure related to that of kaolinite. Fe³⁺ systematically replaces half of the Si, valence compensation being affected by replacing the unshared oxygen of the Fe³⁺ tetrahedrons by (OH). The idealized trioctahedral relation to kaolinite may be written as below.

Cronstedtite	Fe ₃ ²⁺	(Fe ₁ ³⁺ Si ₁) ₂	O ₄ (OH)	(OH) ₄
Kaolinite	Al ₂	Si ₂	O ₅	(OH) ₄

The reported chemical analyses of cronstedtite indicate that the octahedral layer may also contain Mg, Ca, Mn, Al and Fe³⁺ in part and that it need not be completely filled.

Cronstedtite from a new locality at the Cornucopia mine, Nye County,

¹ Mineralogical Contribution No. 405, Harvard University.

TABLE 1. POLYTYPIISM IN CRONSTEDTITE

Name	Lattice type	Cell dimensions in hexagonal coordinates (Å)		Localities
		<i>a</i>	<i>c</i>	
Cronstedtite-1H	Hexagonal	5.50 Å	7.09	Nye County, Nevada. Also Kisbanya, Roumania; Kuttenberg, Bohemia; Wheal Jane, Cornwall; Llallagua, Bolivia.
Cronstedtite-2H	Hexagonal	5.50	14.19	Prizbram, Bohemia. Also Llallagua, Bolivia; Eisleben, Germany.
Cronstedtite-3R	Rhombohedral	5.49	21.29	Kuttenberg, Bohemia. (Also Hendricks, 1939)
Cronstedtite-6H	Hexagonal	5.49	42.50	Steadman and Youell, 1957 (unstated locality)
Cronstedtite-9R	Rhombohedral	9.56	63.85	Nye County, Nevada. Also Cornwall.

Nevada, was examined by the Weissenberg and precession methods in Mo and Cu radiation and by Laue photographs. The crystals, 0.1 to 0.5 mm in size, are jet black with a brilliant vitreous luster, and give specular reflections from the (0001) cleavage. Two types of crystals were found. Eighteen of the 20 crystals x -rayed comprised smooth or vertically striated cones terminated by the pedion {0001}. These had a 1-layer hexagonal structure with $a=5.50$ Å, $c=7.09$ Å. This polytype probably is identical with the material from Kisbanya, Hungary, described by Gossner (1935). His crystals were mechanically deformed and yielded a monoclinic but pseudo-orthohexagonal cell, identical with that found here. Two of the Nevada crystals were trigonal pyramids {10 $\bar{1}$ 9} terminated by the pedion {0001}. These proved to be a 9-layer polytype, based on a rhombohedral lattice with $a=9.56$ Å, $c=63.85$ Å, in hexagonal coordinates.

A survey made by single-crystal x -ray methods of cronstedtite from many of the known localities established that the 1-layer hexagonal polytype is relatively common. A 2-layer hexagonal polytype was identified, and the existence of the 3-layer rhombohedral polytype of Hendricks (1939) was confirmed. The observations are listed in Table 1. The 1H, 2H and 3R polytypes also have been observed by Steadman and Youell (1957) together with a 6H polytype not encountered in the present study. Their work was published at almost the same time that an ab-

stract of the present findings appeared (Fron del, 1957). The 1H polytype also appears to have been observed by Bannister (1938) on material from Wheal Jane, Cornwall. At all of the localities mentioned in Table 1 the mineral occurs as a low-temperature hydrothermal product associated with siderite, pyrite, sphalerite and quartz in sulfide veins.

Stacking disorder, already noted by Hendricks (1939) in his 3R material, is particularly marked in the 9R polytype from Cornwall. It appears as diffuse scattering in zones with constant h and k indices, variable l , and h not a multiple of 3, due to random displacements of $na/3$. Steadman and Youell also mention a disordered 1H polytype. All of the polytypes have marked pseudo-cells with $a=3.19 \text{ \AA}$ and $c=7.09 \text{ \AA}$ (1H), 14.19 \AA (2H), 21.29 \AA (3R) or 21.28 \AA (9R). The true and pseudo-cells are related by a 90° rotation around the c -axis in the 1H, 2H and 3R polytypes and are parallelly oriented in the 9R polytype.

REFERENCES

- BANNISTER, F. A. (1938), cited in HALLIMOND, A. F. On the relation of chamosite and daphnite to the chlorite group. *Mineral. Mag.* 25, 441.
FRONDEL, C. (1957), Polymorphism in cronstedtite (abs.) *Bull. Geol. Soc. Am.* 68, 1731
GOSSNER, B. (1935), Über cronstedtite von Kisbanya. *Zent. Mineral.* 1935A, 195.
HENDRICKS, S. B. (1939), Random structures of layer minerals as illustrated by cronstedtite. *Am. Mineral.* 34, 529.
STEADMAN, R. AND R. F. YUELL (1957), Crystallography and thermal transformations of cronstedtite. *Nature*, 180, 1066.

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FERROAN ANTIGORITE (JENKINSITE)¹

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The ill-defined mineral jenkinsite, here shown to be a ferroan variety of antigorite, was named by C. U. Shepard (1852) in 1852. Two chemical analyses were reported by J. L. Smith and G. J. Brush in 1853. The mineral was later placed by E. S. Dana (1892) together with hydrophite among various ill-defined substances allied to serpentine. Jenkinsite was found as greenish coatings on fissures lined with magnetite crystals at O'Neil's mine near Monroe, Orange County, New York. This mine is one of a number of small magnetite deposits found in the Precambrian Grenville formation of the Highlands of New York and northern New Jersey.

Authentic specimens of jenkinsite are preserved in the Harvard, U. S. National Museum and American Museum of Natural History collec-

¹ Mineralogical Contribution No. 406, Harvard University.