

FIRST U. S. OCCURRENCE OF MANGANOAN  
CUMMINGTONITE, TIRODITE

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ABSTRACT

Tirodite, a Mn amphibole, was discovered in an Indian manganese deposit in 1938. It has now been found in the form of transparent pink crystals at Talcville, New York. The properties are compared with those of cummingtonite. Since the Talcville material is very low in Fe, the specific gravity and refractive indices are lower than those reported for the Indian material.  $\alpha=1.620$ ,  $\beta=1.630$  and  $\gamma=1.635$ . New chemical analyses are given of the tirodite and two tremolites from Talcville.

INTRODUCTION

During a recent visit to the International Talc Co. mines at Talcville, N. Y., in search for more specimens of groutite (Segeler, 1960), some light pink fibrous masses were found, in which were embedded distinct bladed pink crystals an inch in width and up to three inches long. (Fig. 1). The pink crystals were well known to the mine operators, and had been analyzed by Mr. Orton Smalley, the mine chemist. The high Mn and low Ca contents suggested that this material is not tremolite. Dr. Brian Mason of the New York Museum of Natural History kindly made an *x*-ray powder photograph, which was found to resemble that of cummingtonite. Three lines not found in cummingtonite are present, and the intensities of some lines vary.

The name cummingtonite refers to the monoclinic Fe-Mg amphibole. The new mineral is clearly a Mn-Mg amphibole, and is sufficiently different to be identified by a varietal name. In 1851, Erdmann found an Fe-Mn amphibole which he called dannemorite, after its Swedish locality (Dana, 1884). This is now regarded as a varietal name of cummingtonite. However, the new Talcville mineral does not resemble dannemorite.

Before proposing a new name for this variety, a search was made in the Indian Geologic Survey Records. Dunn and Roy (1938) described a Mn-amphibole which they had found at a manganese mine at Tirodi, India, and named it tirodite. Bilgrami (1955) reported the same mineral from the Sitasgoni Mine, Chikla, India. He also repeated the analysis of a specimen from Tirodi. His data do not closely match those of the Talcville material, but this is probably due to the difference in Fe content. The same mineral has also been reported from Nagpur, India, by Zwaan and van der Plas (1958). Their *x*-ray data are in general agreement with the data given in this paper.

A specimen of tirodite from Tirodi, India, has been compared with the

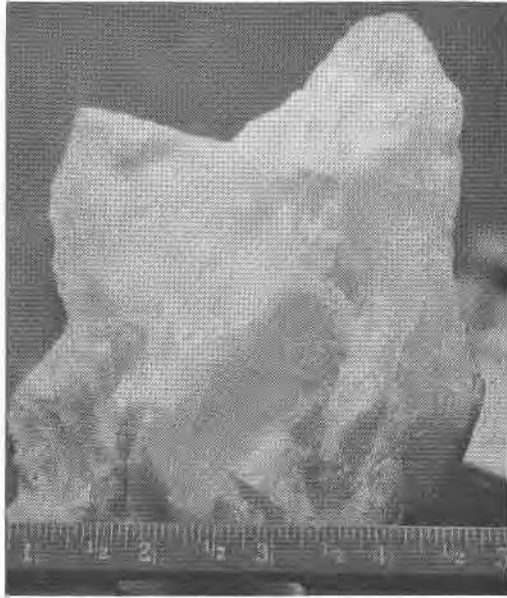


FIG. 1. Typical specimen of tirodite from Talcville, N. Y.

Talcville material. *X*-ray powder photographs taken by Dr. Brian Mason of these two tirodites match very closely (Fig. 2) and the optical data, other than the refractive indices, check very well.

#### PROPERTIES OF TIRODITE

Tirodite occurs at Talcville in transparent pink blades embedded in a matrix of fibrous pink anthophyllite. Both the association and occurrence are quite different from the Indian material.

Monoclinic: cleavage (110) perfect. (100) imperfect. Striated parallel to *c*, and shows

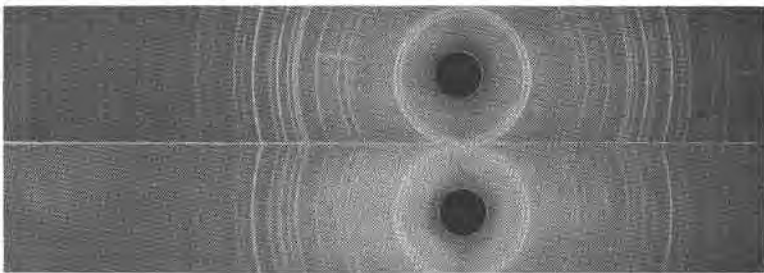


FIG. 2. *X*-ray powder photographs of tirodite. Above—Talcville, N. Y.; below—Tirodi, India.  $\text{FeK}_\alpha$  radiation.

TABLE 1. CHEMICAL ANALYSES OF TIRODITE AND TREMOLITE

	Tirodite						Tremolite	
	Talcville (1)		Chikla (2)	Tirodi (3)	Tirodi (2)	Chavel-tice (4)	Talcville (1)	
	Pink	Rose					Dark purple Hexagone	White
SiO <sub>2</sub>	58.80	58.78	53.26	53.26	53.25	53.69	58.96	59.16
TiO <sub>2</sub>			0.78		0.79			
Al <sub>2</sub> O <sub>3</sub>		0.58	2.26	1.25	2.31	1.65		
Fe <sub>2</sub> O <sub>3</sub>	1.20						1.48	0.88
FeO		0.72	2.60	2.63	1.81	0.32		
MgO	24.80	25.86	1.12	1.06	1.62	5.94		
CaO	2.72	2.38	29.16	31.21	28.42	20.50	24.32	24.18
MnO	2.72	2.38	1.10	1.11	3.42	1.20	12.12	12.44
Na <sub>2</sub> O	10.08	8.70	6.24	8.25	4.66	16.10	1.55	0.30
K <sub>2</sub> O			1.39	1.56	1.25			
H <sub>2</sub> O	2.54	1.26	0.09	0.07	0.06			
			1.87	0.05	2.04	0.70	2.47	2.79
Total	100.14	99.28	99.87	100.50	99.63	100.19	100.25	100.90

Analyses as follows:

1. Orton Smalley, International Talc Co.
2. Bilgrami (1955).
3. Dunn and Roy (1938).
4. Rabbitt, No. 90 (1948).

many parting lines parallel to (001). = 73°. Brittle. Hardness 6.5; G = 3.07. Optical properties: biaxial;  $\alpha = 1.620$ ,  $\beta = 1.630$ ,  $\gamma = 1.635$ ;  $2V = 74^\circ$  on universal stage; X = a, Y = b, Z = c = 16°. Pleochroism: X colorless, Y yellowish, Z colorless.

In Table 1, the chemical analyses of tirodites and two tremolites from Talcville are given, and compared with tirodite from other localities. Table 2 compares the x-ray powder photograph data of tirodite and cummingtonite.

Rabbitt (1948) discussed the role of MnO in anthophyllite and cummingtonite. He listed two specimens (41 and 43) from Edwards, N. Y. as the purest anthophyllites known. On earlier maps Talcville was not usually shown, but Edwards is an old community, and is nearest to present day Talcville. It is therefore quite probable that these two specimens are also from Talcville. They seem to be quite similar to the matrix in which the tirodite crystals are embedded. They contained 2.53

TABLE 2. COMPARISON OF X-RAY DATA FOR TIRODITE AND CUMMINGTONITE  
CAMERA DIAMETER 114.6 MM.; FeK $\alpha$ , Mn FILTER

Tirodite (Talcville)		Cummingtonite (New Zealand)		Tirodite		Cummingtonite	
<i>d</i>	I	<i>d</i>	I	<i>d</i>	I	<i>d</i>	I
9.03	7	9.41	4	2.19	4	2.21	5
8.35	9	8.51	10	2.09	2	2.11	2
5.16	2	5.28	1	2.04	1	2.05	2
4.85	4	4.87	1	1.973	1	1.961	2
4.53	5	4.60	1	1.870	2	—	—
4.17	2	4.17	2	1.811	1	1.801	1
3.88	6	3.90	3	1.707	3	—	—
3.44	3	3.51	3	1.661	5	1.667	3
3.36	3	3.38	2	1.629	2	1.639	1
3.25	5	3.28	3	1.598	3	1.605	2
3.09	8	3.10	9	—	—	1.561	1
2.98	6	3.01	2	1.517	4	1.526	3
2.74	10	2.77	10	1.492	1	—	—
2.61	4	2.64	6	1.415	4	1.410	5
2.52	6	2.53	7	1.380	2	1.389	1
2.32	3	2.31	2	1.298	4	1.336	1
2.26	1	2.24	1	1.187	3	1.305	4

and 2.77% Mn, respectively. It appears likely that geologic conditions favored Mn enrichment to the point where tirodite was formed. Such Mn concentration has previously been mentioned as a possible explanation for the formation of groutite at this locality.

Rabbitt stated that x-ray data for the specimen from Chaveltice, Czechoslovakia (No. 90) showed it to be monoclinic, and that in light of its composition, it was dannemorite. In order to evaluate this conclusion, and also to furnish a more complete picture of the MnO:FeO:MgO ratios in some of these amphiboles, the diagram of Fig. 3 was prepared. The following analyses were used: tirodites from Table 1; cummingtonites from Rabbitt's Table 7, and from Mason (1953); and dannemorite from Dana and No. 84 of Rabbitt.

It seems that the groupings of the points is significant. The tirodites, low in FeO, approach the ideal Mg-Mn amphibole. Cummingtonites show up as Fe-Mg amphibole, with little MnO. Dannemorite is recognizable as a Mn-Fe-Mg variety. No. 90 of Rabbitt, which he called dannemorite, appears to be more appropriately grouped with the tirodites.

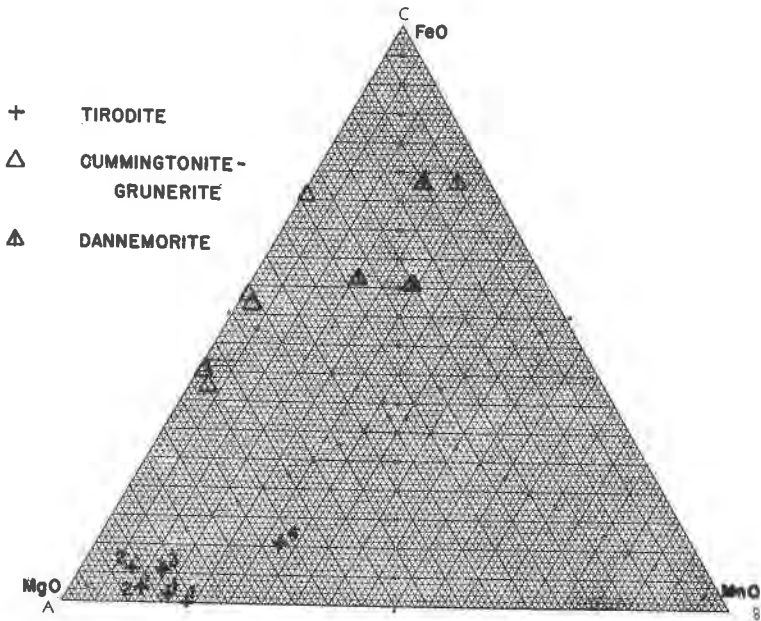


FIG. 3. Diagram showing relative amounts of MgO, FeO and MnO in tirodites (+), cummingtonite-grunerite ( $\Delta$ ), and dannemorite ( $\Delta$ ). The numbers for tirodite correspond to Table 1; cummingtonite-grunerite are from Rabbitt's Table 7; dannemorite from Dana and No. 84 of Rabbitt.

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