

MINERALOGICAL NOTES

ANTIMONIAN GROUTITE

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Groutite has been identified as thin rectangular plates up to 0.5 mm on edge lining an open veinlet in andradite and franklinite ore from Franklin, New Jersey. Electron microprobe analysis surprisingly revealed the presence of Sb. Quantitative determinations² gave Sb 5.7 ± 0.5 percent and Mn 56.3 ± 1 percent, corresponding to Sb_2O_5 7.6 percent and Mn_2O_3 80.9 percent. Fe, Al, Zn and Si were not detected. If the remainder, 11.5 percent, is taken as water the analysis corresponds to $(\text{Mn}_{0.89}\text{Sb}_{0.04})\text{O}(\text{OH})_{1.11}$. The unit cell dimensions obtained by least squares refinement (Burnham, 1962) of selected lines in the X-ray powder diffraction pattern (Table 1) are: a 4.558 ± 0.005 Å, b 10.727 ± 0.034 , c 2.894 ± 0.004 Å. The calculated density based on the electron probe analysis and the measured unit cell dimensions is 4.16. Collin and Lipscomb (1949) obtained a 4.58 Å, b 10.76, c 2.89 on the type groutite of Gruner (1947) from the Cuyuna Iron Range, Minnesota. The calculated density of this material is 4.17 and the value measured by Gruner is 4.144.

The crystals were found by X-ray single-crystal study to be flattened on (010) and elongated [001]. There is an almost micaceous cleavage on (010) and an indistinct cleavage on (100) or (110). Very thin cleavage flakes tend to undulate or warp. The color is black. In very strong illumination the mineral is translucent and deep reddish brown in color. Optically positive, with the axial plane (010) and X parallel to [001]. Extinction parallel; 2V medium. Strongly pleochroic, with α 2.1–2.2 (yellowish brown), γ 2.1–2.2 (dark brown to purplish black). The optical orientation is identical with that of diaspore. Optical data are lacking for groutite from Minnesota and for montroseite, both of which are virtually opaque.

The presence of Sb in groutite is of interest in connection with the puzzling silicoantimonides of manganese catoptrite and yeatmanite (the latter known only from Franklin). These complex minerals are structurally related to pyrochroite (and groutite) and may be stuffed derivatives thereof (Moore, 1966). If the Sb is present as Sb^{5+} in the Franklin

¹ Mineralogical Contribution No. 432.² Analytical conditions: 30 KV accelerating voltage and 0.04 microamperes specimen current. Synthetic MnO_2 and Sb metal used as standards. Absorption corrections after Philibert (1963), atomic number corrections after Poole and Thomas (1962), mass absorption coefficients taken from Heinrich (1964).

TABLE 1. X-RAY POWDER DATA FOR ANTIMONIAN GROUTITE

<i>I</i>	<i>hkl</i>	<i>d</i> , meas.	<i>I</i>	<i>hkl</i>	<i>d</i> , meas.
2 <i>b</i>	020	5.280	3	330*	1.3973
10 <i>bb</i>	110	4.181	2	112	1.3667
2	120	3.447	2	301	1.3468
1	001	2.9540	2	311	1.3356
8 <i>b</i>	130}	2.7842	<i>f</i>	321	1.3057
	011}		2	132}	1.2839
8 <i>b</i>	040	2.6430		180}	
2	021*	2.5371	1	270	1.2705
7	111*	2.3750	3	331	1.2594
8	200*	2.2881	1 <i>b</i>	202	1.2236
3	121	2.2129	2 <i>b</i>	341	1.2020
2	131	2.0044	2 <i>b</i>	360	1.1558
3	230*	1.9199	3 <i>b</i>	190	1.1481
<i>f</i>	141	1.8070	3	410	1.1359
<i>f</i>	201	1.7946	1	242	1.1105
4	211*	1.7647	1		1.0883
5	051*	1.7271	1 <i>bb</i>	370	1.0745
8	221*	1.6955	3		1.0639
7	231*	1.5992	2		1.0498
2	250}	1.5521	<i>f</i>		1.0297
	070}		1		1.0208
6	310*	1.5071	3		1.0065
2	320	1.4610	2		0.99809
<i>f</i>	170	1.4450	<i>f</i>		0.99840
3	012*	1.4366			

* Used in unit cell refinement.

b=broad, *bb*=very broad, *f*=faint.

FeK α radiation, 1.93728 Å, Mn filter. Film recording (camera diameter 114.59 mm) corrected for shrinkage. Visual intensities.

material, valence compensation may be effected by the omission of H from a hydrogen bond analogous to the series extending from montroseite, VO(OH), to paramontroseite, VO₂ (Evans and Mrose, 1955).

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THE AMERICAN MINERALOGIST, VOL. 52, MAY-JUNE, 1967

THE MORPHOLOGY OF MCKELVYITE

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Mckelvyite crystals from four subsurface occurrences in Sweetwater County, Wyoming, were described by Milton, Ingram, Clark and Dwornik (1965). The mineral is a hydrous sodium barium rare-earth uranium carbonate, and the crystals were reported to be trigonal with the space group $P\bar{3}$ with only a few reflections which violated $P\bar{3}m1$ symmetry. The cell dimensions were given as a 9.174, c 19.154 Å, and the following forms were noted: $c\{0001\}$, $m\{10\bar{1}0\}$, $-m\{01\bar{1}0\}$, $r\{10\bar{1}1\}$, e

TABLE 1. GONIOMETRIC MEASUREMENTS OF MCKELVYITE CRYSTALS

Form	Number of crystals	Number of measurements	Measured range		Weighted Mean	
			ϕ	ρ	ϕ	ρ
c 0001	18	18	—	0°00'	—	0°00'
r 10 $\bar{1}$ 1	5	20	29°02'–30°04'	66°03'–68°08'	30°01'	67°18'
z 01 $\bar{1}$ 1	6	22	29°40'–30°06'	67°02'–68°12'	30°00'	67°23'
e 10 $\bar{1}$ 2	9	41	29°32'–30°12'	49°10'–50°27'	30°00'	49°50'
g 01 $\bar{1}$ 2	9	38	29°28'–30°16'	49°00'–50°17'	30°00'	49°57'