

ROWEITE, A NEW MINERAL FROM FRANKLIN, NEW JERSEY

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The new mineral was found on a single small specimen from the Franklin zinc mines, collected a number of years ago by Mr. George Rowe and preserved since then as an unidentified species. The specimen, of which about a quarter was used in our study, is a narrow veinlet of almost pure roweite with only small fragments of attached ore. The new mineral is intimately associated with a silky white fibrous material, which, from its optical properties and a qualitative chemical examination, appears to be thomsonite. Franklinite, willemite and zincite are present in small amounts, the willemite rather more intimately associ-

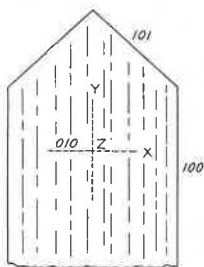


FIG. 1. Roweite. Sketch showing the tabular habit {010}, poor cleavage {101}, and optical orientation.

ated with the vein material, the other two minerals presumably part of the wall of the vein.

The crystals of roweite are light brown in color, lath shaped and without measurable terminations. Figure 1 illustrates the habit of the imperfect crystals, which permitted only rough goniometric measurements on the strongly striated prism zone. These sufficed to correlate the habit both with the optical and *x*-ray orientations.

X-ray crystallography. A Laue picture with the *x*-ray beam normal to the prism axis [001] showed a plane of symmetry normal to that axis. Equatorial and first layer line Weissenberg goniometer pictures about [001] showed the plane point group symmetry C_{2v} of Buerger (1935), that is, two central lattice lines of symmetry of unequal length and 90° apart. These *x*-ray criteria, together with the optical data presented below, prove that roweite is orthorhombic. The axial lengths a_0 and b_0 of the unit cell were determined from measurements in the equatorial

layer line picture. The length c_0 was determined from the rotation picture about the axis of elongation. These values are:

$$a_0 = 8.27\text{\AA} \pm 0.01; b_0 = 9.01\text{\AA} \pm 0.01; c_0 = 6.62\text{\AA} \pm 0.02;$$

$$a_0 : b_0 : c_0 = 0.916 : 1 : 0.735$$

A poor cleavage observed under the microscope is inclined to [001] at 48° ; it corresponds approximately to {101} for which the calculated angle is $51^\circ 14'$. No cleavage was observed in the prism zone.

Optical properties. The obtuse bisectrix Z emerges apparently normal to the flat face (010) of the imperfect crystals of roweite; the plane of the optic axes is normal to [001]. The optical orientation is therefore as shown in fig. 1.

$X = a[100]$	1.648	$\left. \begin{array}{l} 1.648 \\ 1.660 \\ 1.663 \end{array} \right\} \pm 0.003$	Negative
$Y = c[001]$	1.660		$2V = 15^\circ$
$Z = b[010]$	1.663		$r < v$, strong

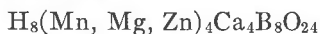
The parallel extinction in all positions about the c -axis and the measurable optic axial angle with strong dispersion are in keeping with the orthorhombic symmetry given by the x -ray measurements.

Physical properties. The density of roweite is 2.92 ± 0.02 as determined by floating a portion of the material prepared for analysis in a solution of bromoform and methylene iodide. The hardness is about 5. The crystals are brittle and break with an even fracture across the elongation.

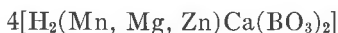
Chemical properties. The following analysis by F. A. Gonyer, was made on more than a gram of purified material:

	Analysis	Reduced to 100%	Molecular ratios	Atomic ratios	Atoms in unit cell	Theoretical comp.
MnO	28.30	28.48	0.402	Mn 0.402	3.52	27.75
MgO	1.66	1.67	0.041	Mg 0.041	0.36	1.58
ZnO	3.13	3.15	0.039	Zn 0.039	0.34	3.18
CaO	25.40	25.55	0.455	Ca 0.455	3.97	26.33
B ₂ O ₃	32.40	32.59	0.468	B 0.936	8.17	32.70
H ₂ O	8.51	8.56	0.475	H 0.950	8.29	8.46
Insol.	0.84	—	—	O 2.816	24.57	—
Total	100.24	100.00				100.00

The molecular weight of the unit cell is $M = Vd/1.65 = 873$. The atomic content of the unit cell deduced from the chemical analysis and the molecular weight of the cell is:



which may be written:



with Mn:Mg:Zn = 10:1:1. This formula has the percentage composition given in the last column in good agreement with the analysis.

Tests. Professor Palache kindly determined the following: Fuses at 1 (candle flame) to a black glass. Colors the flame faintly green. With boron flux a strong green (boron). In closed tube turns brown, gives off water and after long heating melts to a glass. Perfectly soluble in dilute HCl, solution giving boron reaction with turmeric paper.

Related minerals. The following is a list of natural borates with compositions of the type $H_2WX(BO_3)_2$:

Roweite	$H_2MnCa(BO_3)_2$
Sussexite	$H_2Mn_2(BO_3)_2$
Magnesiosussexite	$H_2(Mn, Mg)_2(BO_3)_2$
Ascharite	$H_2Mg_2(BO_3)_2$
Camsellite	$H_2Mg_2(BO_3)_2$

In addition two other borates of a similar type are:

Nordenskioldine	$SnCa(BO_3)_2$
Jeremejevite	$Al_2(BO_3)_2$

No simple calcium borate of the chemical types here given is known in nature. Sussexite, ascharite and camsellite are fibrous and said to be orthorhombic. Magnesiosussexite is a mineral intermediate in composition between sussexite and camsellite. The authors do not consider roweite to be a calcium sussexite but rather a distinct species with manganese and calcium in equal atomic proportions, and therefore in nonequivalent structural positions, just as they are presumably in bustamite, johannsenite and glaucochroite. The definite ratio Mn+Mg+Zn:Ca = 1:1, and the differences in optical properties between roweite and sussexite, show that roweite is a distinct species and not an end component of a series with sussexite.

The authors take great pleasure in naming this mineral after Mr. George Rowe of Franklin, for many years Mine Captain and for as many years an ardent collector of Franklin minerals.

REFERENCE

- Buerger, M. J. (1935): *Zeits. Krist., A.*, **91**, 255-289.