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JOHANNSENITE AND MANGANOAN HORTONOLITE FROM FRANKLIN, N. J.[1]

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JOHANNSENITE

The occurrence of johannsenite, $CaMn(SiO_3)_2$, at Franklin as "minute brown crystals embedded in bustamite" was noted by Schaller (1938). In 1952, johannsenite was found abundantly on the 900 level during the removal of pillar 910 adjacent to the Palmer shaft. It occurred as V-shaped divergent fibrous aggregates up to 2 cm in length. The color usually ranged from colorless or white to pale brown; rarely bluish green, or the terminal portions of the fibers graded from pale brownish into greenish shades. The johannsenite occurred chiefly with massive granular nasonite and calcite that filled the interstices of a breccia composed of fine-grained masses of andradite and fragments made up of manganophyllite with smaller amounts of calcite, franklinite, axinite, hancockite and willemite. The manganophyllite aggregates generally have a reaction rim of fine-grained andradite a millimeter or so in thickness. Neither bustamite nor rhodonite is immediately associated, but bustamite occurred abundantly as coarse crystals in nearby parts of the orebody. Chemically, the virtually colorless johannsenite here analyzed lacks iron and has a much higher manganese content than the material of Schaller (Table 1). An effort to obtain single-crystal x-ray photographs from the

TABLE 1. COMPOSITION AND OPTICAL PROPERTIES OF JOHANNSENITE

	1	2	1	2
SiO_2	48.29	50.30	1.699	1.697
CaO	22.59	22.97	1.712	1.706
MgO	2.84	6.19	1.734	1.725
MnO	26.10	14.85	$\gamma \wedge c$ 46°	
FeO	tr.	2.59	S.G. 3.52	
ZnO		3.27		
Total	99.82	100.17		

1. L. H. Bauer, analyst. Zn present in small amount but not determined.
2. J. G. Fairchild, analyst, cited by Schaller (1938).

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TABLE 2. ANALYSES OF HORTONOLITE

	1	2	1
MgO	16.66	16.68	α 1.741
FeO	44.15	44.37	β 1.772
MnO	5.70	4.35	γ 1.788
ZnO	nil	nil	d(130) = 2.795 Å
SiO_2	33.28	33.59	S.G. 3.92
Rem.		0.65	
Total	99.79	99.64	

1. Franklin, N. J. L. H. Bauer, analyst.

2. Monroe, N.Y. W. G. Mixter, analyst, cited in Brush and Blake (1869). Rem. is K_2O 0.39, ign. loss 0.26, CaO tr. Average of two.

microscopically sub-parallel groups of fibers was not successful; the fiber elongation is the *c*-axis, and the identity period is approximately 5.3 Å. Schiavinato (1953) obtained *a* 9.81, *b* 9.02, *c* 5.26 Å, β 105° on chemically similar material from Monte Civillino, Italy. The *x*-ray powder d-spacings are close to those reported by Hutton (1956) for material from Broken Hill, New South Wales.

MANGANOAN HORTONOLITE

This is the first recorded occurrence of a member of the olivine group at Franklin that is close in composition to the forsterite-fayalite series. Magnesian and ferroan varieties of tephroite, the manganese member of this group, are well known from both Franklin and Sterling Hill (Palache, 1937; Hurlbut, 1961). The present specimen, found on the picking table in 1952, shows rounded single-crystals of hortonolite up to 6 cm long associated with calcite, magnetite and a small amount of pyrrhotite. The mineral is greenish black in color, with a strong vitreous to resinous luster. Clavage is not well developed. It is virtually identical in composition with the original hortonolite described from the magnetite deposit at Monroe, Orange County, New York (Table 2). Yoder and Sahama (1957) give d(130) = 2.803 Å for the Monroe material. Several non-type specimens of the Monroe hortonolite here examined had somewhat variable values of d(130) and of the indices of refraction. These values in general were higher than those of the Franklin material.

REFERENCES

BRUSH, G. J. AND J. M. BLAKE (1869) On hortonolite, a new member of the chrysolite group. *Am. Jour. Sci.* **48,** 17–23.

HURLBUT, C. S. (1961) Tephroite from Franklin, N. J. *Am. Mineral.* **46,** 549–559.

Hutton, C. O. (1956) Manganpyrosmalite, bustamite and ferroan johannsenite from Broken Hill, New South Wales. *Am. Mineral.* **41**, 581–591.

Palache, C. (1937) The minerals of Franklin and Sterling Hill, N. J. *U. S. Geol. Surv. Prof. Paper* **180**, 75–79

Schaller, W. T. (1938) Johannsenite, a new manganese pyroxene. *Am. Mineral* **23**, 575–582.

Schiavinato, G. (1953) Sulla johannsenite dei giacimento a silicati manganesiferi del Monte Civillino. *Rend. Soc. Mineral. Ital.* **9**, 210–218.

Yoder, H. S. and T. G. Sahama (1957) Olivine *x*-ray determinative curve. *Am. Mineral.* **42**, 475–491.

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CRYSTALLOGRAPHIC DATA FOR RARE-EARTH ALUMINUM GARNETS: PART II

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The rare-earth aluminum garnets may be represented by the general formula $R_3Al_2Al_3O_{12}$ where R represents the rare-earth ion. The crystallographic properties of the rare-earth aluminum garnets from terbium to thulium in the periodic table were reported by Rubinstein and Barns (1964). This note presents the indexed *x*-ray powder data and index of refraction for gadolinium, ytterbium and lutetium aluminum garnets which will hereafter be referred to as GdAlG, YbAlG and LuAlG. In addition, the growth habit of YbAlG is reported.

All the crystals used in this study were grown by a technique discussed by Van Uitert *et al.* (1965). The crystals varied in size from fractions of a millimeter to a full centimeter in cross-section. The total impurity concentration in the crystals is estimated to be 0.1 per cent. The powder diffraction photographs were taken with a Straumanis-Type Norelco camera of 114.6 mm diameter using CuKα radiation and an Ni filter. Corrections were made for film shrinkage. The data so obtained are given in Table 1.

The lattice parameters used to calculate the spacings reported in Table 1 are given in Table 2. The color, *x*-ray density and index of refraction are also given in Table 2. For convenience, our previously reported lattice parameters, *x*-ray densities and colors are also included in Table 2. The refractive indices were determined with a Rayner refractometer equipped with a sphalerite prism. The indices previously reported by Rubinstein and Barns (1964) were redetermined by this, more accurate, method. A conservative estimate of the error for the lattice parameter gives 3σ limits of ± 0.003 Å and an estimate of the probable error for the index is ± 0.001.