

required (0.29%) does not occur in the mineral. Grouping the ferric iron with the alumina in the almandite molecule the garnet has the following molecular and percentage compositions:

	MOLECULAR RATIO	WEIGHT PER CENT.
Almandite	1292	63.61
Spessartite	673	32.95
Pyrope	86	3.44
TOTAL	2051	100.00

The measured index of refraction of the analyzed powder is 1.818 while the calculated value for a mixture of the above composition, based upon Ford's data for the end members of the group, is 1.816, the two agreeing within the limit of error.

### THE CRYSTALLOGRAPHY OF ANTIMONY TRIBROMIDE

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Antimony tribromide is a very highly deliquescent salt which rarely forms in well developed crystals. Crystals of the halogen salts of antimony were first described by Cooke<sup>1</sup> who prepared his material while investigating the atomic weight of antimony. The crystals described in this paper were obtained from R. K. McAlpine,<sup>2</sup> of the Department of Chemistry, who has recently revised the atomic weight determination of Cooke.

The crystals were formed by subliming powdered antimony tribromide in a sealed glass tube which had been exhausted to a pressure somewhat under 1 mm. Upon volatilization the material was deposited in the cooler portions of the tube generally in the form of long, slender, interlacing needles. In a few of the tubes, however, small well-developed crystals were found together with the customary deposit of acicular masses. After a period of several months a considerable growth in the size of these small, well-developed crystals was noted and in some of the sealed tubes crystals appeared where previously none had been observed. These continued to grow and at the end of a year and a half the larger crystals measured 8 by 4 by 3 mm. They were perfectly

<sup>1</sup> Cooke, *Proc. Am. Acad. Arts Sci.*, 13, 74, 1877.

<sup>2</sup> Willard and McAlpine, *J. Am. Chem. Soc.*, 43, 797, 1921.

transparent and possessed a high adamantine luster and dispersion similar to that of the diamond. The growth of these crystals is analogous to the growth observed in solutions when well developed crystals are formed at the expense of the smaller ones.

Upon exposure to air in the laboratory the mirror-like faces soon became blurred and in short time the crystals themselves dissolved in the moisture they had extracted from the atmosphere. To overcome this difficulty a special moisture free chamber was constructed.<sup>3</sup>

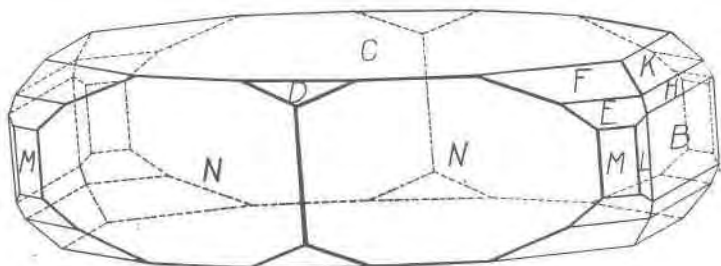


FIG. 1. Antimony tribromide showing prismatic development

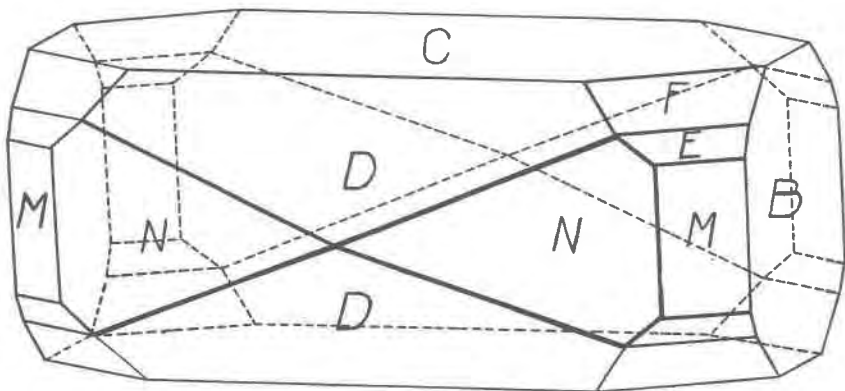


FIG. 2. Antimony tribromide showing equal development of prisms and macrodomes

Antimony tribromide crystallizes in the orthorhombic bipyramidal class. Two habits were observed as shown in Figures 1 and 2. Fig. 1 shows the prismatic habit with well developed

<sup>3</sup> An apparatus for handling deliquescent crystals, *Am. Min.*, 7, (2), 25, 1922.

brachydomes, while Fig. 2 illustrates the equal development of the prisms and the macrodomes. The following forms were observed: C(001), B(010), M(110), N(310), L(120), H(021), K(052), D(101), E(111), and F(221). There were also a few small imperfectly developed faces which gave no distinct signal. The computed axial ratio was,  $a : b : c = 0.7808 : 1 : 1.1645$ .

	OBSERVED READINGS	CALCULATED VALUES
B:M (010):(110)	52° 1'	X
C:D (001):(101)	56°10'	X
B:N (010):(310)	75°20'	75°24'
B:L (010):(120)	31°48'	32°38'
C:E (001):(111)	27°32'	27°52'
C:K (001):(052)	67° 4'	66°46'
C:H (001):(021)	71° 8'	71° 2'
E:F (111):(221)	18°45'	18°43'

Complete optical orientation with reference to the crystallographic axes was not possible but upon a number of crushed crystal fragments the emergence of an optic axis could be observed. The substance is optically negative and the large number of rings gave evidence of its extremely high double refraction. Parallel extinction was also noted so the crystals undoubtedly belong to the orthorhombic system. Crystals kept in a desiccator containing calcium chloride for one week became coated with a fine white powder of the oxybromide. When this powder was removed good etch figures were observed upon the prisms and macrodomes showing the presence of planes of symmetry parallel to the brachy- and basal pinacoids, but no etch figures were observed which indicated the presence of a plane of symmetry parallel to the macropinacoid. The substance probably belongs to the bipyramidal class. Immersed in methylene iodide the fragments stood out in good relief indicating that the indices of refraction were considerably higher than that of the liquid (1.74). An unusually good cleavage was observed parallel to the brachypinacoid.

### NOTES AND NEWS

Mr. William F. Foshag, who has been taking post graduate work at the University of California, has returned to the U. S. National Museum. We hope soon to be able to publish accounts of some of his visits to western mineral localities.