The persistent failure of all the analyses of boussingaultite thus far published to show even approximately the theoretical value for ammonia, and the fact that the ammonium oxide and water vary reciprocally strongly indicate that a part of the water is constitutional. The composition can then be explained by writing the formula $(NH_4,H)_2SO_4.MgSO_4.6H_2O$. This interpretation is supported by the rate of dehydration of the present material at various temperatures, the results being as follows:

15 hrs.	over H_2SO_4 26°C.	loss H_2O	0.08
3 "	at 80°C.		2.24
7 "	at 150°C.		25.53
	Above 150°C.		3.63
		Total water	31.48%

THE GOLDSCHMIDT TWO-CIRCLE METHOD. CALCULATIONS IN THE TETRAGONAL SYSTEM.

CHARLES PALACHE

Harvard University

The gnomonic projection of a tetragonal crystal is closely similar in type to that of the isometric system. There are, however, two main differences. One is that the poles of the form (101), 01 and 10, lie either within or without the circumference of the unit circle depending on the ratio $a : c$, which is never unity. The second is that since in this system the third index cannot be interchanged with the first two, no form has more than two face-poles in any one octant. Both of these have the same ρ, and complementary φ angles; hence a single pair of angles defines any form in the angle-table. Figure 25 shows a projection (based on the mineral vesuvianite) containing the face-poles of one each of the seven holohedral forms of the system. The position of a particular face in any octant may be indicated by its symbol (pq) with the proper signs or by the form letter written with exponents placed as in the figure.

Calculation of Axial Ratio and Symbols from Measured Angles, φ and ρ

From the figure, and as in the preceding system, we have the equations:

$$x = \sin\varphi \tan\rho = pp_0 \qquad y = \cos\varphi \tan\rho = qp_0$$

for prisms,

$$\tan \varphi = \frac{x}{y} = \frac{p}{q}.$$

The various values of x and y calculated from the different faces thus yield multiples, integral or fractional, of the common value p_0. p and q are generally determined graphically or by comparison of the various multiples of p_0; a series of values of p_0 is thus obtained from which an average value is derived. If there are n faces and x_1y_1, x_2y_2, . . . x_ny_n are thec oördinates of each face, then:

$$p_0 = \frac{1}{2n}\left[\left(\frac{x_1}{p_1}+\frac{x_2}{p_2}+\cdots+\frac{x_n}{p_n}\right)+\left(\frac{y_1}{q_1}+\frac{y_2}{q_2}+\cdots+\frac{y_n}{q_n}\right)\right]$$

In the tetragonal system $p_0 = q_0 = c$.

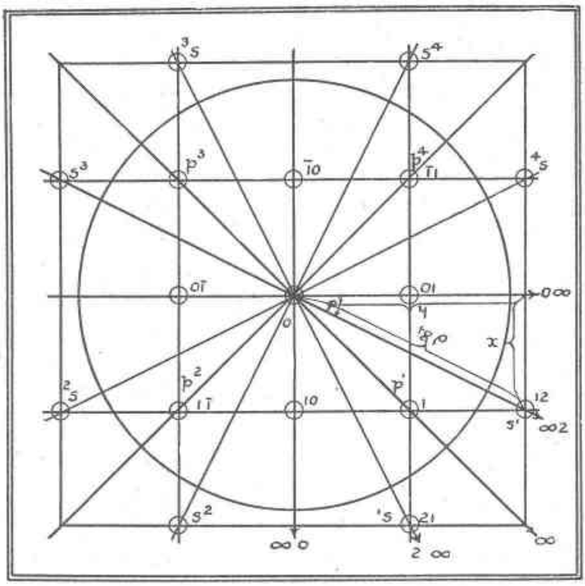

FIGURE 25. TETRAGONAL SYSTEM. VESUVIANITE.

CALCULATION OF ANGLES FROM SYMBOLS AND ELEMENT, p_0

For a face s^1, the symbol of which is pq (see figure 25) we have from the equations of the preceding paragraph:

$$\tan \varphi = \frac{x}{y} = \frac{pp_0}{qp_0} = \frac{p}{q}.$$

$$\tan \rho = \sqrt{x^2+y^2} = \sqrt{p^2p_0^2+q^2p_0^2} = p_0\sqrt{p^2+q^2}.$$

These equations are closely similar to those for isometric crystals. The values of φ are independent of p_0; they may be found therefore from the table on page 25 of the Winkeltabellen, directly. The values of ρ differ only in requiring to be multiplied by p_0. They may therefore be derived from the tables of page 22. For example, to find the angles of the face (121), 1 2, of vesuvianite, for which $p_0 = 0.5376$:

From table, page 25, $\varphi = 26°34'$

From table, page 22, $\tan \rho = p_0\sqrt{1^2 + 2^2}$; $\log\cdot\tan \rho = \log p_0 + \log \sqrt{5}$.

$$\begin{aligned} \text{Log } p_0 &= 9.73046 \\ \text{Log } \sqrt{5} &= \underline{0.34948} \\ \text{Log tan } \rho &= 0.07994 \quad \rho = 50°15'. \end{aligned}$$

For an example of the complete calculation of a tetragonal crystal see V. Goldschmidt, Phosgenit von Monteponi, *Z. Kryst. Min.*, **21**, 321, 1893.

TETRAGONAL SYSTEM. PHOSGENITE FROM TSUMEB, AMBO-LAND, SOUTHWEST AFRICA

Heidelberg and Toronto

V. GOLDSCHMIDT AND E. THOMSON

As far as we can ascertain, phosgenite has not been mentioned heretofore as coming from Tsumeb. On that account it would seem to be of interest to describe this occurrence briefly. The crystals used were obtained from the Heidelberger Mineralien Comptoir (Fr. Rodrian), Heidelberg, Germany. They are crystals of considerable size, smoke-brown in color, fresh, and with a brilliant luster. They show good basal cleavage. In appearance they are similar to those from Monteponi. Trapezohedral hemihedrism could not be established in the few crystals which were at our disposal. It seems likely, however, that among the cerussites and anglesites from Tsumeb many phosgenites lie hidden, and it is possible that more abundant material will bring out this hemihedrism.

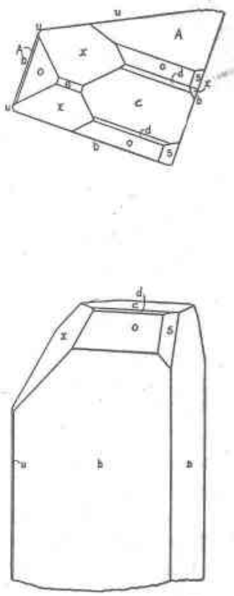

FIG. 26.