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

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The following relations may be derived from the diagram, figure 32, in which pq is the face-pole of a pyramid for which the angles φ and ρ are known:

$$x = \sin\varphi \tan\rho = pp_0;\ y = \cos\varphi \tan\rho = qq_0$$

From these, p and q being known, p_0 and q_0 can be calculated.

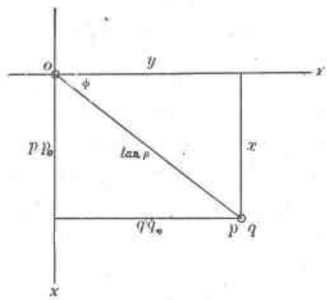

Fig. 32

Each face gives values for x and y and the averages for n faces have the form:

$$p_0 = \frac{1}{n}\left(\frac{x_1}{p_1} + \frac{x_2}{p_2} + \ \ldots\ + \frac{x_n}{p_n}\right)$$

$$q_0 = \frac{1}{n}\left(\frac{y_1}{q_1} + \frac{y_2}{q_2} + \ \ldots\ + \frac{y_n}{q_n}\right)$$

For domes: If $y = 0$, $x = pp_0$; If $x = 0$, $y = qq_0$.

For prisms:

If the angle hk0 to 010 $= \varphi$, $\tan\varphi = \dfrac{pp_0}{qq_0}$.

Relations of Elements to Linear Axes

$$p_0 = \frac{c}{a}.\quad q_0 = c.\quad a = \frac{q_0}{p_0}.\quad c = q_0$$

Calculation of Angles from Elements

From the diagram and equations of the first paragraph we have for any face, pq:

$$\frac{x}{y} = \frac{pp_0}{qq_0} = \tan\varphi;\ \frac{x}{\sin\varphi} = \frac{y}{\cos\varphi} = \tan\rho;\ \sqrt{x^2 + y^2} = \tan\rho$$

For domes: If $x = 0$, $\tan \varphi = 0$, $\varphi = 0$; $\tan \rho = qq_0$.
If $y = 0$, $\tan \varphi = \infty$, $\varphi = 90°$; $\tan \rho = pp_0$.

For prisms:

$$\frac{p}{q} \infty, \tan \varphi = \frac{pp_0}{qq_0}; \tan \rho = \infty, \rho = 90°.$$

ILLUSTRATION OF THE ORTHORHOMBIC SYSTEM. MEASUREMENTS AND CALCULATIONS ON HIGGINSITE

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As an illustration of the application of the formulas given in the preceding article, the following discussion of a crystal of the new mineral higginsite, described above, may well serve. The measurements of one crystal are given in full in Table 1, the form of calculation being that used thruout in Goldschmidt's work. In this table, columns 1, 2, 5, and 6 contain the record of actual observation on the goniometer. The numbers of col. 1 are those used to mark the faces in the note-book sketch of the crystal; the letters of col. 2 stand for good, fair and poor, depending on the quality of the reflected signals; col. 5 contains the angles read on the vertical circle, V, col. 6 those on the horizontal circle, H, of the goniometer.

These angles were plotted in gnomonic projection yielding a diagram similar to figure 33. The next step was the choice of the unit form. Either of the pyramids, o and p, might have been taken for this and its coördinates would then have been the elements, p_0 and q_0. The choice fell upon o because this form is more prominently developed on the crystals; the zonal relations with other forms are at least as good; and its selection brings to expression the isomorphism of the new species with descloizite, as will be shown below.

The unit form chosen, the Goldschmidt symbols could be read at once from the projection; they are entered in col. 3. The letters of col. 4 follow the usage for the mineral descloizite.

Determination of the value v_0 was next in order. The projection showed that the face 1 will have $\varphi = 0$, and therefore v_0 would be close to 77°28′, the V reading of face 1. Each of the pairs of faces: 2 and 3; 4 and 5; 8 and 9; are symmetrically dis-