$$\tan \varphi_1 = \frac{\frac{1}{2}qp_0\sqrt{3}}{pp_0 + \frac{1}{2}qp_0} = \frac{q\sqrt{3}}{2p+q} = \frac{\sqrt{3}}{2n+1} \quad \text{where } n = \frac{p}{q},$$

$$\tan^2 \rho = (pp_0 + \tfrac{1}{2}qp_0)^2 + (\tfrac{1}{2}qp_0\sqrt{3})^2 = p_0^2(p^2 + pq + q^2),$$

whence

$$\tan \varphi_1 = \frac{\sqrt{3}}{2n+1} \text{ where } n = \frac{p}{q}; \quad \tan \rho = p_0\sqrt{(p^2 + pq + q^2)}.$$

Since φ_1 is independent of p_0 the φ angles are alike for all hexagonal forms with like ratio of p to q. The values may be found for most cases from the table of page 25, *Winkeltabellen.* In the same way log tan ρ may be found for most forms from the tables of pages 22 and 23.

For example, to find φ and ρ for the scalenohedron $(21\bar{3}4)$ of calcite:

$$21\bar{3}4 = \tfrac{2}{4}\,\tfrac{1}{4}\,(G_1) = \tfrac{4}{4}\,\tfrac{1}{4}\,(G_2).$$

Winkeltabellen, p. 25: $p : q = 1 : 4$, $\varphi = 10° 53'$.
Winkeltabellen, p. 22: $\tan \rho = p_0\frac{1}{4}\sqrt{16+4+1} = p_0\frac{1}{4}\sqrt{21}$

$$\lg\tfrac{1}{4}\sqrt{21} = 0.05905$$
calcite $p_0 = .5695$ $\lg p_0 = \underline{9.75552}$
$$\lg \tan \rho = 9.81457 \qquad \rho = 33° 07'$$

ILLUSTRATION OF THE HEXAGONAL SYSTEM. HEMATITE FROM NEW MEXICO.[1]

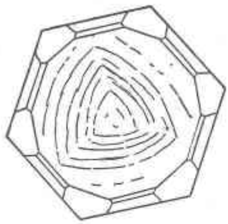
WILLIAM F. FOSHAG

U. S. National Museum

A specimen of hematite in the U. S. National Museum (Mus. No. 93761) from the western part of the San Augustine Plain, Socorro Co., New Mexico has been found to show some unusual features and seems worthy of a short description. The specimen consisted of a somewhat cellular quartz in which are embedded single hematite crystals of excellent development and lustrous faces. The hematite includes quartz and the two minerals were no doubt formed at the same time.

The crystals are thick tabular in habit and, due to the equal development of the + 1 and −1 rhombohedrons, have a hexagonal aspect. The trigonal character of the crystals is brought out, however, by concentric triangular markings on the base of

[1] Published with the permission of the Secretary of the Smithsonian Institution.



some of the crystals. These markings are not due to etching, but are connected with the growth of the crystals. They are not depressed, but slightly stepped and do not affect the brilliancy of the base. The sides of the triangles are parallel to +1 faces while the angles point toward −1. These markings are sketched on the orthographic projection shown (Fig. 31.). The forms present are 0(0001), ∞0 ($10\bar{1}0$), 10($10\bar{1}1$), 20($20\bar{2}1$), ±1($11\bar{2}1$). The signals were sharp and the deviations in the measurements from those given in Goldschmidt's tables and those of Melczer[1] are so slight, amounting to almost perfect agreement, that it is evident that this hematite is essentially pure and free from any great amount of FeO, TiO_2 or other constituents in solid solution.

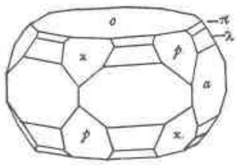


FIG. 31.

The zonal relations are brought out to better advantage in the hexagonal system, as well as in the other systems, with the Goldschmidt than the other symbols. Thus in the hematite measured, ∞0, 0, 10, 20, are in a zone, as shown by the common value for q (G_2), while the corresponding Bravais symbols $10\bar{1}0$, 0001, $10\bar{1}1$, $20\bar{2}1$, do not show this relation so well.

TABLE OF ANGLES OF HEMATITE

Form	Gdt. G_1	Gdt. G_2	Bravais	Bravais	Measured φ	Measured ρ	Calculated φ	Calculated ρ
0	0	0	0001	0001	—	0° 00′	—	0° 00′
a	∞	∞0	$11\bar{2}1$	$10\bar{1}0$	0° 00′	90 00	0° 00′	90 00
π	$\frac{1}{3}$ $\frac{1}{3}$	10	$11\bar{2}3$	$10\bar{1}1$	0 00	42 10	0 00	42 14
λ	$\frac{2}{3}$ $\frac{2}{3}$	20	$22\bar{4}3$	$20\bar{2}1$	0 00	61 8	0 00	61 10
px	1 0	±1	$10\bar{1}1$	$11\bar{2}1$	30 00	57 31	30 00	57 33

LISTS OF THE HEXAGONAL AND TRIGONAL MINERALS INCLUDED IN GOLDSCHMIDT'S WINKELTABELLEN. EDGAR T. WHERRY. Washington, D. C.—This list follows the plan used with tetragonal minerals, altho it has seemed best to separate the hexagonal from the trigonal classes. In the event of the axial ratio obtained on an unknown crystal not fitting in the table, the factor by which it may be multiplied or divided is $\sqrt{3}$ or $\frac{1}{2}\sqrt{3}$. For example, a crystal of a mineral found to contain calcium and phosphorus may give on measurement $c = 0.73\pm$. No corresponding mineral

[1] *Z. Kryst. Min.*, **37**, 580, 1903.