NOTES AND NEWS

OCTAHEDRON-LIKE CRYSTALS OF CALCITE*

WALDEMAR T. SCHALLER,
Geological Survey, Washington, D. C.

Among the manifold habits shown by calcite, that of the combination of the base $c\{0001\}$ with a rhombohedron, yielding an eight-sided solid, is not common. Out of 2544 combinations illustrated in Goldschmidt's *Atlas der Kristalformen,*[1] only 26 show only the base and a rhombohedron. If the angle (0001) $(h0\bar{h}l)$ is close to 70°, and if the intersection of opposite faces is a point and not a line, then every face is a triangle and the crystal closely resembles an octahedron.

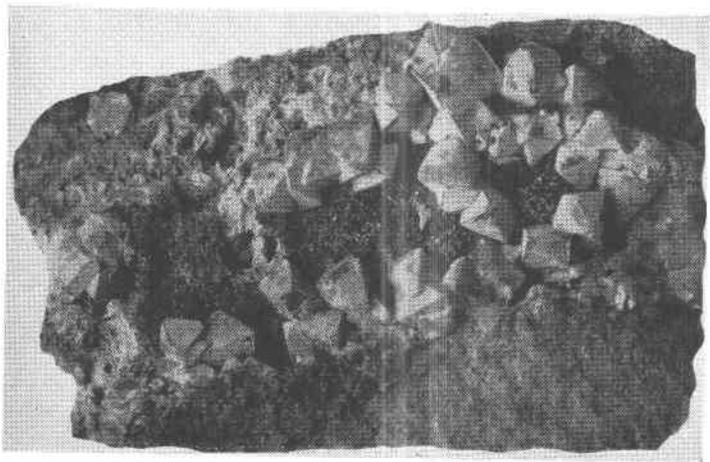

FIG. 1. Octahedron-like crystals of calcite from the Magdalena district, New Mexico. Enlarged two diameters.

In a suite of specimens from the Magdalena district, Socorro County, New Mexico, sent in for identification by the late Herman Wuestner of Cincinnati, is a small specimen (Fig. 1, enlarged two diameters) with white to gray crystals, about 4 mm. thick, which appear to be octahedra. It was thought by Mr. Wuestner that the calcite might be pseudomorphous after an isometric mineral like fluorite. Optical and chemical tests showed that the mineral was calcite with no indication of pseudomorphous structure. A little iron and manganese is present and the ω index of refraction is 1.669. Goniometric measurements established the crystallographical combination $c\{0001\}$ and $\eta\{04\bar{4}1\}$, using Dana's lettering.

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[1] *Tafeln*, Band **2**, plates 2–155 (1913).

This combination of the base (two faces) and a steep rhombohedron (six faces) simulates an octahedron in shape, especially if the faces of the base and rhombohedron are triangular in shape and of equal size. Similar combinations have been noted on a number of minerals such as those of the jarosite group[2] with $c\wedge s\{02\bar{2}1\}=70°53'$ and $s\wedge s'=70°11'$ for jarosite, as coquimbite with $c\wedge o\{30\bar{3}2\}=69°42'$, and $o\wedge o'=71°22'$, and as tincalconite to which the name "octahedral borax" is commonly applied to the artificial salt, with $c\wedge r\{10\bar{1}1\}=62°53'$.

A crystal of the octahedron-like calcite from the Magdalena district was adjusted on the two circle goniometer in polar position by cleaving off three bright smooth surfaces of $r\{10\bar{1}1\}$. The average ρ angle of the negative rhombohedron $\eta\{04\bar{4}1\}$ present on these crystals was measured as 76°38′ (limits 74°04′–77°42′). The ρ angle for $\eta\{04\bar{4}1\}$ for calcite is 75°47′, which is close to the octahedral angle of 70°32′. The faces of c and η are to a large extent covered with drusy layers of later minute scalenohedral crystals of calcite, the faces of c more completely than those of η which are uneven and slightly rounded. The scalenohedron of the drusy layers is the positive form $E\{41\bar{5}6\}$ in G_1 position, or $\{21\bar{3}2\}$ in G_2 position, if they are in parallel growth with the octahedral-like crystals, as seems probable. The average of the measurements of the six faces of E is $\phi=11°38'$, $\rho=37°23'$ (calc. $\phi=10°54'$, $\rho=37°00'$).

The combination $\{0001\}$, $\{03\bar{3}1\}$ with a ρ angle for $\{03\bar{3}1\}$ of 71°20′ would simulate an octahedron even closer. A rhombohedron with indices $\{0.23\cdot\overline{23}.8\}$, with $\rho=70°25'$, would yield a combination with $\{0001\}$ which could hardly be distinguished fron an octahedron (70°32′) by goniometric measurement.

Of the 26 combinations of the base and a rhombohedron for calcite listed by Goldschmidt, 80 per cent are a negative rhombohedron, distributed as follows:

$\{03\bar{3}2\}$	16 per cent
$\{02\bar{2}1\}$	28 per cent
$\{05\bar{5}1\}$	12 per cent
All others	24 per cent
	80 per cent

The combination $\{0001\}$, $\{04\bar{4}1\}$ is not listed by Goldschmidt.

The positive rhombohedra (20 per cent) are $\{40\bar{4}1\}$ and $\{10\bar{1}1\}$.

For dolomite, the combination of the base and a rhombohedron is of similar relative scarcity. Out of 102 combinations illustrated by Goldschmidt only two show such a combination, one with $\{10\bar{1}1\}$ and one with

[2] Particularly well shown by the equant octahedral-like crystals of plumbojarosite from the Tintic Standard mine, Dividend, Utah.

{$40\bar{4}1$}. Since Goldschmidt's *Atlas* was published, octahedron-like crystals of dolomite, up to $\frac{3}{4}$ inch in thickness have been found in New Mexico[3] and George L. English kindly sent the writer a similar smaller black crystal of dolomite from Spain. The angle $c\{0001\} \wedge M\{40\bar{4}1\}$ was measured as $75\frac{1}{2}°$ on the crystals of dolomite from New Mexico.

Of the four known localities of such octahedron-like crystals of dolomite, the rhombohedra are all positive, whereas in the majority of the occurrences for calcite (80 per cent), the rhombohedra are negative.

PROCEEDINGS OF SOCIETIES

THE CRYSTALLOGRAPHIC SOCIETY

A stated meeting of the Crystallographic Society was held November 17, 1941, in Room 4-345, Massachusetts Institute of Technology, Cambridge, Mass. Twenty-six members were present. The proposed Constitution and By-laws were discussed and approved, and the organization of the Society was placed on a formal basis. The following officers were elected for 1941–42: Professor Martin J. Buerger, President; Professor Harry Berman, Vice-President; Dr. Clifford Frondel, Secretary-Treasurer. At the close of the business meeting, Mr. Joseph Lukesh spoke of work carried on jointly by him and M. J. Buerger on "The Tridymite Problem." The talk was followed by a lively discussion bearing on the geological implications of the unusual thermal behavior reported, and on the mechanism of formation of super-structures based on silica frameworks. The speaker's abstract of his talk follows:

THE TRIDYMITE PROBLEM

Crystals of tridymite from Plumas County, California, have been investigated by the Weissenberg method. The diffraction symmetry of the low form is *mmm*. It is based upon a face-centered orthorhombic lattice, the cell having the following dimensions:

$$a = 9.91 \text{ Å}$$
$$b = 17.18 \text{ Å}$$
$$c = 81.57 \text{ Å}$$

Possible space groups include *Fmm*, *Fmmm* and *F*222. The abnormal length of the *c* axis prompted investigation of tridymite from other localities. A sample from San Cristobal, Mexico, was found to have the same *a* and *b* axes, but the *c* axis was one-half as long. The *c* axis rotation patterns of the two materials were substantially identical as regards distribution and relative intensities of all reflections, except that the intermediate layer lines found on the pattern of the Plumas County material were missing on the pattern of the San Cristobal material.

Spectroscopic and chemical analyses of the Plumas County tridymite indicate a high impurity content, with an empirical formula approximating $NaCaAl_3Si_{15}O_{36}$. The presence of the impurity atoms is believed to be the cause of the doubled *c* axis.

Attempts were made using a controlled-temperature Weissenberg camera to locate the two inversions of tridymite at 117° C. and 163° C. as determined by Fenner from thermal observations on pure, artificial material. The Plumas County material inverted directly from the low form to the high form at 127° C. with no evidence of a middle form. The tridymite from San Cristobal showed two inversions, low to middle at 121° C. and middle to high at 135° C. The absence of a middle form in the case of the Plumas County material and the

[3] *The Mineralogist* (Oregon), **7**, 385 (1939).