VALENTINITE CRYSTALS FROM CALIFORNIA

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ABSTRACT

Valentinite crystals from Lone Tree Canyon, Kern County, California, show an unusual habit. The individuals are lathlike in habit, bounded by a broad and elongated base, a narrow side pinacoid, and a series of eighteen prisms, many of which are line faces. No pyramids or domes are present. New forms are the prisms {560}, {670}, {12.11.0}, {870}, {970}, and {750}.

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Valentinite, the orthorhombic form of Sb_2O_3, is common as an alteration product of stibnite, but is rather rarely crystallized. Accordingly, any occurrence as crystals is worth recording, and the more so in the present instance, as the crystals appear in a habit hitherto not reported.

The mineral has been previously reported from two California localities, once as poor, unterminated crystals from Kern County,[1] and once as pseudomorphs after stibnite, from San Benito County.[2] Undoubtedly it is commonly present as an alteration product of stibnite in many other localities, but not differentiated from other similar oxides, such as cervantite, stibiconite, etc.

A specimen of partly oxidized stibnite, collected by the writer from one of the small antimony mines in Lone Tree Canyon, Kern County, California, was found to have several small vugs lined with valentinite crystals. These crystals are small, the largest measuring approximately $1\times0.25\times0.1$ mm., and elongated tabular in habit, attached to the matrix by one end. The faces present are $c\{001\}$, $b\{010\}$ and a numerous series of prisms to be described more fully; c is ordinarily the largest, and nearly always whitened, or roughened, so that it gives a poor reflection. Next in size is b, usually long and narrow, and also of very poor quality. The prism faces are all smooth and shiny, and where wide enough, give good signals on the goniometer. Many of them, however, are narrow or line faces, and the signals are poor, or merge into a more or less continuous train, in which the brighter spots cannot always be determined with certainty. One notable peculiarity of the crystals is that the prisms, which form the terminations of the crystals, often do not appear symmetrically. Thus, there may be present on a crystal the forms: {110}, {760}, $\{7\bar{6}0\}$, $\{8\bar{9}0\}$, or {110}, $\{5\bar{4}0\}$, $\{4\bar{3}0\}$, $\{10.\bar{7}.0\}$, and $\{14.\bar{9}.0\}$. This lack of balance, and the roughness of b makes it sometimes difficult to orient the crystals

[1] Behre, C. H., Jr., Native antimony from Kern County: *Am. Jour. Sci.*, 5th Series, **2**, 330–331 (1921).

[2] Rogers, A. F., Notes on rare minerals from California: *School of Mines Quart.*, **33**, 373 (1932).

accurately with respect to true position. In addition, there is a frequent tendency for the side pinacoids to diverge from parallelism, this divergence being in one instance as much as 4°, although usually it is less than $\frac{1}{2}$°. This is apparently not due to subparallel groups, as optically such crystals are single individuals. The general habit of this valentinite is shown in Fig. 1. A few crystals showed the suggestion of poor reflections in the [0*kl*] zone at a small angle from {001}, but these were so vague that they could not be considered as representing faces. No pyramid faces were noted on any crystal.

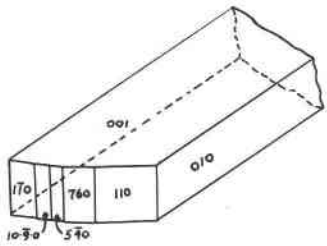

FIG. 1

This habit for valentinite appears to be most unusual, as the recorded habits all show domes or pyramids with the prisms. Crystals from Bräunsdorf show prism and brachydome, either nearly equidimensional, or elongated parallel to *a*, or are tabular parallel to {010}.[3] From Ballao, Italy,[4] considerably elongated parallel to *b*, with {110}, and a flat pyramid {5.10.8} strongly developed, so that the crystals are sharply pointed. From Bolivia[5] the crystals are tabular parallel to *b*. From Crook County, Oregon,[6] the crystals are slender prismatic parallel to *c*, with a brachydome and a complex series of prisms. From Sensa, Algeria,[7] minute crystals are reported, slender prismatic parallel to *c*, with prisms, domes, and many pyramids.

Because of this unusual habit, considerable hesitation was felt in identifying the mineral as valentinite. However, all the other physical, chemical, and optical properties agree with those of valentinite, and in addition, *x*-ray measurements kindly made for the writer by Dr. J. D. McCullough of the Department of Chemistry, University of California

[3] Hintze, C., *Handbuch der Mineralogie*, **1**, pt. 2, p. 1238.

[4] Cavatino, A., Valentinite della Miniera di Ballao: *R. Acad. Naz. Lincei, Atti. Rend.*, Ser. 6, **25**, f. 3, 140–144 (1937).

[5] Spencer, L. J., On some Bolivian minerals: *Mineral. Mag.*, **14**, 328 (1907).

[6] Schaller, W. T., Crystallography of valentinite: *Am. Mineral.*, **22**, 652–662 (1937).

[7] Ungemach, M. H., Sur la Valentinite: *Bull. soc. franc. mineral.*, **35**, 539–552 (1912).

(Los Angeles), check closely with those determined by Buerger and Hendricks,[8] so that its identity may be considered settled.

The crystals are orthorhombic, and show a perfect cleavage parallel to a prism of 42°40′ [$m/\backslash m'''$ for valentinite is 42°41′] as measured on the goniometer. The luster is vitreous to adamantine, H = 2±, and the fusibility is very low. The mineral heated in a closed tube fused readily and gave off no water, but formed a sublimate of minute white octahedra.

TABLE 1

New forms are starred

Form	Times observed	Average reading	Variations	Calculated
* 560	2	64°42′		64°42′
* 670	1	65°16′		65°19′
* 780	2	65°47′		65°46′
* 890	7	66°33′	(66°00′–67°20′)	66°11′
m 110	15	68°34′	(67°28′–69°32′)	68°30′
* 12.11.0	6	69°39′	(69°20′–70°00′)	70°09′
D 10.9.0	5	70°25′	(70°08′–70°46′)	70°29′
* 870	2	70°48′		70°59′
E 760	12	71°25′	(71°00′–72°00′)	71°21′
σ 540	10	72°35′	(72°12′–72°44′)	72°31′
* 970	5	72°57′	(72°50′–73°12′)	72°58′
F 430	15	73°32′	(73°14′–73°52′)	73°33′
* 750	5	74°07′	(73°58′–74°20′)	74°17′
G 10.7.0	10	74°40′	(74°25′–74°50′)	74°35′
H 14.9.0	9	75°32′	(75°12′–75°56′)	75°48′
J 530	8	76°43′	(76°24′–77°08′)	76°42′
K 950	3	77°56′		77°40′
M 210	6	78°44′	(78°24′–79°28′)	78°52′

The amount of material available was too small for quantitative analysis, but qualitative microchemical tests showed only antimony. The color when pure is faint honey-yellow to colorless, but the crystals may be coated with a white opaque crust, or colored unevenly red by a stain, possibly kermesite.

Optically, the mineral is negative, shows parallel extinction, a very high index (not measured, but far above 1.73), and cleavage flakes show an off-center acute bisectrix figure. Dispersion is high with $r < v$, and crossed, with the optic plane parallel to {001} for blue, and to {100} for red. Because of the extremely high index and dispersion, 2V was not measured accurately, but is about 25° for blue and 10° for red. No twinning was observed.

[8] Buerger, M. J., and Hendricks, S. B., The crystal structure of valentinite: *Zeits. Krist.*, **98**, 1–30 (1937).

The prism zone presents a complex series of forms ranging from {120} to {410}, including a number of the forms recently found by Schaller[9] and eight new ones. These forms, with the number of times each occurs, the average observed angles, and calculated angles, are shown in Table 1. Owing to the difficulty, as noted above, in orienting the crystals, some of these forms may be somewhat doubtful, but in general, agreement with calculated values is reasonably close.

[9] Schaller, *op. cit.*, p. 654.