

PSITTACINITE FROM THE HIGGINS MINE,  
BISBEE, ARIZONA

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Specimens of a cleavable, olive-green mineral, in manganese ore, from the Higgins Mine, near Bisbee, Arizona, were sent to one of the authors (Taber) by Mr. Carl Trischka of the Phelps Dodge Corp., Copper Queen Branch, in October 1927. Similar specimens obtained from Mr. David H. White, superintendent of the mine, by Dr. D. F. Hewett, when he visited the property in 1928, were submitted to the other author (Schaller). Preliminary examination showed the green mineral to be a vanadate and to be related to and probably identical with what has been termed cuprodesclowitzite but which, as explained later, is more correctly called psittacinite. In the described occurrences of this mineral, it has been reported as occurring either in fine-grained compact masses, as thin crystalline crusts with occasional distinct minute microscopic crystals, or in an earthy pulverulent form. In the Higgins Mine the psittacinite forms aggregates of anhedral crystals, the largest of which have uniform cleavage surfaces extending as much as two centimeters across. Since it has not previously been reported in large crystals, a brief description of the mineral is given.

The general geology of the Bisbee district and the occurrence of the deposits of manganese ore have been described by Jones and Ransome.<sup>a,1</sup> The ore bodies are irregular replacement masses formed along a zone of fissuring in the Escabrosa limestone. Along the fissure zone there has been some minor faulting followed by considerable silicification and the deposition of the manganese ore. The ore was reported to be chiefly psilomelane but Hewitt<sup>2</sup> found that the principal mineral "is braunite in the form of myriads of minute octahedrons."

The psittacinite occurs in coarsely granular masses composed of an aggregate of anhedral crystals, ranging up to about two centimeters in diameter, with a well-defined cleavage in one direction and possibly a second poor cleavage in another direction. Well-defined cleavage pieces show parallel extinction and the

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<sup>a</sup> Reference given at end of paper.

mineral is probably orthorhombic. The luster is adamantine and the color dark olive-green, in places almost black due to inclosed manganese oxide. The streak of the pure mineral is yellow (Reed yellow, Pl. XXX, 23b, Ridgway's "Color standards and nomenclature"). The psittacinite can be differentiated readily from the closely associated higginsite which is much lighter in color and has a yellowish-green powder.<sup>3</sup>

The indices of refraction are high, exceeding 2.2, approximate determinations being  $\alpha = 2.22$  and  $\gamma = 2.33$ . Dispersion strong,  $\rho > v$ . In thin sections the mineral appears non-pleochroic, but in thicker fragments it is distinctly pleochroic from yellow to olive-green. The psittacinite is later than the braunite and most of the other minerals with which it is in contact. It is intimately associated with higginsite and large white platy crystals of barite.

ANALYSES OF PSITTACINITE FROM BISBEE, ARIZONA

	Higgins Mine W. T. Schaller, analyst	Shattuck Mine R. C. Wells, analyst
V <sub>2</sub> O <sub>5</sub>	21.11	21.21
As <sub>2</sub> O <sub>5</sub>	trace	1.33
P <sub>2</sub> O <sub>5</sub>	—	0.24
CrO <sub>3</sub>	—	0.50
PbO	50.13 <sup>a</sup>	55.64
CuO	19.10	17.05
ZnO	none	0.31
H <sub>2</sub> O	4.79 <sup>b</sup>	3.57
Insol.	3.06 <sup>c</sup>	0.17
Total	98.19	100.02

<sup>a</sup> The determination is probably low.

<sup>b</sup> Ignition loss.

<sup>c</sup> Manganese oxide.

The analysis was made on a small quantity of material, the grains of psittacinite being carefully hand picked under a microscope so as to avoid, as far as possible, the small inclusions of the black manganese mineral which are not visible to the unaided eye. The inclusion of about three per cent of the manganese mineral could not be avoided, but it could be readily separated from the vanadate, in the course of the analysis, on account of its insolubility in HNO<sub>3</sub>. It is reported as MnO<sub>2</sub>. The analysis must be

considered as only approximate and made primarily for the purpose of confirming identification. The high ignition loss should not, necessarily, be interpreted to mean that this mineral contains more water than usual. For comparison there is added the analysis by Wells<sup>4</sup> of the same mineral (called cuprodescloizite) from the Shattuck Mine, which is about 2500 feet southeast of the Higgins Mine. The Shattuck mineral occurs in the form of stalactites, with a radiating structure, and is dark brown in color and strongly pleochroic from yellow to brown.

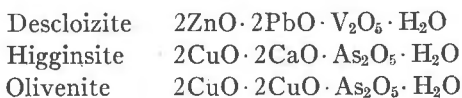
The ignition loss reported in the analysis represents essentially water but includes some carbon dioxide as a little carbonate (malachite? or calcite?) was present in the sample. A careful test for zinc failed to reveal its presence. No zinc is reported, also in the analysis of higginsite.<sup>3</sup>

The ratios calculated from the two analyses of psittacinite from Bisbee, Arizona, are as follows:

RATIOS OF ANALYSES OF PSITTACINITE FROM ARIZONA

	Higgins Mine	Shattuck Mine
V <sub>2</sub> O <sub>5</sub>	.1161=1.00	.1266=1.07
PbO	.2246=1.94	.2493=2.10
CuO	.2399=2.07	.2180=1.84
H <sub>2</sub> O	.2661=2.29	.1983=1.67

Except for the high water, the ratios agree with those of the other minerals of this group:



The ratios of both analyses approximate the formula 2PbO · 2CuO · V<sub>2</sub>O<sub>5</sub> · 2H<sub>2</sub>O, which is that ascribed to psittacinite by Dana. It differs in type from that of descloizite only in containing two molecules of water instead of one. It is to be noted that all analyses of the lead-copper vanadate, free or essentially free from zinc, (psittacinite, mottramite) give a water content (about 4 per cent) agreeing with two molecules of water. On the other hand, two analyses<sup>b</sup> of cuprodescloizite with dominant copper but still

<sup>b</sup> Nos. 17 and 19, as listed by Doelter, C., *Handb. d. Mineralchemie*, vol. 3, p. 839, 1918.

appreciable zinc (11.21 CuO and 4.19 ZnO, and 11.64 CuO and 6.71 ZnO) contain only the quantity of water (2.5 per cent) required for the formula with one molecule of water. No analysis of these minerals is recorded with less than one per cent of ZnO and with a water content agreeing with one molecule of water.

The question is then raised whether a mineral of the formula  $2\text{PbO} \cdot 2\text{CuO} \cdot \text{V}_2\text{O}_5 \cdot \text{H}_2\text{O}$ , analogous to descloizite,  $2\text{PbO} \cdot 2\text{ZnO} \cdot \text{V}_2\text{O}_5 \cdot \text{H}_2\text{O}$ , exists, all the analyses indicating a formula with twice the molecular quantity of water, namely,  $2\text{PbO} \cdot 2\text{CuO} \cdot \text{V}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$ . The analysis by Wells with  $1\frac{2}{3}$  molecules of water is closer to the  $2\text{H}_2\text{O}$  formula than to the  $1\text{H}_2\text{O}$ . The analysis of the mineral from the Higgins Mine indicates  $2\text{H}_2\text{O}$ . The facts now available indicate that the formula for psittacinite, the lead-copper vanadate essentially free from zinc, should be written with  $2\text{H}_2\text{O}$ , but more evidence is needed before the question can be considered settled.

With regard to the question of nomenclature, psittacinite is considered to be the proper name for this mineral. The name descloizite was given by Damour in 1854 to the lead-zinc vanadate, essentially free from copper. Of the eight analyses of descloizite listed by Dana,<sup>5</sup> the highest content of CuO in any one analysis is 1.5 per cent. Cuprodescloizite (Rammelsberg 1883) is a variety of descloizite containing copper in considerable quantity. The zinc-free or practically zinc-free lead-copper vanadate, psittacinite, was described by Genth in 1874. The pulverulent material seemed to contain more water than descloizite, Dana writing the formula with  $2\text{H}_2\text{O}$ . Mottramite (Roscoe 1876) is a similar lead-copper vanadate and as Dana says "may be identical with psittacinite." Two other names are in the literature for the lead-copper vanadate, and have priority over psittacinite, namely chileite (Kenn-gott 1853) and cuprovanadite (Adam 1869) (see Dana,<sup>5</sup> p. 792), but neither of these has been used in the last fifty years, (see Limitations of the Law of Priority, Dana<sup>5</sup>, Introduction, p. xliii, rule 13 j) and the name psittacinite is given species rank by Dana (p. 791, No. 567). Psittacinite is the name to be used for the lead-copper vanadate, it having nine years priority over cuprodescloizite. One of the present authors (Schaller) erred in recommending to Wells<sup>4</sup> the name cuprodescloizite for the stalactitic mineral essentially free from zinc from the Shattuck Mine. It should have been called psittacinite. The term cuprodescloizite should be restricted to the copper-bearing variety of descloizite,

or, still better, the name should be discarded, such varieties being designated as cupriferous descloizite.

It is interesting to note that three minerals of the olivenite group have been found in the Bisbee district; psittacinite and higginsite occurring together at the Higgins Mine, while descloizite has been reported from the Mammoth Mine which is located only about 2 miles southeast.

BIBLIOGRAPHY

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<sup>2</sup> Hewett, D. F. and Rove, Olaf N., Occurrence and Relations of Alabandite: *Economic Geology*, vol. 25, p. 41, 1930.

<sup>3</sup> Palache, Charles and Shannon, Earl V., Higginsite, A Mineral of the Olivenite Group: *American Mineralogist*, vol. 5, pp. 155-157, 1920.

<sup>4</sup> Wells, Roger C., A New Occurrence of Cuprodescloizite: *Am. Jour. Sci.*, vol. 36, pp. 636-638, 1913.

<sup>5</sup> Dana, E. S., *The System of Mineralogy*, 6th Ed., 1892.

NOTES AND NEWS

A BROAD SOURCE OF MONOCHROMATIC LIGHT

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In volume 14 (1929) of this journal, page 329, Buerger and Huntsinger described a source of monochromatic light. The accompanying photographs show a Terrill burner so remodelled, that the height of the flame is considerably less, which makes

