THE

AMERICAN

JOURNAL OF SCIENCE.

EDITOR: EDWARD S. DANA.

FOURTH SERIES

VOL. XLIII—[WHOLE NUMBER, CXCIII].

WITH TWO PLATES.

NEW HAVEN, CONNECTICUT.

1917.

ART. XXX.—*Crystals of Pyromorphite;* by EARL V. SHANNON.

1. *Pyromorphite from the Caledonia Mine, Coeur d'Alene District, Idaho.*

CERTAIN specimens showing hexagonal crystals of some secondary lead mineral were collected by the author in February, 1915, in the Caledonia Mine near Wardner, Idaho. Recent study has shown this mineral to be pyromorphite but, although the crystals are quite simple and show no new forms, the habit and mode of occurrence are somewhat unusual.

Occurrence.—The Caledonia vein consists in its unaltered portion of a rather large body of pure, fine-grained, argentiferous galena with smaller amounts of chalcopyrite and tetrahedrite. From the surface downward for some 800 feet the vein maintains a rather high dip, but on the 900-foot level it flattens out into an almost horizontal position and forms a 'blanket' ore-body of considerable size and richness. Below this level the vein is traceable as a gouge-filled fissure which has not been shown to contain any commercial ore. The inclosing rock consists of a much crushed white quartzite belonging to the Burke division of the Belt Series of sediments of Algonkian age. No igneous rocks are known from the vicinity. The zones of oxidation and secondary enrichment were well defined in the portion of the vein above the 700-foot level. In the oxidized ore, pyromorphite, of the pale green color common in the Coeur d'Alene District, occurred in crystal masses of extraordinary size and beauty, associated with cerussite, massicot, bindheimite, and native silver. The material here described is totally unlike the green pyromorphite in appearance and was not noted in the oxidized nor in the secondary sulphide ore. The crystals commonly occur deposited in cracks in masses of unaltered galena or in the wall-rock adjacent to such masses of galena, from the 500-foot to the 900-foot level. There is no other secondary lead mineral associated with the pyromorphite which has here apparently formed directly from the galena without the intermediate compounds, anglesite and cerussite.

Pyromorphite in this district is a characteristic mineral in the extreme upper portion of the oxidized zone. Ordinary green pyromorphite has not been found here at a greater depth than 300 feet below the surface. No specimen is known, from the district, showing green pyromorphite associated with galena. It is of importance to note that the mineral described below occurs in some abundance in the lowest ore opened, 900 feet, vertically, below the surface.

Description.—The mineral occurs commonly in crusts of minute crystals coating cracks in galena or as larger individuals in cracks in quartzite. The color ranges from faintly pink to colorless in the smallest crystals to quite deep grayish violet in some of the larger ones. In size they range from microscopic to an occasional length of 1·5^{cm}, the larger being those in the wall-rocks. Those over 5^{mm} in length are commonly nearly opaque with curved prism faces and brush-like terminations. The luster in the smaller crystals is adamantine while that of the larger opaque crystals is resinous. Quite commonly the crystals are attached by a prism face and are then doubly terminated, the form being essentially like the accompanying figure 1 with the length several times the diameter. At times these small prisms greatly resemble quartz crystals, the resemblance being heightened by an unequal development of the pyramid faces which gives them a rhombic aspect. As no suitable material was at hand when it was decided to describe the occurrence, a specimen of the type material was borrowed from Col. W. A. Roebling. The crystals measured were taken from this specimen. While promising in appearance these crystals are somewhat dull and give very poor signals. The forms noted were the pyramid x $(10\bar{1}1)$ and the prism m $(10\bar{1}0)$. No other planes have been observed. The best crystal, measured on the reflecting goniometer, gave the value $x \wedge x''' =$ 80°50′. This is sufficiently close to the calculated angle (80°44′) to identify the form.

Fig. 1.

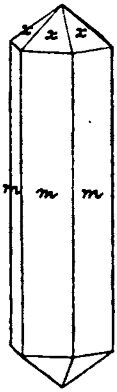
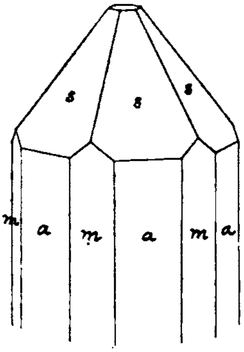


Fig. 2.



The presence of lead, chlorine, and phosphoric acid were proven by qualitative methods, as were the absence of vanadium, calcium and arsenic. Col. Roebling reports that a preliminary analysis on insufficient material gave approximately lead 75 per cent and chlorine 3 per cent. The composition thus corresponds to ordinary pyromorphite.

2. *Pyromorphite from Broken Hill, New South Wales.*

For purposes of comparison Col. Roebling very kindly loaned the author a recently acquired specimen of pyromorphite from Broken Hill. The specimen consists of an irregular mass of iron oxides completely encrusted with glittering microscopic crystals of gray pyromorphite. Measurement on the reflecting goniometer showed that the dominant forms present were the prism *a* $(11\bar{2}0)$ and the pyramid *s* $(11\bar{2}1)$ of the second order and the prism *m* $(10\bar{1}0)$ of the first order with a small base and an occasional pyramid of the first order. The habit is thus quite unlike the Idaho material. Figure 2 shows the appearance of these crystals.

SCIENTIFIC INTELLIGENCE.

I. Chemistry and Physics.

1. *The Penfield Test for Carbon.*—W. G. Mixter and F. L. Haigh have made an interesting examination of the delicacy of this method which was originally devised for testing for carbon and carbonates in minerals. They observe that the method does not appear to be in the literature of analytical chemistry. It is novel only in the very delicate way in which the late Professor S. L. Penfield applied well-known reactions. He fused the substance to be tested with lead chromate in a small horizontal hard glass tube, closed at the heated end, and containing near the open end a small drop of barium hydroxide solution. The appearance of a film of barium carbonate indicates the presence of carbon in the substance. If no film is seen when the fusion is effected, the open end of the tube may be closed with the finger to keep out carbon dioxide from the air and the tube may be removed from the flame so that the result may be more carefully observed.

The method has been used by Professor Mixter in the Sheffield Chemical Laboratory for a number of years, especially for testing metals for carbon. It is so delicate that lead chromate which has been exposed to the air in preparation will react for carbon, but the reagent may be freed from carbon by heating it below its sintering point in an atmosphere of oxygen. Special precautions are necessary also to clean thoroughly the glass tubes used for the experiments, and to protect them from dust.