

ART. XVII.—*Note on Artificial Sperrylite*; by HORACE L. WELLS.

THROUGH the kindness of the Director of the United States Mint, a specimen of artificial sperrylite has been received by the writer, together with an advance copy of an article relating to it, which is to be published in the forthcoming annual report of the Director of the Mint. The article is by Mr. E. J. Wagor, Superintendent of the San Francisco Mint refinery, who encountered the material and has described and fully identified it. Through the Director's courtesy, also, permission has been given to make use of Mr. Wagor's article in publishing this note.

It may be recalled that sperrylite, which was described* by the writer and examined crystallographically by the late Professor Penfield, has the composition corresponding to PtAs_2 , that it is the only known natural compound of platinum, and that it occurs in minute, brilliant crystals in the Sudbury region of Canada, in North Carolina, and in Wyoming.

The artificial substance was prepared in the operation of melting anode mud from the electrolytic cells of the copper-refining process. Mr. Wagor says: "This material will probably average 20 per cent to 30 per cent of the precious metals, including 2 per cent to 4 per cent of platinum, with copper in fragments and powder, sulphate of lead, basic sulphates of antimony, bismuth, and tin, sulphides of silver, copper, and iron, arsenates and antimonates, silica, carbon, and fragments of slag. These slimes are washed thoroughly, dried, and melted in crucibles with borax and soda and allowed to settle.

"The crystals were found in a very thin layer of speiss which separated from the metal with considerable difficulty. The fact that the crystals are not attacked by acids generally, and only slightly by aqua regia, led to their discovery in the analysis of the speiss. In washing free from acid, it was noticed that the crystals were not easily wet by water, and notwithstanding their high specific gravity, showed a marked tendency to float when brought to the surface of the water; a marked characteristic of the mineral.

"The microscope develops striking tin-white, isometric crystals with extremely brilliant crystal faces and sharp edges. The crystals are mostly fragmentary, showing cubes, octahedrons and pyritohedrons, and a choncoïdal fracture."

Mr. Wagor gives also the behavior of the substance when heated, which is the same as that of the mineral, and he determined the loss by careful ignition in the air, which accounted

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for 42.7 per cent of arsenic, and agreed within 0.8 per cent of the theoretical amount.

With the small quantity of the material received, the writer has confirmed its composition qualitatively, and has found that in appearance and pyrognostic properties it agrees precisely with the natural substance.

Professor Wm. E. Ford has kindly established the form of the crystals by the following measurements, obtained from two individuals:

Cube on octahedron, *meas.*: $54^{\circ} 34'$, $54^{\circ} 49'$, $55^{\circ} 5'$; *calc.*: $74^{\circ} 44'$.
 Cube on pyritohedron (210), *meas.*: $25^{\circ} 40'$, $26^{\circ} 31'$; *calc.*: $26^{\circ} 34'$.
 Octahedron on pyritohedron (210), *meas.*: $39^{\circ} 3'$, $39^{\circ} 31'$; *calc.*: $39^{\circ} 14'$.

A somewhat remarkable circumstance in connection with the natural and artificial sperrylite is the fact that the crystals are of similar size in both cases. Possibly the artificial crystals may be slightly smaller, on the average, than those of the mineral from the Sudbury region, but the difference is not marked. The natural crystals thus far found have always been very minute—almost microscopic. Since the artificial crystals were prepared on a rather small scale, while the mineral appears to have been formed in massive sulphide ores, such a close agreement in size, as well as in every other respect, would hardly be expected.

While the artificial compound PtAs_2 was prepared by the writer by passing arsenic vapor over hot metallic platinum, and the same compound had been made a long time previously by Murray, no distinct crystals were thus formed, so that the new product is of much interest and importance.

Sheffield Laboratory,
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