

Sperrylite crystals from the Transvaal.

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A VERY fine and unusual crystal of sperrylite, recently presented by Mr. G. H. Beatty of Johannesburg to the mineral collection of the British Museum, came from a new adit on the Tweefontein farm (no. 1033), about 10 miles NNW. of Potgietersrust, Waterberg district, Transvaal. It had been found embedded in copper-stained limonite in crush-zones of banded ironstone underlying norite. The limonite matrix is presumably an alteration-product of sulphides (pyrrhotine, pentlandite, and chalcopyrite). The banded ironstone is an altered sediment belonging to the dolomite series, and is penetrated by apophyses from the basic margin of the Bushveld igneous complex.¹

The crystal measures 5·5, 5·3, and 5·0 mm. in the direction of the three cubic axes and weighs 1·294 grams. It is thus far larger than any sperrylite crystal from the few localities² previously known for this

¹ An account of the platinum occurrence at this locality has been given (previous to the finding of the sperrylite) by P. A. Wagner, *Trans. Geol. Soc. South Africa*, 1926, vol. 28 (for 1925), p. 110. [*Min. Abstr.*, vol. 3, p. 76.]

² (1) In copper-nickel ores from the Vermilion mine, Denison township, Sudbury district, Ontario (H. L. Wells, 1889); also in chalcopyrite from the neighbouring Victoria mine (C. W. Dickson, 1903).

(2) In ruby-bearing gravel of tributaries (Caler Fork and Mason Branch) of the Little Tennessee River, near Franklin in Macon Co., North Carolina; also in sand near the summit of Mason Mountain in this district (W. E. Hidden, 1898).

(3) In covellite from the Rambler mine, Medicine Bow Mountains, Wyoming (H. L. Wells and S. L. Penfield, 1902).

(4) Nikolaevsky gold-washings on the Tipton river, a tributary of the Zeya in prov. Amur, eastern Siberia (P. P. Pilipenko, 1915). [*Min. Abstr.*, vol. 2, p. 138.]

(5) A mention of sperrylite from British Columbia has not been verified in the literature.

The size of the Ontario crystals is given as 0·05 to 0·5 mm.; one measured by W. Nicol and V. Goldschmidt (1903) was 0·8 mm. across. Crystals from

rare mineral (platinum arsenide, PtAs_2). Larger, but imperfect and broken, crystals up to half an inch across have recently been found at this locality in the Transvaal. The specific gravity of the crystal, as determined by hydrostatic weighing, is 10.609 (corrected $D_4^{19.5} = 10.58$).

The crystal has a brilliant metallic lustre with silver-white colour, much resembling the crystals of amalgam (silver-amalgam) from the Palatinate (Rhenish Bavaria). It is completely developed on all sides without any point of attachment. Thin films of limonite are present as a few spots on the surface.

The form is the cubo-octahedron with the corners and edges much rounded, and the faces have curved outlines. The rounded areas when examined with a magnifying lens show numerous small but curved facets. Pyritohedral symmetry is not evident. On the goniometer, single sharp images are given by the six cube $\{100\}$ and the eight octahedron $\{111\}$ faces. The other areas give a profusion of scattered images, few of which appear to lie in definite zones on the crystal. In the principal zones the only faces identified with certainty are those of the rhombic-dodecahedron $\{110\}$ and the tetrakis-hexahedron $\{210\}$ (or the two pyritohedra $\{210\}$ and $\{120\}$). Only one sharp image was obtained for the trapezohedron (icositetrahedron) $\{211\}$. Nine of the twelve possible faces of the rhombic-dodecahedron are present as minute facets. The form $\{210\}$ considered as a pentagonal-dodecahedron is represented by only seven of the possible twelve faces; of these the faces (210) and (021) are of fair size and readily recognizable with a lens, but (102) is absent. Similarly, $\{120\}$ as a hemihedral form is represented by only seven minute facets, two of which lie about one degree of arc from the true position. This crystal alone cannot help to decide whether the symmetry is holohedral or hemihedral (pyritohedral).

Eleven zones were measured on the Fuess single-circle goniometer, viz. $[100]$, $[010]$, $[001]$, $[110]$, $[\bar{1}\bar{1}0]$, $[\bar{1}01]$, $[01\bar{1}]$, $[1\bar{2}1]$, $[\bar{1}\bar{1}2]$, $[1\bar{2}0]$, and $[111]$. Many faint images and bands of reflected light lying in or very near these zones were noted, but when plotted on a projection they showed no symmetrical repetition. Many other images were out of zone. By measuring such a crystal on a two- or three-circle goniometer it would no doubt be possible to place on record for sperrylite numerous 'new' crystal-forms with high indices. But no useful purpose can be served by recording a number of indefinite faces. The rounding of the edges and

North Carolina are still smaller, for of those measured by S. L. Penfield (1898) 55 weighed only 0.0019 gram. The Transvaal crystal now described is over thirty-seven thousand times as large.

corners of this crystal is very similar to that so well known on diamond crystals; but whether it is due to growth or corrosion of the crystal is not clear. On one of the cube-faces there are well-marked 'terraces of growth'.

A brief preliminary account of the sperrylite crystals from this locality was given by Mr. G. H. Beatty at a meeting of the Chemical, Metallurgical and Mining Society of South Africa on February 20, 1926,¹ and by Dr. P. A. Wagner at a meeting of the Geological Society of South Africa on March 29, 1926.² The latter states that the crystals are usually cubic in habit and range from 0.05 to 0.675 inch across, the largest weighing 1.5 oz. troy.

Sperrylite had previously been found in the Transvaal on the Vlakfontein farm (no. 902), about 30 miles NW. of Rustenburg in the Rustenburg district,³ where, in 1923, minute specks of the mineral were obtained by panning the oxidized sulphide nickel ore. It has also been recently found on the farms Sandsloot (no. 276)⁴ and Zwartfontein (no. 121),⁵ adjoining the Tweefontein farm in the Potgietersrust platinum field.

Since the above was printed, Mr. George H. Beatty has very kindly brought to the Museum, as a handsome donation from the Chairman and Directors of the Potgietersrust Platinum Mining Company, the largest crystal of sperrylite that has been found at the Tweefontein locality. This crystal is of the same type as that described above, but considerably larger, weighing 33.75 grams (or more than an ounce—either troy or avoirdupois) and measuring $18\frac{1}{2} \times 16\frac{1}{4} \times 15$ mm. along the cubic axes. The greatest diameter, along a dodecahedral (diad) axis, is $22\frac{2}{3}$ mm., or nearly one inch. It is a cubo-octahedron with rounded edges and corners, and shows, in addition to six cube-faces and eight octahedron-faces, one well-defined face of the form {210}. The development is somewhat irregular, owing to the variable size of the faces. With the

¹ Journ. Chem. Metall. Mining Soc. South Africa, 1926, vol. 26, p. 183.

² Report of meeting in South African Journ. Mining & Engin., 1926, vol. 37, p. 124, and Mining Mag. London, 1926, vol. 34, p. 379; to appear also in Proc. Geol. Soc. South Africa for 1926.

³ P. A. Wagner, On magmatic nickel deposits of the Bushveld complex in the Rustenburg district, Transvaal. Mem. Geol. Survey, South Africa, 1924, no. 21, p. 100 [Min. Abstr., vol. 3, p. 44]. Also mentioned in Trans. Geol. Soc. South Africa, 1926, vol. 28 (for 1925), p. 98 [Min. Abstr., vol. 3, p. 75].

⁴ P. A. Wagner, Trans. Geol. Soc. South Africa, 1926, vol. 28 (for 1925), p. 117.

⁵ Mentioned by P. A. Wagner, South African Journ. Mining & Engin., 1926, vol. 37, p. 124; Mining Mag. London, 1926, vol. 34, p. 380.

silver-white colour and brilliant metallic lustre the faces give mirror-like reflections. The surfaces are, however, not perfectly smooth: when examined in the reflecting position with a lens all the faces show beautiful 'terraces of growth'. In two places the crystal is slightly broken, showing a well-marked conchoidal fracture and also very good cleavages parallel to the faces of the cube. Attached to the crystal is a small amount of limonite on which is a speck of green copper stain.

Of interest is the piece of friable cellular (gossany) limonite from which this crystal was taken: it shows a sharply marked cavity into which the crystal fits. This comparatively small ($5 \times 4 \times 3$ cm.) piece of limonite also shows portions of two other similar cavities from which large crystals of sperrylite have been taken. At the surfaces of contact with the sperrylite, the limonite is smooth and glazed. Another specimen shows minute specks and small splashes of sperrylite in a more compact matrix consisting of a mixture of limonite, malachite, quartz, and felspar. This no doubt represents a mineralized pegmatite.

A much smaller crystal of sperrylite from this locality, which was sent by Dr. A. W. Rogers for the Cambridge Mineralogical Museum, shows a more perfect development of many small faces, and, as is generally the case with small crystals, this would be more suitable for goniometric measurement and identification of crystal-forms than the show crystals now described.
