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ART. IX.—*On the Crystalline form of Sperrylite;* by S. L. PENFIELD.

THE crystalline form of sperrylite is isometric; pyritohedral. Simple cubes are common, octahedrons are exceptional, while the majority of the crystals, which are usually fragmentary, show combinations of cube and octahedron. The first crystal which was selected for measurement was a fragment showing the above mentioned combination; one of its central octahedral faces being imperfect, the best measurements were obtained from a cubic to an adjoining octahedral face. The results, which are given below, are very satisfactory considering the small size of the crystals, and prove that the mineral is isometric; it may also be said that where the reflections were sharpest and best the values came nearest to the theoretical.

			Calculated.
a ∧ *o*	001 ∧ $\bar{1}11$	54° 34′	54° 44′
"	001 ∧ $1\bar{1}1$	54 46	"
"	100 ∧ $1\bar{1}1$	54 35	"
"	100 ∧ $11\bar{1}$	54 45	"
a ∧ *a*	100 ∧ 001	90 2	90°

At first only the above mentioned forms were detected, but on sifting off the smallest crystals and carefully looking over the largest ones some were detected which suggested pyrite forms. The chemical relation of the mineral $PtAs_2$ to the minerals of the pyrite group caused me to make a very careful search for pyritohedral forms, which was fortunately successful. Cubes with replacement of the edges are very exceptional; a number of them were found, however, and in all cases the replacements, which were necessarily small and frequently failed on some of the edges, had the arrangement required by the combination of cube and pyritohedron. The best crystal selected for measurement was the top of a cube measuring 0·35 × 0·45^{mm} in combination with octahedron and two small but well developed pyritohedral faces; the latter gave very good reflections. The measured angles are

			Calculated.
i-i ∧ *i-2*	001 ∧ 102	26° 28′	26° 34′
"	001 ∧ $\bar{1}02$	26 31	"

Another crystal which was carefully measured was an irregular one measuring 0·35 and 0·55^{mm} in two diameters; this was developed in all directions; in one zone the four cubic and four pyritohedral faces were all present in their proper order and gave satisfactory measurements, in a second zone four cubic and two pyritohedral faces were found and in the third zone four cubic and one truncating rhombic dodecahedral face were detected; this is the only case in which a dodecahedral (110) face was found. In a few cases the characteristic combination of octahedron and pyritohedron was detected, but the latter faces were always very small. These results are most satisfactory and from the number of crystals which have been examined and measured, in all of which the pyritohedral faces occur with their proper order and arrangement, the hemihedral nature of the mineral can not be doubted. Some of the crystals are somewhat rounded and probably other isometric forms are present but none of them were determined. The faces on the crystals are usually very flat and must be very highly polished to give such satisfactory measurements. It may also be noted that the cubic faces are not usually striated parallel to their intersection with the pyritohedron as is common in pyrite, although it was a slightly striated cube which first called my attention to the pyritohedral nature of the crystals.

The first attempts to determine the pyritohedral faces of the mineral yielded results which were very perplexing but which are not without interest. Cubes with pyritohedral faces were found and measured giving repeatedly the angle of cube on pyritohedron between $29\frac{1}{2}°$ and $30\frac{1}{2}°$, the pyritohedral faces always giving poor reflections. The calculated value of *i-i* on $i\text{-}\frac{7}{4}$, $001 \wedge 407$ being 29° 45′. The pyritohedral arrangement of the faces was perfect but I always failed to find the common pyrite form $\frac{1}{2}(i\text{-}2)$ $\pi(210)$. On talking this over with Professor Wells he stated that all of the material which he had given to me had been cleaned, as for analysis, with aqua-regia and that perhaps the acid had had some action on the faces, as the mineral was not wholly insoluble. He therefore gave me some material which had not been cleaned with acid and the results which were given earlier in this article were obtained from it. The aqua-regia seems to have no effect on the cubic and octahedral faces, at least not enough to diminish their power of reflecting light, for the first measurements given in the article of cube on the octahedron were obtained from a crystal which had been cleaned with acids; the acids have, however, a very decided action on the pyritohedral faces, nearly destroying their power of reflecting light and perceptibly changing their angle.

To sum up the crystallographic observations, the crystals usually show the combination of cube 100, *i-i*; octahedron 111, 1; pyritohedron $\pi(210)$, $\frac{1}{2}(i\text{-}2)$ and very rarely dodecahedron 110, *i*. Taken in connection with the chemical results the mineral takes a place in our classification in the pyrite group where an atom of a metal, usually Fe, Co or Ni is united with two atoms of either S, As or rarely Sb, or an isomorphous mixture of them. As this is the first time that platinum has been found in combination as a mineral it may be noted that

Fe, Co, and Ni and the metals of the platinum group fall in the same series in Mendelejeff's periodic system of the elements, which gives additional grounds for putting this mineral in the pyrite group.

The hardness of the mineral is between 6 and 7, which was determined by placing selected crystals on a bright feldspar surface, pressing down on them with a soft pine stick and rubbing back and forth; the sperrylite repeatedly cut into the feldspar but could not be made to scratch quartz. The crystals have no distinct cleavage but are very brittle and break with an irregular, probably conchoidal fracture.

Mineralogical Laboratory, Sheffield Scientific School, Dec. 12th, 1888.

SCIENTIFIC INTELLIGENCE.

I. Chemistry and Physics.

1. *On the Vapor-density of the Chlorides of Indium, Gallium, Iron and Chromium; and on two new Chlorides of Indium.*—Nilson and Pettersson have determined the vapor density of the chlorides of indium, gallium, iron and chromium by V. Meyer's method, employing for the purpose vessels made either of hard Thuringen glass or of porcelain. In the course of their researches upon the indium chlorides they discovered two new ones; the mono-chloride, having a vapor density of 5·402 at 1300°–1400° and the formula $InCl$; and the dichloride $InCl_2$ whose vapor density was found to be 6·885 at 1100°. The third chloride carefully purified gave a vapor density of 8·156 at 606°; of 7·391 at 850°; of 6·716 at 1048; and of 6·234 at 1100°–1200°. The formula $InCl_3$ gives 7·548; and hence the authors consider this formula correct. The higher chloride of gallium gave the vapor density 8·846 at 350°; 6·118 at 440°; 6·144 at 606°, and 5·185 at 1000°–1100°; corresponding to the formula $GaCl_3$ which requires 6·081. The lower chloride gave a density of 4·823 at 1000°–1100° and 3·568 at 1300°–1400°; the formula $GaCl_2$ requiring 4·859. Ferrous chloride at 1300°–1400° gave a vapor density of 4·340; and at 1400°–1500°, one of 4·292; the formula $FeCl_2$ requiring 4·375. The higher chloride of chromium gave values varying from 6·135 at 1065° to 4·580 at 1350°–1400°, the formula $CrCl_3$ requiring 5·478. The lower chloride gave a vapor density of 7·800 at 1300°–1400°; 7·278 at 1400°–1500°, and 6·224 at 1500°–1600°. At a higher temperature the authors believe it would reach 4·256 the value required by the formula $CrCl_2$.—*J. Chem. Soc.*, liii, 814, October, 1888. G. F. B.

2. *On the Vapor-density of Ferric chloride.*—Friedel and Crafts have determined the vapor density of ferric chloride by the method of Dumas taking the same precautions as with alumi-