ART. XXXII.—*Contributions from the Laboratory of the Lehigh University.* No. II.—*Examination of a supposed Hercynite;*
by CLARENCE A. WOLLE.

THE mineral Hercynite is known only by an analysis of Quadrat (Ann. Ch. Pharm., lv, 357.) A mineral very much resembling it was discovered by Prof. W. T. Röpper, who kindly gave me the specimen for the following investigation, which was made in the Laboratory of the Lehigh University under the direction of Dr. Chas. M. Wetherill. The locality is near Peekskill, N. Y., and Prof. Röpper, who visited the spot, describes the mineral as occurring in large isolated masses in syenitic gneiss.

The supposed hercynite is intimately mixed with magnetite, from which it may be freed by digesting the fine powder with hydrochloric acid. It remains unaltered by this reaction and appears, under the microscope, as a transparent greenish crystalline mineral which, when fused with carbonate of soda, is not decomposed. The crystals were boiled with a solution of carbonate of soda to remove silica.

The mineral thus treated when examined under the microscope shows traces of octahedral cleavage and crystallization. It is vitreous on surfaces of fracture, but otherwise possesses a dull luster. The color is greenish to leek-green, becoming greener and lighter when powdered; to the naked eye it is not transparent. Hardness 7.5; specific gravity 3.58; not magnetic.

Before the blowpipe it shows the following reactions:—1. Alone infusible. 2. With carbonate of soda bead it remains undissolved and floats about like silica in a microcosmic salt bead, and on withdrawing from the flame is first green and finally on cooling turns gray. 3. With borax bead, a yellow-green glass, which on cooling assumes an olive-green color. 4. With microcosmic salt, dissolves completely, and forms a greenish-yellow glass, which, when cold, is colorless.

The qualitative analysis shows Al_2O_3 , Fe_2O_3 and MgO to be its constituents. 0.8036 gram of the dried substance was taken, according to Rose and Quadrat, and fused with about five to six times its weight of bisulphate of potassa in a platinum crucible

for a considerable time, thereby evolving SO_2 . After a perfect fusion the mass when cold was dissolved in water made slightly acid with HCl , and from this solution the Al_2O_3 and Fe_2O_3 precipitated with NH_4O and finally separated by KO , and treated as usual. The Fe_2O_3 after being incinerated weighed $\cdot 2364$ gram, = 29.40 per cent, and the Al_2O_3 weighed $\cdot 4885$ gram, = 60.79 per cent.

The MgO in the filtrate from the first precipitate of Al_2O_3 and Fe_2O_3 was precipitated as phosphate with phosphate of soda, and weighed, after incineration, $\cdot 2863$ gm. = $\cdot 1032$ gm. MgO = 12.84 per cent. The results of the analysis therefore yield—

Fe_2O_3	=	29.40 per cent.
MgO	=	12.84 “
Al_2O_3	=	60.79 “
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103.03		

The iron does not all exist as FeO , for such constitution would give the oxygen ratio of $\text{RO} : \text{R}_2\text{O}_3$ as 1 : 2.557 instead of 1 : 3. The hardness and insolubility in acids of this mineral show that it is a spinel. Part of the Fe must therefore exist as Fe_3O_4 . A calculation of this Fe_3O_4 in such a manner as would give the oxygen ratio 1 : 3 will yield the following percentage composition :

Al	Fe	Fe	Mg
60.79	5.26	21.74	12.84 = 100.63

and calculating from the formula—

$$(\frac{1}{2}\text{Mg} + \frac{1}{2}\text{Fe}) + (\frac{1}{2}\frac{2}{3}\text{Al} + \frac{1}{2}\frac{1}{3}\text{Fe}),$$

we obtain the following percentage composition, which agrees well with the above analysis :

Al	Fe	Fe	Mg
60.45	4.94	22.25	12.36 = 100

An analysis of a spinel from Tunaberg, by Erdman, gave the following results:—

Mg 13.03	Fe 23.46	Al 62.95 = 99.44.
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From the above analyses and remarks, it will therefore be seen that the mineral is a magnesia-iron spinel, with part of the Al_2O_3 replaced by Fe_2O_3 , and it may be regarded as intermediate between Hercynite and Ceylonite.

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