

and give the same X-ray pattern, in spite of the radical difference in composition between Fe_3O_4 and Fe_2O_3 . The ferromagnetic oxides are similar in color and differ in color from ordinary Fe_2O_3 . The natural specimen gives a different hysteresis curve from the artificial oxide and from magnetite. The ferromagnetic property of Fe_2O_3 is lost reversibly at a definite temperature a little above 500° , and irreversibly at 650° and possibly lower, depending upon the time of heating. A ferromagnetic oxide has also been obtained by the dehydration of lepidocrocite, one of the two crystalline forms of the monohydrate $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$, while the other form, goethite, yields only paramagnetic Fe_2O_3 .

MINERALOGY.—*Petzite from the Last Chance mine, Cornucopia district, Oregon.* By EARL V. SHANNON,¹ U. S. National Museum. (Communicated by D. F. HEWETT.)

A specimen of rich telluride gold ore recently collected in the Last Chance Mine in the Cornucopia district, Oregon, by Mr. Clyde P. Ross of the U. S. Geological Survey has been forwarded to the writer for identification. This has been analysed in the museum laboratory and found to be petzite. The results of this work are considered to be of sufficient interest to deserve record in the present brief article.

The mineral is massive and occurs in a gangue of quartz with some white calcite. Some areas in the ore up to 2 centimeters across consist of about equal volumes of the telluride and the gangue. The calcite seems to be intimately associated with the petzite.

In color the telluride is lead gray with a faint suggestion of red which becomes more definitely perceptible with exposure. It is very soft and sectile but is brittle enough to be readily pulverized in a mortar. The luster on fresh fracture is brilliant metallic. There is no trace whatever of any cleavage and the fracture is perfectly conchoidal.

The analyzed material was submitted to a metallographic examination by Mr. M. N. Short of the U. S. Geological Survey who reports it pure except for less than 1 per cent of chalcopyrite. The results of his microscopic examination are given as follows: Color of polished surface silvery white; very soft and sectile but gives a little powder on edges of the scratch. In polarized reflected light shows medium anisotropism with pink and blue colors of about the

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same intensity as arsenopyrite. With the standard microchemical reagents of Davy and Farnham, it gives the following reactions: HNO_3 tarnishes black differentially with no effervescence; HCl tarnishes iridescent to brown; KCN brings out scratches and pits surface, action slow and rather feeble; FeCl_3 instantly tarnishes iridescent; KOH , negative, HgCl_2 tarnishes differentially iridescent. These data agree fairly well with those of hessite given by Davy and Farnham and present some essential differences from their data for petzite. This work is in line with the efforts of Mr. Short to record such microchemical and microscopic properties of opaque ore minerals as made upon analyzed material.

The material for analysis was ground and the gangue removed by floating in methylene iodide. The mineral was insoluble in either nitric or hydrochloric acids alone but dissolved readily in mixtures of the two with separation of silver chloride. The solution in the mixed acids was evaporated to dryness and after freeing from nitric acid by repeated evaporation on the steam bath with hydrochloric acid was taken up in hydrochloric acid, diluted largely and boiled. The silver was thus separated as chloride together with a little gold and the insoluble quartz. This mixture was treated on the filter with ammonia to remove the silver chloride which was recovered later by acidification of the extract with nitric acid, filtered on a gooch and weighed. The small amount of gold remaining with the quartz was separated, after ignition, by solution in aqua regia. The first filtrate from the silver chloride, etc. was treated with oxalic acid and the gold separated and weighed as metal. The tellurium was then precipitated by saturating the solution with sulphur dioxide; it was filtered on a gooch crucible and weighed as the element. The iron and copper were recovered from the filtrate by ordinary methods. Sulphur was determined in a separate portion by the ordinary method.

The results of the analysis are given in Table 1.

The results are of interest in several respects. This represents a new locality for this mineral although hessite is reported from the North Pole mine, near Sumpter. Its composition is, nevertheless, in line with the results indicated by Dana who, on the basis of several good analyses considered petzite to represent a definite double salt in which gold telluride and silver telluride were combined in the ratio of 3 to 1. Dana includes this mineral in the galena group, a wrong interpretation since it is essentially a telluride of univalent metals quite devoid of the cubic cleavage characteristic of the lead

TABLE 1.—ANALYSIS OF PETZITE FROM OREGON

	I. OREGON	II. THEORY
Quartz.....	0.60	
Gold (Au).....	23.04	25.5
Silver (Ag).....	42.00	42.0
Iron (Fe).....	0.44	
Copper (Cu).....	0.32	
Sulphur (S).....	0.12	
Tellurium (Te).....	33.44	32.5
	99.96	100.00

I. Analysis of Petzite from the Last Chance mine.

II. Theoretical composition of Petzite $3\text{Ag}_2\text{Te} \cdot \text{Au}_2\text{Te}$.

sulphide, telluride and selenide. The examination of Wherry's classification of the sulphide minerals finds that petzite is definitely assigned a 3:1 silver-to-gold formula, these elements not being regarded as isomorphous and not mutually replaceable.² Moreover the mineral is not, as in Dana's mineralogy, included in the galena group, a group of bivalent-metal sulphides characterized by cubic cleavage, but is relegated to a non-crystallized section of the chalcocite group (orthorhombic). No crystals of petzite have ever been obtained but the marked anisotropism observed by Mr. Short and recorded above would seem to place the present mineral, at least, in a crystalline and non-isometric group, presumably the chalcocite group. This analysis confirms several previously recorded ones and the composition of this mineral can now be considered to be well established. The investigated specimen is numbered 95,185 in the U. S. National Museum catalog.

² E. T. Wherry, The nomenclature and classification of sulphide minerals. This JOURNAL, 10: 492. 1920.