

clay gangue; if Thoulet solution was used, then the clay may well have extracted and retained potassium from the heavy solution.

Microscopic examination of baddeckite and brown micaceous hematite, placed side by side on a slide, showed no difference in appearance. Micaceous hematite scales, rubbed on the clay gangue, could not be told by appearance from baddeckite.

Although the conclusion that baddeckite is hematite and that the analysis was made on a mixture of hematite and a clay similar to cimolite, can not be considered to be definitely established, yet the evidence seems to be so suggestive that its possible correctness must be considered. In that case, there is no muscovite unusually rich in ferric iron, replacing the alumina, and the reddish purple muscovite from Pilar, New Mexico, must be placed with those muscovites having a maximum iron content.

MINERALOGY OF THE CHROME ORE FROM ETCHISON, MONTGOMERY CO., MD.

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An old chromite mine near Etchison in Maryland has been mentioned by Gill² as a locality for chrome tourmaline and fuchsite and the present writer has recently described a green margarite from this region.³ The mine now consists of a shallow depression surrounded by dumps, somewhat overgrown with briars. The only rock exposed in place is a mass of rusty talc in the pit. Beneath this talc outcrop is an old tunnel which still shows a narrow opening but, since no light was available, this was not explored.

The rocks on the dump are principally made up of a grayish, somewhat schistose material which is probably largely composed of talc and chlorite. One of the puzzling features encountered at the mine was the absence of anything which could be recognized as chromite, chrome ore being supposed to exist in large quantity here. Specimens were collected from what appeared to be an ore

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² A. C. Gill. Note on some minerals from the chrome pits of Montgomery County, Maryland. *Johns-Hopkins Univ. Circular*, Vol. 8, No. 75, pp. 100-101 (1889).

³ Earl V. Shannon. Chromium-colored margarite from Montgomery County, Maryland. *Amer. Mineralogist*, Vol. 9, pp. 194-195 (1924).

heap as the material most closely resembling chromite of any about the mine. It was decided that this material must be the ore or that every vestige of the chromite had been removed by the miners. This material forms the matrix of the margarite previously described and in that paper it was referred to as dark chocolate-colored serpentine. After two years of intermittent perusal of the collection from the Etchison mine, the writer finally concluded that this must be the ore of the mine. An examination of it was therefore undertaken to ascertain, if possible, what its mineralogical nature was and why it differed from ordinary chromite.

In ordinary hand specimens, as broken by the hammer, this material is dark brown or brownish black. The luster is hardly metallic and the impression gained, from handling it in chunks and specimens, is that the specific gravity is too low to be anything more than a silicate. There is a suggestion of cleavage or parting, probably octahedral in unit areas up to a centimeter broad, much interrupted by fractures filled with serpentine and margarite. The lump specific gravity as roughly determined on a piece from the analyzed sample, is 3.43, as compared with the range 4.32 to 4.57 given for chromite by Dana.

A polished surface of this material showed the base to be a single mineral, having, when polished, a very feeble suggestion of metallic luster and varying from medium dark brown to blackish-brown in color. This is enormously fractured, the fracturing amounting almost to complete crushing or grinding, and the cracks are filled with margarite and serpentine. The margarite occurs only in the wider filled cracks where it appears as a replacement of the fine-grained serpentine which fills all of the smaller openings. A sample ground to pass 100 mesh was treated with a heavy solution which did not result in materially improving the quality of the sample, although a few grains of serpentine and margarite were freed. It had previously been found, in preparing the hand-picked margarite sample for analysis, that this dark mineral was nearly nonmagnetic to the large research electromagnet.

The mineral making up the mass of the specimens is opaque in thin section and in finely ground powder under the microscope. A mass of average and typical material was selected for analysis, as free as possible from the larger seams of margarite. The method of analysis used gave fairly satisfactory results. The sample was pulverized and screened to pass two hundred mesh silk bolting

cloth, a portion of one half gram was weighed out and this was thoroughly ground into sodium carbonate containing a small amount of sodium nitrate. The sample with its intimately mixed flux was transferred to a covered 20 cc. platinum crucible and this was placed in a much larger covered crucible to preclude loss from boiling during the fusion. Fusion was continued at a full red heat for three hours. After cooling the melt was thoroughly leached with boiling water. The residue insoluble in water was washed on a filter and dissolved through the filter in dilute hydrochloric acid. No undecomposed residue of consequence remained. The water extract containing the chromium and aluminum with a part of the silica was acidified with hydrochloric acid and the silica separated by evaporation to dryness in the usual manner. The hydrochloric acid solution of alumina and chromium was again evaporated to dryness, moistened with strong hydrochloric acid and alcohol several times to reduce chromium, taken up in dilute acid and the chromium and aluminum precipitated with ammonia, ignited, and weighed together. The filtrate was found to be free from lime and magnesia.

The weighed alumina and chromic oxide were ground into sodium carbonate to which some nitrate had been added, fused and leached with water, leaving no residue. This solution was acidified with acetic acid, the chromium precipitated as barium chromate by addition of barium acetate, filtered on a gooch crucible and weighed. The alumina was taken by difference.

The hydrochloric acid solution containing the iron, lime, and magnesia was evaporated to dryness to separate silica and analyzed by standard methods. This was found to retain only traces of alumina and chromium. The silica was about equally divided between the two portions.

Since it was evident that the sample examined was not homogeneous in character but contained large numbers of fine cracks and seams filled with serpentine and margarite, it was concluded that the best that could be accomplished was to make a mass analysis of the ore and arrive at the composition of the chromite by deducting the impurities. In the following table, therefore, the analysis is given and it is then corrected for the presence of margarite, for which lime is taken as an index, the margarite having the composition previously determined by analysis. The balance of silica, after deducting margarite, is used to form serpentine.

ANALYSIS OF CHROME ORE FROM ETCHISON

	Analysis	Margarite	Serpentine	Chromite
SiO ₂	16.42%	3.11%	13.31%	—
Al ₂ O ₃	17.88	5.10		12.78
Cr ₂ O ₃	20.56	.07		20.49
FeO	17.62			17.62
CaO	1.08	1.08		
MgO	20.98	.27	12.98	7.73
H ₂ O	6.64	.50	3.89	
Total	101.18	10.13	30.18	58.62

The analysis, in the first place, indicates that the sample, containing as it does only 20.56 of chromic oxide, is a very poor ore of chromium. The interpretation of the analysis indicates 10.13 per cent of margarite, 30.18 per cent of serpentine and 58.62 per cent of a spinel mineral allied to chromite to have been present in the sample. The spinel contains, in addition to the constituents of chromite, important amounts of alumina and magnesia. Recalculated to 100 per cent, the corrected analysis gives results and ratios as follows:

FeO	30.06	.418	} .745
MgO	13.19	.327	
Al ₂ O ₃	21.18	.213	} .443
Cr ₂ O ₃	34.95	.230	
Total	100.00		

In the analysis the determination of the state of oxidation of the iron is precluded by the insoluble character of the mineral and this constituent is stated above as ferrous oxide. The ratios derived, however, do not approximate those of the spinel group in which the ratio of R''O to R'''₂O₃ should be 1:1. This indicates that the iron in the mineral exists both as ferrous and ferric oxide and, when the analysis is adjusted, on this assumption, the values obtained are as follow:

FeO	14.51%
MgO	13.19
Fe ₂ O ₃	16.13
Al ₂ O ₃	21.80
Cr ₂ O ₃	34.95
Total	100.58

This may be recalculated into standard molecules of the spinel group giving the following approximate results:

Chromite	FeO. Cr ₂ O ₃ .	48.80%
Magnesioferrite	MgO. Fe ₂ O ₃ .	20.20
Spinel	MgO. Al ₂ O ₃ .	30.36
		<hr/>
		99.36

It seems probable that all of the chrome ore of this locality is of this nature and it is evident that the purest form of this spinel is entirely too low in chromic oxide to make a commercial chrome ore, even under the most favorable conditions likely to be encountered in the chrome ore market in this country.

PROCEEDINGS OF SOCIETIES

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences of Philadelphia, Sept. 10, 1925

A stated meeting of the Philadelphia Mineralogical Society was held on the above date, with an attendance of twenty-seven members. Vice-president Trudell presided.

The evening was devoted to reports of summer trips taken by various members of the society, the chair calling upon each one present to render an account of his summer activities.

Mr. Warford exhibited garnet from Chelsea, Delaware Co., Pa.

Mess^{rs}. Biernbaum and Hoadley exhibited large analcite crystals and brilliant prehnite from Paterson, N. J. This locality is again producing, but the quarry cannot be visited without a pass from the operators.

Mr. Hoadley reported trips to Haddam and Litchfield, Conn. He stated that the Tilly Foster Mine, N. Y., is unsafe to visit at the present time on account of the active hostility of its owner.

Dr. Cajori exhibited limonite pseudomorphs after pyrite from Dorset, Vt.

Mr. Trudell reported a trip taken over Labor Day by eight members of the Society to the French Creek Mines. Pyrite, uralite, and apophyllite were obtained. He also related his experiences on a recent trip to Europe, and described at length many noteworthy specimens in the British Museum at London.

HORACE R. BLANK, *Secretary*

Academy of Natural Sciences of Philadelphia, October 8, 1925

A stated meeting of the Philadelphia Mineralogical Society was held on the above date, with the vice-president, Mr. Trudell, in the chair. Twenty-six members and seven visitors were present.