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THE SO-CALLED HALLOYSITE OF JONES FALLS, MARYLAND[1]

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Widely distributed specimens from the gneiss quarries along Jones Falls in the city of Baltimore, Maryland, contain zeolites coating narrow fractures. These include stilbite, chabazite of the variety called haydenite, and heulandite of the crystal habit first described under the name beaumontite. The beaumontite-heulandite is younger than the others and rests upon them. It is frequently noted that the older generation of stilbite and haydenite are altered and to a greater or less extent replaced by a fine steel or lead gray to olive green mineral of clayey consistency which may form pseudomorphs after the rhombohedral crystals of haydenite. This soft clayey mineral may also form thin coatings on otherwise bright and uncorroded haydenite crystals.

In the specimen investigated the clayey mineral was of an olivine-green color and occurred as masses of irregular form between and on rhombohedral crystals of haydenite up to 5 mm. on an edge. Although rusty and partly coated with small beaumontite crystals, where fractured the haydenite is light brownish-pink and is comparatively unaltered, although in other specimens rhombohedral pseudomorphs after haydenite now consist entirely of the secondary mineral. In this specimen the greenish areas possess a radiating structure clearly inherited from the stilbite. The mineral rusts brown on the outside and is filled with contraction cracks. When pieces are placed in water they disintegrate somewhat by the splitting off of curved fragments after the manner of an "aquacreptite" and become more translucent and more yellowish in color. The mineral does not become plastic when moist.

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[1] Published by permission of Dr. Charles D. Walcott, Secretary of the Smithsonian Institution. This paper is the fifth preliminary paper on subjects of interest investigated in connection with the preparation of a bulletin on the minerals of Maryland in cooperation with the Maryland State Geological survey.

This mineral is specifically mentioned by Williams[2] who states that it is often called chlorite but is not chlorite but halloysite, rendered impure by admixture of silica. He describes it as a compact, apparently amorphous mineral of a light blue color, sometimes occurring in connection with the haydenite, which turns brown on exposure to the air. An analysis, made by Bayley, is given which probably represents a very impure sample.

In the present investigation a fairly pure sample was prepared by digging the mineral out with a needle point, screening it to uniform size after grinding, and separating with an electromagnet and heavy solutions. This was analyzed with the results and ratios given in the following table:

ANALYSIS AND RATIOS OF "HALLOYSITE"

CONSTITUENTS	PER CENT	RATIOS		
SiO_2	48.92	.815	.815	1.00×3
Al_2O_3	18.96	.186	.241	.89×1
Fe_2O_3	8.75	.055		
FeO	1.09	.015	.101	.92×2/5
CaO	1.68	.030		
MgO	2.24	.056		
H_2O	19.00	1.055	1.055	.97×4
Total	100.64			

The ratios of the above analysis lead to the formula: $2/5\ R''O.R'''_2O_3.3SiO_2.4H_2O$. The bivalent bases representing less than half a molecule may be dropped or may be included with the water. In the former case the formula may be simplified to $Al_2O_3.3SiO_2.4H_2O$. This formula is exactly that obtained by a recalculation of the analysis of the "leverrierite" of Wherry and Larsen[3] from Beidell, Colo., and from the writer's analysis of "leverrierite" from Idaho.[4] It is evident that this mineral from Maryland is essentially identical, chemically, with these gouge clays.

Under the microscope this material shows a very fine aggregate crystalline-micaceous structure and greenish-brown color. It is obvious that it was deposited in a colloidal form but it is now

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[2] George N. Williams: Notes on the minerals occurring in the neighborhood of Baltimore. *Johns Hopkins Univ. Publications*, Baltimore, **1887.**

[3] Esper S. Larsen and Edgar T. Wherry: Leverrierite from Colorado. *J. Wash. Acad. Sci.*, **7**, 208-217 (1917).

[4] Earl V. Shannon: Notes on the mineralogy of three gouge clays from precious metal veins. *Proc. U.S. Nat. Mus.*, **62**, Art. 15, (1922).

completely crystalline. It is not fibrous with the structure which is commonly called metacolloidal, for example, like chalcedony. No pleochroism could be detected in the fine aggregates nor could any interference figure be obtained from such fine-grained material.

There can remain little doubt that this mineral is not halloysite, the isotropic equivalent of kaolinite but, it is one of the high-water clay group identical with the gouge clays and, as indicated by unpublished work, with the Arkansas bentonite. It now appears that the name leverrierite was inappropriate for this compound but it has not, as yet, been decided just what mineral name should be applied to it. Its occurrence in the present specimens as an alteration product of zeolites is, so far, unique and quite different from its other modes of origin.

ANTLERITE FROM CHUQUICAMATA, CHILE

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In a lot of unlabelled specimens of copper ore from Chuquicamata, Chile, recently sent by Mr. Juan L. Carrasco, there was found in abundance a dark green mineral occurring in thin veins in a sericitized granitic rock. In one specimen it occurs with gypsum and, for the most part, not associated with other copper minerals. It was supposed that the green material was brochantite, atacamite, or a mixture of the two, since these have been reported[1] as among the principal ore minerals of this locality. However, chemical analyses and determination of optical properties show conclusively that it is antlerite ($3CuO.SO_3.2H_2O$) and not brochantite ($4CuO.SO_3.3H_2O$).

Crystals of antlerite from the same locality have recently been described and drawn by Ungemach,[2] who found from measurements on very good crystals that they are orthorhombic with an axial ratio of $a:b:c = 0.5038:1:0.6868$. The material examined by the writers was in part well crystallized but measurements were carried out only far enough to locate the crystallographic c axis for determination of the optical orientation. The habit of the

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[1] Palache and Warren: *Am. J. Sci.*, **26**, 345 (1908).
J. A. Hendricks: *Univ. of Cal. Publications*, **14**, 75-84 (1922).

[2] *Bull. Soc. Min. France*, **47**, 124 (1924).