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Let me further add, that I recommend this acid in all cases of debility where I would advise any other acid, and that I entertain a high opinion of its tonic powers.

I remain, yours, &c.

CALEB MILLER.

ART. VIII. DESCRIPTION and ANALYSIS of GIBBSITE, a *New Mineral*: by JOHN TORREY, M. D. of New-York.

[Read before the Lyceum of Natural History, March 18th, 1822.]

Among a promiscuous collection of minerals I lately received from the Northwestern parts of Massachusetts, I observed one, which, from some uncommon characters it possessed, I was induced to submit to a minute examination. It occurs in a neglected mine of brown hæmatitical iron ore, in the town of Richmond in Massachusetts, where it was first observed by Dr. Ebenezer Emmons, of that place.

This substance was by some supposed to be a variety of Arragonite, and by others, phosphate of lime; but a few experiments proving it could not be either of these minerals, an analysis was undertaken, in order to ascertain its nature with certainty. Professor Dewey, of Williams College, was engaged with its analysis at the same time with myself, and we agreed very nearly in our results, so that it is doubtful to whom the credit of priority is due. The Professor first announced it as a variety of *Wavellite*, in Silliman's Journal. vol. 2, p. 249; and in vol. 3, p. 239, he gives additional reasons for supposing it to be that mineral. Since, however, Berzelius has lately examined the European varieties of Wavellite, and found their composition so entirely different from what had been stated by Davy and Klaproth, there remained very little doubt but that the Richmond mineral is, what I always supposed it to be, a species not hitherto described.

The detail of the analysis of Berzelius, which is published in the 12th vol. of the Journal de Chymie et Physique, I have

not been able to refer to, as the work is not to be had here, and I am therefore ignorant of the means by which the errors of Davy and Klaproth were avoided.

#### DESCRIPTION OF THE MINERAL.

*External characters.* It occurs in small irregular stalactitical masses from an inch to three inches in length, and one inch or more in breadth, consisting of an aggregation of elongated tuberous branches, laid parallel, and united together. Sometimes the masses are larger, tuberous, and incrusting.

The colour is dirty white, greenish white, and grayish.

Its hardness is rather superior to that of calcareous spar. It is tough, but easily reduced to powder.

The fracture is indistinctly fibrous, the fibres radiating from an axis.

Its lustre is a little glimmering.

Surface dull.

It is slightly translucent.

Specific gravity, 2.40.

*Chemical characters.* It does not effervesce with acids. Before the blowpipe it whitens, but undergoes no farther change, even when the heat is increased to the utmost.

#### ANALYSIS.

1st. One hundred grains in fine powder were heated white hot in a platina crucible for two hours. The mineral underwent little apparent change, but lost 34.7 grains in weight. The same experiment was repeated with other portions of the mineral, and the loss varied, from 34. to 35.5.

2d. Some of the powdered stone was digested in nitric acid. It was speedily dissolved without effervescence, and formed a transparent solution. This had a very astringent sweetish taste, and did not crystallize when reduced by evaporation. A part of the solution was diluted with water, and various tests were applied to it. Sulphuric acid did not disturb its transparency. Ammonia threw down a bulky opaline precipitate. Prussiate of potash, and tincture of galls, produced no effect, neither did the solution of oxalate of ammonia.

3d. One hundred grains of the powder were boiled in sulphuric acid. The whole was dissolved without residue. The excess of acid was driven off by heat, leaving an astringent salt which was soluble in water. This was again made slightly acid. A small quantity of carbonate of potash and some water were added, and heat applied. A transparent solution was obtained, which had a strong taste of alum. It was evaporated and set aside. Well defined octahedral crystals soon formed. These crystals had the peculiar sweetish astringent taste of alum, and intumescenced strongly when laid on hot coals. To ascertain whether they were really sulphate of alumine of potash, I dissolved them in water, and added to the solution pure ammonia: an abundant precipitate was thrown down, which was entirely soluble in a solution of caustic potash.

The alkaline solution was neutralized with nitric acid; carbonate of ammonia was then added till precipitation ceased, and the whole thrown on a filter. The earth when well washed and heated to redness for half an hour, weighed 64.8 grains, and had all the properties of pure alumine. It formed soluble and *deliquescent* salts with the nitric, sulphuric, and muriatic acids. It was precipitated from its solutions by potash, and re-dissolved again when these alcalies were added in excess. When a strong solution of potash or soda was poured into a solution of the sulphate, a large quantity of octahedral crystals of alum were suddenly deposited.

From these experiments there can remain very little doubt but that the mineral under examination consists almost entirely of alumine, and something which escapes by the application of heat. As sulphuric acid does not evolve any elastic fluid, and no perceptible vapour is produced when heat is applied, we may safely pronounce this volatile part, *water*.

4th. There being a possibility that the alumine might be united to phosphoric acid, as nearly all the earthy phosphates are soluble in acids, some of the mineral was boiled in water with three times its weight of subcarbonate of potash, the liquid was filtrated, and the residue well washed and collected. This resi-

due, on being tested with acids, appeared to have suffered no change, for no effervescence took place. The filtered liquor, on being *neutralized* with nitric acid, let fall a trifling precipitate which was ascertained to be nothing but alumine. No further change took place on adding muriate of lime. Hence we infer the absence of phosphoric acid.

5th. A portion of the powdered stone was next tested for fluoric acid, by placing it on a piece of glass, moistening it with sulphuric acid, and applying a gentle heat. No erosion could be perceived.

6th. By the preliminary experiments we have proved the absence of iron and lime, but these are sometimes found, especially when the purest specimens are not employed. They never I believe exist in greater quantity than two or three per cent. Magnesia and Zircon are excluded by the test of the caustic alkalies, which do not dissolve these earths. Barytes and Strontian would have been detected, had they been present, by the sulphuric acid in Exp. 2. Tests were applied for the remaining earths, but none were detected.

The results of the analysis therefore are :

Alumine,	-	-	64.8
Water,	-	-	34.7
			99.5
Loss,	-	-	1.5
			100.0

The following is the result of the analysis of Wavellite, by Berzelius :

Alumine,	-	-	35.35
Phosphoric acid,	-	-	33.40
Fluoric acid,	-	-	2.06
Lime,	-	-	0.50
Oxyds of Magnesia			
and Iron,	-	-	1.25
Water,	-	-	26.80

It is therefore a hydrous phosphate of alumine, instead of a *hydrargillite* as it was considered by Davy. The analysis of Wavellite by three different and celebrated chemists is here added for comparison. They are extracted from Jameson's Mineralogy.

	Barnstable Wavellite.		Cornish Wav.	Hualgayac.
Alumine,	71.50	70.0	58.76	68.00
Oxyd of iron,	0.50		19	1.
Lime,		1.4	37	
Silex,			6.12	4.50
Water,	28.00	26.2	30.75	26.50
Loss,			3.87	
	100.00	100.00	100.00	100.00
	KLAPROTH, Beit. DAVY.		GREGOR.	KLAPROTH, Beit.
	b. iv. s. 110. Nich. Jour. xi. 157..			b. v. s. 111.

These results stand on such high authority that we should scarcely be inclined to listen to any who should dispute them, except so distinguished a chemist as Berzelius. There can, however, be no doubt but that the Wavellite contains phosphoric acid, especially since its existence in that mineral has been confirmed by the experiments of Professor Fuchs. It appearing from our analysis, that the mineral of Richmond differs in its composition from Wavellite, and its external character being so dissimilar, there can be no hesitation in giving it a proper name, and assigning it a place in the system. The name of GIBBSITE will, I hope, be adopted for this singular substance, in honor of one\* who has done so much for the advancement of American mineralogy.

In a chemical arrangement of minerals, Gibbsite must occupy the place of Wavellite, which must now be transferred to the *earthy salts*. The name *hydrargillite* of Davy would be proper for the new mineral, if there would not be danger of confounding two minerals under one appellation. According to the

\* Colonel George Gibbs.

nomenclature of Proust, who established the class of *hydrates* it would be a *hydrate of alumine*; but the name is objectionable, as it conveys the idea of a *salt*, when the compound is not of a saline nature.

Nearly all the Gibbsite yet found has been collected at the mine in Richmond, where Dr. Emmons discovered it. It occurs in considerable quantity among the *rubbish*; but the mine being closed, we are ignorant of its precise situation and connexions. No doubt it is produced by infiltration into cavities, for the mineral is evidently stalactitical. It is a little remarkable, however, that so little iron should enter into its composition, as it occurs among *hæmatite*, and is often found attached to it.