ART. XIV. — *Notes on some California Minerals*; by
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HALLOYSITE.

THE pink clay occurring at Branchville, Ct., has been shown* to be montmorillonite, while that occurring at Norway, Me., has proven† to be cimolite. That from the lepidolite mine near Pala, San Diego Co., California, differs from both of the New England clays, being comparable with halloysite.

At Pala, the halloysite occurs in large seams, often several inches thick, and extending many feet in length. The clay is somewhat moist, but quickly dries to a crumbling mass when taken out of the mine. In color it is rather deeper pink than the Norway cimolite and occasionally is somewhat translucent. It readily crumbles to a fine powder when placed in water. The material analyzed had been drying in the air for over three months.

The results of analysis are :

SiO ₂	43.62
Al ₂ O ₃	35.55
Fe ₂ O ₃	.21
MnO	.26
CaO	1.02
MgO	.19
Li ₂ O	.23
Na ₂ O	.19
K ₂ O	.03
H ₂ O (107°)	6.63
H ₂ O (ab. 107°)	12.25
TiO ₂	none
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	100.18

The iron was determined as Fe₂O₃, FeO not being tested for. The analysis agrees well with the formula

AMBLYGONITE.

The occurrence of amblygonite at the lepidolite mine at Pala, California, has already been noticed, and a somewhat fuller description of the mineral is here given. A large deposit has been uncovered and the indications seem to show that it is merely a small part of an extensive body of massive

* This Journal, xx, 283, 1880.

† Ibid., xxxii, 355, 1886.

amblygonite. The mineral usually occurs pure; very rarely small amounts of lepidolite are present with it. Frequently broad cleavage faces with irregular outlines can be seen. The color is white and in thin pieces the mineral is translucent. It fuses easily, coloring the flame red, and in powder is difficultly decomposed by sulphuric acid.

An analysis of a specimen kindly presented by Mr. G. F. Kunz gave the writer the following results:

P_2O_5	48.83
Al_2O_3	33.70
Fe_2O_3	.12
MnO	.09
MgO	.31
Li_2O	9.88
Na_2O	.14
H_2O	5.95
F	2.29
TiO_2	none
	<hr/>
	101.31
Less O	.96
	<hr/>
	100.35

Regarding fluorine and hydroxyl as isomorphous, in the specimen analyzed the latter greatly predominates over the fluorine. The water was determined by igniting the mineral with lead oxide, previously heated nearly to fusion. Three determinations gave the loss of weight, due to the escape of water, as 5.89, 6.01, 5.95 per cent. The loss of the mineral on ignition was 8.03 per cent, equalling the sum of the water and fluorine content.

BOOTHITE.

A specimen of a pale blue copper sulphate was collected at the copper mine near Campo Seco, Calaveras Co., California, by Mr. James Wise, and kindly presented to the writer for investigation. The pale blue color suggested that the mineral might be boothite instead of the more frequently occurring chalcantite. The results of a chemical analysis have shown that the mineral is boothite, thus affording a second locality for this interesting mineral. Careful quantitative determinations of hydrous copper sulphates will probably show that the heptahydrate is not so rare as may be supposed.

The mineral from Campo Seco occurs massive, showing no crystalline structure. The average of several determinations afforded the following results:

		Ratio.
CuO	26.13	1.00
FeO	.81	.03
MgO	.64	.05
SO ₃	27.25	1.04
H ₂ O (110°)	36.76	6.22 } 7.06
H ₂ O (ab. 110°)	4.91	
Insol.	3.96	----
	100.46	

Formula, $\text{CuSO}_4 \cdot \text{H}_2\text{O} + 6\text{H}_2\text{O}$.

A careful determination of the specific gravity of the mineral gave (21° C.) 1.944. This being much lower than the value obtained (2.1) on the boothite from Leona Heights, a redetermination of the latter was made on purer material collected since the publication of the first results.* This gave, as an average value, the figure (22° C.) 1.935. The average of these two determinations, or 1.94, is probably very near the true value for the specific gravity of boothite.

PISANITE.

A small specimen of massive pisanite from Gonzales, Monterey Co., California, was analyzed some time ago and the results are here presented. The quantity of material available for analysis was very small and the determinations do not claim any great accuracy. About 6 per cent of insoluble matter has been deducted and the results recalculated to 100 per cent.

		Ratio.
CuO	7.56	.27 } .89
FeO	15.85	.72 }
SO ₃	30.74	1.08
H ₂ O	45.85	7.18
	100.00	

The analysis approximates to the formula $\text{CuO} \cdot 2\text{FeO} \cdot 3\text{SO}_3 \cdot 21\text{H}_2\text{O}$.

In the following table, all available analyses of pisanite are tabulated, and one can readily see that there is no definite ratio between the copper and iron. The formula is then written $(\text{Cu}, \text{Fe})\text{SO}_4 \cdot 7\text{H}_2\text{O}$, pisanite being an isomorphous mixture of melanterite and boothite. All the analyses are calculated to 100 per cent.†

* Minerals from Leona Heights, Alamada Co., California, by W. T. Schaller, Bull. Dept. Geol. Univ. of Cal., vol. iii, No. 7.

† Anal. No. 1, theoretical comp. of melanterite, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$; No. 2, Schaller, anal. quoted above; No. 3, Schaller, Bull. Dept. Geol. Univ. of Cal., vol. iii, No. 7; No. 4, Hintz, Zeit. Krys. ii, 309; No. 5, Hillebrand, Bull. U.S.G.S., No. 220, p. 105; No. 6, see No. 3; No. 7, Pisani, Comptes Rendus, 1859, xlviii, 807; No. 8, see No. 3; Nos. 9 and 10, Herz, Zeit. Krys. xxvi, 16; No. 11, theoretical comp. of boothite, $\text{CuSO}_4 \cdot 7\text{H}_2\text{O}$.

No.	1	2	3	4	5	6
CuO	-----	7.56	9.17	10.07	12.61	15.52
FeO	25.86	15.85	16.37	(16.15)	14.14	12.14
SO ₃	28.80	30.74	29.00	28.84	28.44	27.82
H ₂ O	45.34	45.85	45.46	(44.94)	44.81	44.52
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00

No.	7	8	9	10	11
CuO	15.56	17.45	17.64	18.81	27.85
FeO	10.98	10.18	9.62	8.51	-----
SO ₃	29.90	28.43	28.27	27.93	28.02
H ₂ O	43.56	43.94	44.47	44.75	44.13
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00

Quartz Pseudomorph after Apophyllite.

At the Datolite and Pectolite* locality near Fort Point, San Francisco, Cal., a small group of crystals was found which were at first taken to be apophyllite. However, as the crystals proved to be infusible, a more extended investigation of the mineral was made.

The crystals, from one to three mm. in diameter, appear cubic with the corners truncated by small faces. Measurements of the best crystals showed that they are tetragonal and that they agree in angles with those of apophyllite. The forms present are the base, prism of the second order and the unit pyramid of the first order. The prism faces are vertically striated and faces of the other two forms are also rarely somewhat striated.

By trial it was found that hydrochloric acid does not attack the crystals, so the associated calcite was easily removed and pure material for analysis obtained. The crystals are opaque and no optical determinations could be made.

The analysis gave the following figures, showing that the crystals are now, chemically, essentially silica with various impurities.

SiO ₂	90.58
Al ₂ O ₃	1.58
CaO	1.87
MgO	2.20
H ₂ O	4.32
	<hr/> 100.55

* Mineralogical Notes by A. S. Eakle, Bull. Dept. Geol. Univ. Cal., vol. ii, No. 10.