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carbon loop in an exhausted vessel raised to such a point of incandescence that it will radiate a definite amount of energy—this energy being measured by a bolometer strip or the thermopile at a definite distance from the carbon loop, and also being measured by the formula $JH = C'Rt$, would have a greater range than an incandescent strip of platinum placed in free air. The latter method, however, for the incandescence which produces a light similar in color to that of a sperm candle, is extremely sensitive, and can be made, I think, more exact than present photometric tests. Both methods have the great advantage of substituting a measure of energy for a relative indication by the eye, which is not connected with any absolute measurement.

These remarks apply to the question of a standard of light for practical purposes, which shall also be scientific in so far that more refined scientific investigation can connect this standard at any time with more precise methods of measuring the exact amount of heat given by radiations of definite wavelength. By means of a Rowland concave grating and with a bolometer strip, one can at present measure the energy of definite radiations. We can say that our scientific standards for light of different colors shall be based upon the energy received upon a definite surface at definite points in the diffraction spectrum.

Jefferson Physical Laboratory, Harvard College.

ART. XIX.—*On Hanksite, a new anhydrous sulphato-carbonate of sodium, from San Bernardino County, California*;* by WM. EARL HIDDEN.

IN the very complete and attractive exhibit of California minerals brought to the World's Industrial and Cotton Centennial Exposition at New Orleans, by Professor Henry G. Hanks, State Mineralogist of California, were several species of unusual interest. Among these was the new borate, colemanite, in large and brilliant crystals, much resembling the finest of the Bergen Hill datolites; also the new vanadium mica, roscoelite, mixed mechanically with much native gold between the folia; borax crystals, clear and bright, of unusual size; stibnite in fine crystals almost equalling the late discoveries in this species in Japan, and many others equally noteworthy.

Of particular interest to the writer was a small lot of apparently hexagonal crystals to which had been given the name of thenardite. Now as thenardite crystallizes in the orthorhombic system, I was prompted to question the correctness of this

* Read before the New York Academy of Sciences, May 25, 1885.

determination. The results of measurements confirmed my first suspicions of their true hexagonal character, though only approximate, being made with a hand goniometer. Since, however, the hexagonal aspect of the mineral might possibly be due to complex twinning of orthorhombic individuals, it seemed advisable to have this question decided on the basis of an optical examination. For this purpose three of the best crystals were kindly given by Professor Hanks, and these were sent by me to Dr. Edward S. Dana; the crystals being quite clear. In a few days he reported them to be normally uniaxial with negative double refraction, and thus they were positively proved to be different from thenardite. An analysis being now necessary to settle the composition of the mineral, I placed sufficient material in the hands of Mr. James B. Mackintosh, E. M., for that purpose, and he has very kindly done the work, with the following results:

		Corresponding to	
SO ₂	45.89	Na ₂ SO ₄	81.45
CO ₂	5.42	Na ₂ CO ₃	13.06
Cl	2.36	NaCl	3.89
Na ₂ O*	46.34	Na ₂ O (excess)	1.08
			99.48

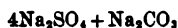
These results give the following molecular ratios for

Na ₂ SO ₄	57.3	}	or	{	3.95
Na ₂ CO ₃	14.5				1.00
NaCl	6.65				.46
Na ₂ O	1.75				.12

Or closely in the ratio of 4 : 1 : $\frac{1}{2}$: $\frac{1}{3}$. This points to the formula,



as representing the composition of the crystals under examination. Neglecting the sodium chloride as non-essential, the formula becomes:



which is probably the true one.

The observed excess of soda is either due to errors of analysis, as only a small quantity was used, or it may have been combined with boracic acid, as borax is very abundant at the locality.

The interesting anomaly of a sulphate and carbonate being in chemical combination reminds us of the rare sulphato-carbonate of lead, leadhillite, to which this alone bears relation as a natural species.

The angles obtained were as follows:

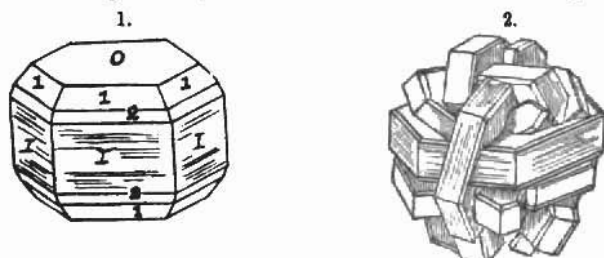
<i>O</i> on <i>I</i> = 90°.	<i>O</i> on 1 = 130° 30'.
<i>I</i> on <i>I</i> = 120°.	<i>O</i> on 2 = 113° 30'.

Accordingly, the value of the vertical axis is 1.014. Cleavage parallel to *O* nearly perfect, but difficult to obtain.

* All bases calculated as soda. Lime and magnesia were not present.

Crystals striated horizontally. They are commonly terminated at both ends of the prism and are very symmetrical in shape. They average, as thus far seen, about one centimeter in length and thickness, with *O* and *I* as predominating planes (fig. 1).

Sometimes the crystals are confusedly grouped (fig. 2), as from a common center, much like the aragonite from a noted European locality. For some late years mineralogists have received from several localities in the far West groups of tabular crystals that were hexagonal in appearance, very impure in composition, and to which the name of aragonite has



been attached. For the most part they are simply calcium carbonate mixed with sand and mud, and are without cleavage. It is very probable that they are pseudomorphs after the sodium sulphato-carbonate here described. In particular I refer to crystals which I have seen credited to Colorado and to Nevada.

The crystals here analysed were found with salt, thenardite, tincal, etc., at the works of the San Bernardino Borax Co., in San Bernardino County, California.

The density of this new California mineral is 2.562. Its hardness, 3-3.5. It is readily soluble in water. Effervesces with acids. It affords, when dissolved in water, an abundant precipitate of barium sulphate when barium chloride is added to the solution. On addition of silver nitrate to a fresh solution chloride of silver is precipitated, showing that chlorine is also present. Gentle ignition develops no appreciable loss in the weight of the mineral.

The crystals are transparent to semi-opaque, with a white waxy color inclining to yellow. Surfaces never highly polished nor very smooth.

The definite formula deduced from Mr. Mackintosh's analysis, taken together with the form, warrants me in announcing this as a new mineral species. I therefore propose for it the name of Hanksite, after Professor Henry G. Hanks, of California, to whom we are so largely indebted for our knowledge of the minerals of the Pacific coast.

Newark, N. J., May 23, 1885.