but that, as in plagioclase, Ca is replaced by Na with a simultaneous replacement of Al by Si.

Therefore, in thomsonite as in the anhydrous silicates, a natural isomorphous series is formed not between molecules which are unlike in number and size of atoms, but between molecules having exactly the same number of atoms of nearly the same sizes; the replacement is not 2Na for Ca and 3Si for 2Si, but, Na for Ca and Si for Al.

Accordingly, accepting the conclusions of Gordon regarding the water in thomsonite (with which this article does not deal) the mineral is an isomorphous series from about the point F whose composition is $Na_4Ca_8Al_{20}Si_{20}O_{80}.25H_2O$ nearly to the point G whose composition is $Na_7Ca_5Al_{17}Si_{23}O_{80}.20H_2O$.

(To be continued)

FOSHAGITE, A NEW SILICATE FROM CRESTMORE, CALIFORNIA[1]

Arthur S. Eakle, *University of California*

The Riverside Portland Cement Company which quarried the crystalline limestone at Crestmore, has transferred most of its operations to a hill, lying further west, of white crystalline limestone containing few associated minerals, and the original quarries have been practically deserted. The old Commercial quarry on Sky Blue Hill where the wilkeite and other minerals described by the writer[2] were found has been cleaned up and is not now of special interest. Some later quarrying has been done on the north side of the hill at what is locally known as the Wet Weather quarry, and there was a large accumulation of boulders at the base of this quarry last May, when visited by the writer. Brown and yellow vesuvianite and light blue calcite, principally, formed the boulders, but other minerals occur in the vesuvianite masses which make a visit to the deposit of great interest to the mineralogist. The solutions connected with the intrusive pegmatitic and monzonitic dikes in the limestone mass were magmatic siliceous waters which were in all probability responsible for the conversion of the

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[1] Presented at the annual meeting of The Mineralogical Society of America, Ithaca, New York, December 31, 1924.

[2] Minerals associated with the crystalline limestone at Crestmore, Riverside County, California. Arthur S. Eakle. *Bull. Dept. Geol. Univ. Calif.*, **10,** 327-360 (1917).

limestone into the predominating masses of vesuvianite and garnet with recrystallized calcite. Minor amounts of sulphides accompanied the flows and the presence of these and of a phosphate in the original limestone may account for the unusual localized development of calcium derivatives of one-, two-, three-, and four-acid solutions. The possibilities of new mineral species formed by the action of such thermal solutions are so great, that it occasions slight wonder that each visit to the quarries results in the finding of one or more. One is fortunate to catch them before they disappear into cement.

Wide veins of a white, fibrous mineral were observed in one of the large vesuvianite boulders which the writer was confident had not been noted before and a good supply of specimens were collected, which was fortunate, as Mr. Foshag visited the quarry in September, having in mind to get some of the mineral and reported all the boulders had disappeared.

The mineral proves to be a new ortho-silicate and the name *foshagite* is proposed for it in honor of W. F. Foshag, who has added considerable to our knowledge of the minerals of these hills.

The mineral has a very compact fibrous structure with the fibers perfectly parallel and several inches long in some of the veins. It has a snow-white color and somewhat silky luster. In some portions of the boulder it appears intergrown with the vesuvianite but in general its contact with the vesuvianite is in sharply defined walls, with the fibers normal to these walls. Granular masses of very glassy thaumasite and large cleavage rhombohedrons of deep blue calcite are in close association with the foshagite.

The fibers are soft and brittle, but the compact mass has a hardness of 3. G. = 2.36, determined with the pycnometer. When the mineral is ignited to expel water it becomes a pale blue. Heated with the blowpipe it becomes incandescent and converted into a vitrified mass which is infusible. Easily soluble in HCl with abundant gelatinization.

Analyses of the mineral were made by C. A. Gentle of the College of Chemistry and also by the writer. Dr. Blasdale kindly made a determination of CO_2 which served as a check. The fibers effervesce so it was thought the mineral might be a carbonate-silicate which its intimate association with thaumasite could well indicate, but the small percentage of CO_2 present does not support such a belief.

The average of the several analyses gave as the composition of the mineral

	Percentages	Ratios	Approx. ratios
SiO_2	33.92	.562	3
Fe_2O_3	0.83		
CaO	53.48	.954	5
MgO	tr		
CO_2	1.83		
H_2O	10.19	.562	3
	100.25		

The combining ratio of SiO_2:CaO:H_2O suggested here is 3:5:3. This is not materially changed by deducting the $CaCO_3$ and calculating the composition as a pure hydrous calcium silicate and this gives:

SiO_2	35.62	.591	3
CaO	53.68	.957	5
H_2O	10.70	.593	3

The composition of foshagite is therefore $5CaO.3SiO_2.3H_2O$ and this can be expressed as an orthosilicate by the formula, $H_2Ca_5(SiO_4)_3.2H_2O$.

The optical determinations were carefully carried out by C. A. Anderson, Teaching Fellow in Mineralogy. The fibers show parallel extinction indicating orthorhombic crystallization. Elongation is positive, a characteristic of all these hydrous calcium silicates. Very low birefringence. Indices of refraction: $\alpha=\beta=1.594$; $\gamma=1.598$. Optically positive.

Foshagite approaches the mineral hillebrandite in its composition but is deficient in CaO in its relation to SiO_2 to conform to the simple ratio of 2:1:1 for CaO:SiO_2:H_2O as in that mineral. The indices of these fibrous silicates are very similar.

		α	β	γ
Crestmoreite	$H_8Ca_4(SiO_4)_4.3H_2O$	1.593	1.603	1.607
Riversideite	$H_4Ca_2(SiO_4)_2.H_2O$	1.595	1.60	1.603
Hillebrandite	$Ca_2(SiO_4).H_2O$	1.605	1.61	1.612
Foshagite	$H_2Ca_5(SiO_4)_3.2H_2O$	1.594	1.594	1.598