with little tendency to unite either isomorphously or in non-isomorphous solid solution with normal thomsonite. The earliest name given to presumably soda-free material was comptonite (Brewster, 1821), although it has also been subsequently termed chalilite, picrothomsonite, sloanite, calciothomsonite, etc. Unfortunately none of the analyses of these are sufficiently dependable to assign it a definite formula.

The 10 or more analyses whose points lie to the right of the dense strip exhibit a tendency toward natrolite. Bøggild showed that intergrowth of natrolite and thomsonite is fairly frequent, and these analyses may well have been made on mixtures,[8] for there is no clustering of points in such a manner as to suggest that appreciable solid solution occurs between these minerals.

It is concluded, then, that much of the apparent variability in composition of thomsonite is due to the fact that two species are represented, although part of the variation, especially in cases of high soda, is due to the analyses having been made on mixtures. There is no evidence of isomorphism between calcium and sodium, nor between SiO_4 and Si_3O_8. Thomsonite appears to be a non-variable mineral, with the formula $NaCa_2(Al_5Si_5O_{20}).6H_2O$; and faroelite, which is optically distinct and deserves species rank, is probably $Na_2Ca_3(Al_8Si_9O_{34}).9H_2O$.

[8] Practically all date from the days before the importance of optical demonstration of homogeneity was recognized, when analyses more often than not represented mixtures. The fact that simple ratios are shown by such mixtures occasionally does not render them of any value in deciding the composition of a mineral or in demonstrating the existence of isomorphism.

OPTICAL NOTES ON THOMSONITE

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The usually quoted indices of refraction for thomsonite are the values of Des Cloizeaux[1] and Lacroix,[2] namely, $\alpha = 1.498$, $\beta = 1.503$, $\gamma = 1.525$, which were probably determined indirectly from measurements of optic axial angles and birefringences of oriented sections. In 1912, Scheit[3] described thomsonite crystals containing a nuclear crystal of natrolite, from Jakuben in the Bohemian Mittelgebirge, which gave the values, upon immersion,

[1] Manual de Minéralogie, 374, **1862.**

[2] Lévy and Lacroix: Les Minéraux des Roches, **1888;** Larsen quotes α as 1.497.

[3] *Min. Petr. Mitth.*, **31,** 495, 1912.

for yellow light: $\alpha=1.521$, $\beta=1.523$, $\gamma=1.534$; $\gamma-\alpha=.013$, $2V=49°$.

Thru the courtesy of Mr. George Vaux, Jr., of Bryn Mawr, the writer was privileged to examine a specimen of a zeolite resembling thomsonite in his collection from Franklin Furnace, N. J. This gave the following indices for Hg yellow light: $\alpha=1.530$, $\beta=1.532$, $\gamma=1.542$; $\gamma-\alpha=.012$, all $\pm.001$; $2V=48°$. The mineral was suspected of being new, until an analysis revealed it as calciothomsonite, with $CaO : Na_2O=5:1$.

This wide divergence from the indices given in the literature led to an optical examination of all the specimens of thomsonite in the collections of this Academy, the results of which are given below. The indices of refraction were determined by the immersion method using Hg yellow light, and the matching liquids were checked with an Abbé-Spencer refractometer.

Indices of refraction of thomsonite

	α	β	γ	$\gamma-\alpha$	all	
Franklin, N. J.	1.530	1.532	1.542	.012	±.001;	2V=48°
Kilpatrick, Scotland	1.529	1.531	1.541	.012	±.001;	2E=81°
Kaaden, Bohemia	1.527	1.529	1.540	.013	±.001;	2E=90°
Färöe Islands	1.517	1.520	1.530	.013	±.003	
Fritz Island, Pa.	1.516	.....	1.527	.011	±.003	

The Franklin Furnace, N. J., specimen consists of large, colorless, coarse radiations of thomsonite, associated with colorless, cleavable barite, on a mass of polyadelphite and axinite. The thomsonite from Kilpatrick, Scotland, occurs as radiations of coarse crystals, at times terminated when found in cavities, associated with analcite. The specimen from Kaaden, Bohemia, consists of druses of small prismatic crystals showing the forms *a* (100), *b* (010), *c* (001), and *m* (110), with a marked tendency toward more or less parallel growth. The mineral from the Färöe Islands consists of small balls, with a radiating structure. The thomsonite from Fritz Island, Pennsylvania, is similar to the Färöe mineral, excepting that the balls are seldom more than 2mm. in diameter.

During the investigation, 16 specimens labeled thomsonite, representing 12 localities were examined. Of these, 9 proved to be thomsonite, 2 were scolecite, 2 were mesolite, and 3 were natrolite. As the Academy collections may be taken as representative, the same mislabeling probably occurs in most other collections. Curators are therefore strongly urged to examine this group of radiating white zeolites.[4]

While the external appearance of these zeolites is so close as to cause confusion, their optical properties are so distinctive as to rapidly differentiate them, as may be seen by the following table.

	α	β	γ	$\gamma-\alpha$	System
Natrolite	1.480	1.482	1.493	.013	Orthorhombic
Thomsonite	1.529	1.531	1.541	.012	Orthorhombic
	1.517	1.520	1.530	.013	Orthorhombic
Faroelite[5]	1.512	1.513	1.518	.006	———
Mesolite	1.505	1.505	1.506	.001	Monoclinic?
Scolecite	1.512	1.519	1.519	.007	Monoclinic

An index liquid of n about 1.505 is the most serviceable one. Mesolite practically disappears in this liquid, while its extremely low birefrigence (.001), makes it appear isotropic. The presence of cleavage fragments showing inclined extinction would at once indicate scolecite. Natrolite and thomsonite both show parallel extinction, but may be promptly distinguished by the indices of refraction; the indices of natrolite are much lower, while those of thomsonite (and faroelite) are much higher, than the liquid used ($n=1.505$).

[4] Since preparing this paper, the writer has learned that Bøggild (*Danske Vidensk Selskab., Math.-fysiske*, 4 (8), 1922) had previously observed the existence of an error in the accepted optical data for thomsonite, and had also urged re-examination of radiating zeolites.

[5] Dr. Wherry's values for thomsonite given in the preceding paper lie between the extremes recorded in this table. The marked variability in refractive indices shown by thomsonite is noteworthy, and a correlation of the indices and composition of different specimens would seem very desirable.

NOTE ON THE FIRST DISCOVERY OF VANADINITE IN IDAHO[1]

Harold T. Stearns, *U. S. Geological Survey*

Vanadinite was discovered by the writer in a small prospect near the tunnel of the Iron Mask Mine in the Spring Mountain Mining District, Lemhi County, Idaho. This is the first reported occurrence of vanadinite in Idaho. It occurs as yellow-brown tabular crystals 2 millimeters wide and ½ millimeter thick in clusters on manganiferous limonite. All of the crystals are hexa-

[1] Published by permission of the Director of the United States Geological Survey.