TABLE 1

Chemical analyses and optical properties of lawsonite and anorthite used as starting materials

Oxide	A	B	C
SiO_2	38.11	43.13	44.49
TiO_2	0.29	nd	nd
Al_2O_3	30.91	35.87	36.00
Fe_2O_3	1.56	0.45	0.08
FeO	0.13	0.29	nd
MnO	0.01	nd	nd
MgO	0.03	0.08	0.04
CaO	17.54	19.27	19.49
Na_2O	0.06	0.65	0.59
K_2O	0.14	0.05	0.03
H_2O	10.72		
H_2O+		0.63	nd
H_2O-		0.35	nd
Total	99.53	100.77	100.72

Refractive Indices

	A	B	C	D
α	1.665 ± 0.002	1.5748	1.5748	1.57 ± 0.005
γ	1.686 ± 0.002	1.5880	1.5880	1.59 ± 0.005
An %		94.3	94.9	96 ± 2

A. Lawsonite. Analyst, D. Thaemlitz; optical properties, G. A. Davis; Blake Gardens, North Berkeley, California (Davis and Pabst, 1960).

B. Anorthite. Analyst, Y. Kawano; optical properties, I. Kato; crystal lapilli erupted in 1940, Miyake-jima volcano, Tokyo Prefecture, Japan (Kawano and Aoki, 1960).

C. Anorthite. Analyst, H. S. Washington; optical [illegible]; crystal lapilli erupted in 1874, Miyake-jima volcano, Tokyo [illegible] (Kawano and Aoki, 1960).

D. Anorthite. Miyake Island, Tokyo Prefecture, Japan. Optical prop[illegible] universal stage An percent determination, Crawford.

The simplest reactions which field evidence suggests bear on this problem involve:

$$\text{laumontite} = \text{lawsonite} + 2\ \text{quartz} + 2\ \text{water} \quad (1)$$

$$CaAl_2Si_4O_{12} \cdot 4H_2O = CaAl_2Si_2O_7(OH)_2 \cdot H_2O + 2SiO_2 + 2H_2O;$$

$$\text{thomsonite} = \text{lawsonite} + 0.4\ \text{water} \quad (2)$$

$$CaAl_2Si_2O_8 \cdot 2.4H_2O = CaAl_2Si_2O_7(OH)_2 \cdot H_2O + 0.4H_2O.$$

Some data bearing on (1) are available, and we can make some reasonable guesses concerning (2).

Thermodynamic data (table 3) are available for leonhardite, a close relative of laumontite. Coombs (1952) described the conditions for the reversible conversion of laumontite to leonhardite. Laumontite in dry air loses water forming leonhardite, $Ca_2Al_4Si_{18}O_{24} \cdot 7H_2O$. Leonhardite, when soaked in liquid water at room temperature, is converted to laumontite. These observations