

ART. XLVI.—*On the Chemical Composition of Triphylite, from Grafton, New Hampshire*; by SAMUEL L. PENFIELD. *Contributions from the Sheffield Laboratory of Yale College.* No. XLVII.

THE rare mineral species, triphylite, is found at Grafton in a granite vein which has been extensively worked for mica. It occurs imbedded in the granite in masses of varying size, and occasionally of fifty or more pounds in weight. The exterior of the masses in some instances shows evidences of the decomposition to which the mineral is peculiarly liable, but a large portion of the material is fresh and unaltered. It has a light blue color, a greasy to resinous luster and a perfect cleavage. Specific gravity = 3.52. Analyses of the finely pulverized, pure mineral, dried over sulphuric acid, show the following composition :

	I.	II.
P ₂ O ₅	44.18	43.88
FeO	26.09	26.38
MnO	18.17	18.24
CaO	.89	.99
MgO	.56	.61
Li ₂ O	8.77	8.81
K ₂ O	.32	.32
Na ₂ O	.16	.09
H ₂ O	1.47	1.47
	100.61	100.79

The phosphoric acid was separated from the iron and manganese by fusion with sodium carbonate, except a small amount retained with the iron, which was separated afterward by means of molybdic acid.

The alkalis were separated from the iron and phosphoric acid by adding a small amount of ferric chloride to a nearly neutral, oxidized solution of the mineral and precipitating the iron and phosphoric acid together by means of barium carbonate. Care was taken to use platinum vessels in conducting the evaporations. The total amount of water was expelled by ignition and determined by absorption in a chloride of calcium tube. Water amounting to 0.50 per cent was driven off at 100° C. These results show the Grafton mineral to be richer in manganese and lithia than that from Bodenmais.

The relative number of atoms calculated from analysis 1 are the following :

P	.622			6.22
Fe	.362	} .648		
Mn	.256			
Ca	.016			6.48
Mg	.014			
Li ₂	.292	} .297	Li	.584
K ₂	.003		K	.006
Na ₂	.002		Na	.004
				.594
		.945		

The above gives the ratio of the phosphorus to the bases = .622 : .945 or 1 : 1.52, which shows the composition of the mineral to be that of a normal phosphate. The ratio of the atoms of the univalent elements to those of the bivalent is .594 : .648 = 1 : 1.09 which gives the formula $10\overset{\text{I}}{\text{R}}_3\text{PO}_4 + 11\overset{\text{II}}{\text{R}}_3\text{P}_2\text{O}_8$. Rammelsberg * deduces the formula $4\overset{\text{I}}{\text{R}}_3\text{PO}_4 + 5\overset{\text{II}}{\text{R}}_3\text{P}_2\text{O}_8$ from the most trustworthy analysis of the Bodenmais mineral, but suggests $\overset{\text{I}}{\text{R}}_3\text{PO}_4 + \overset{\text{II}}{\text{R}}_3\text{P}_2\text{O}_8$ as possibly the true formula. The

* Mineralchemie, 1875, page 307.

composition here obtained for the Grafton triphylite renders it almost certain that this is the correct formula of the mineral. This work was conducted in the Sheffield Laboratory under the supervision of Professor O. D. Allen, to whom I wish here to express my thanks.