

*Two Analyses of Crystals of Apatite.*

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BEFORE commencing the analysis I sifted the crystals to remove all small ones and dust, and then picked out, as far as possible, the hematite and every thing which differed from the general mass of crystals. By these means I obtained a very uniform sample of fair sized crystals. The whole was then finely powdered and divided into two portions, of each of which an analysis was made. I had reason to suppose that in the analysis I made previously\* some of what appeared as  $\text{CO}_2$  was really fluorine, so before making these analyses I made some experiments to see if I could arrange the strength of my acid so that while the substance was dissolved, the hydro-fluoric acid should not be given off on boiling the solution for a reasonable time to get rid of the  $\text{CO}_2$ . By using a sufficient quantity of a dilute solution of nitric acid containing 147.5 grams of  $\text{HNO}_3$  in the litre, I succeeded in my object. All dissolved in the cold except a few particles of hematite and quartz—2.0 mgrms. from 731.75 mgrms., and on boiling the solution and drawing air through it there was no taste of any acid but  $\text{CO}_2$ ; the hematite also remained undissolved. As the hematite and quartz were evidently foreign to the mineral, I deducted the amount found of them from the substance originally taken, as also I did the very small quantity of water present, 0.2 mgrms. in 731.75 mgrms. There was scarcely a trace of iron dissolved, not enough to estimate. In the first of these two analyses I evaporated the nitric acid solution, obtained after estimating the  $\text{CO}_2$  to dryness; converted the solids into chlorides, and went through the usual process to remove silica, but none was present. The lime was precipitated as oxalate and weighed as sulphate, the phosphoric acid was estimated in the ordinary way as magnesium pyro-phosphate, the  $\text{CO}_2$  from the loss of weight after decomposing the mineral with the dilute nitric acid already mentioned. The fluorine was estimated indirectly as follows:—I took the necessary amount of lime from that found to convert the whole of the  $\text{CO}_2$  and  $\text{P}_2\text{O}_5$  into carbonate and phosphate, and the remainder I calculated as fluoride. For A 948.94 mgrms. of the mineral were taken, for B 727.3 mgrms.

\* *Trans. R. G. S. of Cornwall*, 1886.

	A		B
	Mgrms.		Mgrms.
Ca CO <sub>3</sub>	27·0 = 2·845 o/o		21·0 = 2·887 o/o
Ca <sub>3</sub> 2 PO <sub>4</sub>	886·1 = 88·108 ,,		648·8 = 89·206 ,,
Ca F <sub>2</sub>	85·8 = 9·041 ,,		62·2 = 8·552 ,,
	948·9 = 99·994		732·0 = 100·645

In B there is most likely a slight error in excess in the phosphoric acid ; this brings the fluoride a little too low and the total too light. I should have said there was not more than a mere trace of chlorine present, if any.

The following analysis A was the mean analytical result obtained by Dr. Flight for francolite, and B expresses the proportions of the typical formula of apatite.

	A	B
Ca <sub>3</sub> 2 PO <sub>4</sub>	83·261	92·26
Ca F <sub>2</sub>	7·683	7·74
Ca CO <sub>3</sub>	5·104	—
Fe O & Mn O	0·913	—
Na O	0·694	—
H <sub>2</sub> O	1·593	—
	99·248	100·00