On the identity of Bruiachite and Fluor.

By Professor M. Forster Heddle, M.D., F.R.S.E.

[Read June 25th, 1889.]

SEVERAL years ago Dr. Thomas Aitken, of Inverness, put into my hands a mineral which he thought to be new, with the request that I would analyse it.

He stated that the mineral occurred in veins in the conglomerate of the Old Red Sandstone, near Loch Bhruithaich, in Inverness-shire; that it had been found by and given to him by the head gamekeeper on the Lovat property, and that similar pieces had been given to Mr. Wallace.

The specimens which he put in my hands, and others which he showed me, consisted of one side of a vein-plug, and were formed of alternate bands of foliated flesh-coloured baryte, with narrower ones of the substance in question.

This had a dusky yellow colour, with, in the fresher portions, "a tendency to a bluish tinge;" it had a radiating crystalline structure, which protruded the solid angles, apparently of cubes and cubo-octahedra, into the overlying layers of baryte. The appearance of a ground but not polished specimen in Dr. Aitken's possession was so similar to that of cut specimens of Derbyshire fluor, that when I found the hardness to agree, I said that the substance was probably only fluor.

As Dr. Aitken remained in doubt, I considered it only due to his experience as a mineralogist that I should sufficiently examine the substance. This, upon my return to St. Andrew's, I did, and obtained an amount of calcium normal to that in fluor; I shortly after left this country, and the matter passed from my memory.

Upon the first occasion of my visiting Dr. Aitken after my return from Africa, he remonstrated with me for having let slip the discovery of a new mineral, informing me that Mr. Wallace had had it analysed in Edinburgh, and that it had proved to be new.

Shortly after this the analysis of this substance under the name of "Bruiachite" appeared in this Magazine;[1] but it should be noticed that

[1] 1887, Vol. 7, p. 42.

in Mr. Wallace's previous announcement of it,[1] he refers to a resemblance to fluor-spar, so far as "tint" is concerned.

From the want of detail as regards physical properties, in the notice which contains the analysis, it might be considered that there is a deficiency of evidence that the forthcoming analyses were conducted upon the same material; but I have lately been shown by Mr. Peyton a specimen presented to him by Mr. Wallace as Bruiachite, and this, though a "fresher" specimen, is identical with what I examined.

Mr. Wallace in his paper has described the geological occurrence of the veins of baryte, which had indeed—though not this associated mineral —been noticed by myself some years previously.

To Mr. Wallace's description I would only add that they occur sparingly in the series of craggy knolls which denudation has alone left of the basement beds of the Old Red conglomerate, and which are best studied in walking from Drumnadrochit Inn over to what, before Wynan days, used to be the Inn at Struay Bridge. The veins are to be seen on the western fall of Meallnan Caorach, the 1,400 feet summit of the range, in equal force to those near the *débouchement* of the Bruiach Burn.

A point of excelling interest in connection with these knolls is this: in the more easterly of them, nodules of serpentine occur as constituents of the conglomerate, in its very lowest layers. These nodules will be easily found in a boss near a bridge on the path from Glen Urquhart to Beauly; this is at the point marked 733 on the Ordnance map.

The occurrence in this conglomerate of rounded masses of serpentine, perfect in their transmutation, and derived doubtless from the Polmally locality, demonstrates that the serpentine change had been completed before the Old Red period. I do not remember to have seen nodules of serpentine elsewhere in Old Red conglomerate.

My description and analysis of "Bruiachite" is as follows:—

It is associated with lamellar flesh-coloured baryte, sometimes in alternate layers. The baryte is the basement layer—that nearest to the rock—in all the specimens I have seen it is also the upper layer, showing cockscomb forms.

There are thus no free crystals of "Bruiachite" to be seen; but summits of crystals, which seem to be cubes and cubo-octahedra, are imbedded in the lower surface of the layers of baryte, or have been dissolved out of these, leaving hollow casts.

The structure of the substance is precisely that of cut specimens of

[1] 1886, Vol. 6, p. 169.

Derbyshire fluor. Sharp angles of this substance scratch fluor feebly; and sharp angles of fluor similarly scratch this.

The specific gravity, taken upon two perfectly fresh specimens, was—

1st on 463·6 grains	...	...	=	3·158
2nd on 321·2 grains	...	...	=	3·149

The cleavage is octahedral.

In section it is optically isotropic.

The crystal faces, measured by the goniometer, gave angles 109° 26′ and 125° 20′, which are evidently the angles of the octahedron and the cubo-octahedron.

The analysis yielded—

Calcium	51·12
Fluorine	48·56
Barium Sulphate	·23
	99·91

To prevent all mistakes, I wrote to Dr. Aitken lately, asking him to send me another specimen, from which I would cut a portion, returning the remainder. Upon 103·2 grains of this I again determined the specific gravity, and got 3·152. This gives 3·153 as the mean of the three determinations.

The material in hand was divided, and part sent to Mr. J. Stuart Thomson, with a request that he would analyse it. He was simply told that it was a fluoride, possibly contaminated with a little baryte.

I again determined the fluorine by loss, getting 48·85 per cent. and no baryte.

In a letter of March 28th, 1889, Mr. Thomson writes:—

"In addition to the details which I enclose, I may remark that I had "great difficulty in getting all the fluorine replaced by sulphuric acid, as I "found it necessary to evaporate with sulphuric acid no fewer than eight "times before I got a constant weight. I looked carefully for traces of "barium, but failed to find any, so the material may be taken as pure. I "found no iron. My calcium carbonate was beautifully white. The "substance is undoubtedly ordinary fluorite."

The details of Mr. Thomson's analysis follow; our finding is the same.

Analysis of Fluoride (?) received from Prof. Heddle, St. Andrews, March, 1889.

Pt. Cruc. and Substance	...		33·6585
Pt. Cruc.	...	...	32·7715
Substance ...		...	0·8870

Weight after gentle ignition	33·6570
	32·7715
Weight of dry substance taken	0·8855

Heated 8 times with H_2SO_4 till weight was constant—

	34·3165
	32·7715
$CaSO_4$	1·5450

The difference in weight is equivalent to—

48·75% Fluorine

The resulting $CaSO_4$ was fused with sodium and potassium carbonate, dissolved in water, excess of hydrochloric acid added to the filtrate, when a *perfectly clear* solution resulted. Excess of ammonia was now added, and then ammonium oxalate, the precipitate of oxalate of lime was dealt with in the usual way, being finally ignited very gently at a dull red heat with ammonium carbonate.

Pt. Cruc. and $CaCO_3$	32·4255
Pt. Cruc.	31·2945
$CaCO_3$	1·1310

Equivalent to 51·09 % of calcium.

	Theory.	Found.
Ca	51·28%	51·09
F_2	48·72	48·75
	100·00%	99·84%