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On Dudgeonite, Hydroplumbite, Plumbonacrite, and Plattnerite.

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

[Read March 12th, 1889.]

Dudgeonite.

THIS substance was found by Mr. Dudgeon at the Pibble mine, which is directly opposite to Cairnsmore of Fleet, in Kirkcudbrightshire, and is within a few miles of Creetown.

This mine was worked for lead, and a few pieces of copper-nickel (nickeline) were obtained at it. The blue variety of the silicate of zinc also very sparingly occurred, and there were slight appearances of the phosphate and of the carbonate of lead.

The specimens of copper-nickel had very rough corroded-looking surfaces, with pitted cavities, which were filled with the substance analysed.

This is a greyish-white, loose-structured solid, which is easily powdered. Some small spots of some of the specimens were tinged pale pink, and others pale green; but there was no definite appearance of either annabergite or of pharmacolite. It is usually dull, but here and there has a slight resinous lustre. From its absorbing water the specific gravity could not be determined. H. about 3 or 3·5. Fracture, earthy. Streak, lustrous or waxy.

In closed tube gives off water, and becomes slightly grey. B.B. fuses imperfectly to a lustrous slag. On charcoal gives off arsenical fumes, and forms a scoriaceous mass which shows pellets of metal. Totally soluble in nitric and in chlor-hydric acids; not entirely soluble in sulphuric acid.

The analysis was executed upon 10·97 grains, picked under a magnifier.

Oxide of Nickel	25·01
„ Cobalt	·76
Lime	9·32
Arsenic Acid	39·33
Water	25·01
	99·43

The calculations for the formula are—

NiO	... 25·77 ÷	37·5	= ·687	= 2	= 75	=	25·862
CaO	... 9·32 ÷	28·	= ·333	= 1	= 28	=	9·655
As_2O_5	... 39·33 ÷	115·	= ·343	= 1	= 115	=	39·655
H_2O	... 25·01 ÷	9·	= 2·777	= 8	= 72	=	24·828
					290		100·000

Formula $(\frac{2}{3}\ NiO + \frac{1}{3}\ CaO)_3\ As_2O_5 + 8\ H_2O$

Annabergite, with one-third of the nickel oxide replaced by lime. This is somewhat near Forbesite (Dana p. 560).

I have much pleasure in naming this substance—as is most fit—after its discoverer.

Hydroplumbite and Plumbonacrite.

About the year 1853 Mr. Greg sent me for examination the substance now to be—though only very partially—described. He wrote that the locality given for it was Cumberland, but he appeared to be in some doubt as to the accuracy of this. He considered the probability more in favour of Leadhills, and the specimen certainly has more the appearance of a Leadhill specimen than it has of any I have seen from Cumberland. The bulk of the specimen is cerussite upon galena; yellow pyromorphite overlies, with a group of caledonite crystals in one corner.

The substance to be described overlies all the others, and is lodged in largest amount in cavities of the pyromorphite.

It is in very minute scaly crystals, which unite to form thin flakes. These have an exceedingly high pearly lustre. They are of the purest white. They appear to be hexagonal.

The chemical and blowpipe characters are most marked.

The flakes are *entirely* soluble, *without the slightest effervescence*, in nitric acid. The solution gives the reactions for lead, but for no other metal.

B. B. in closed tube gives out *much* water, and *instantly* becomes *bright red*. Upon a slight increase of heat unites with the glass, and forms a *clear transparent* glass therewith.

As the quantity altogether was insufficient for a quantitative analysis, a small portion was left upon the specimen, and it was retained in the hope of others being obtained.

Steps were at once taken to endeavour to *form* such a compound as this appeared to be.

A quantity of a solution of acetate of lead was precipitated by ammonia. The precipitate was washed with warm thrice-distilled water, and was set aside in an absolutely-full bottle of recently distilled water, being left for a number of years.

Scale-like crystals gradually formed upon the surface, and throughout the mass of the "claggy" precipitate. Through the solution of these during summer, and the re-growth of the larger ones during winter (according to the usual law), these crystals gradually increased in size.

When examined these crystals behaved both chemically and B.B. precisely as did the above mineral; but they appear to belong to the prismatic system, and are biaxal. The quantity of water obtained from them left no doubt that they were $8PbO, H_2O$; and, notwithstanding the apparent difference in the symmetry, the mineral in all probability has the same composition; from this composition I would propose for it the name *hydroplumbite*.

In 1857 I was presented by my late colleague, Dr. Macdonald, with a specimen of leadhillite with susannite in very large crystals, which had a little of apparently the same substance as the above upon it. The colour was, however, slightly greyish, or at least not so purely white. Still I should have said that they were the same.

This also gave out water in the tube. It dissolved *totally* in nitric acid, but *with* effervescence.

B.B. in closed tube, after emission of some water, it became a *yellow* blebby mass, which united with the glass with difficulty, forming a *dull yellowish* compound.

The two are therefore different; and *neither* can be leadhillite.

In 1878 and in 1880 I got several small specimens from Dr. Wilson of Wanlockhead, which carried a good deal of the *second* of these substances, and apparently pure.

No larger quantity being procurable after considerable delay, I was forced to make the quantitative examination of this "Hydrocerussite"[1] upon only 8·96 grains for the lead and water, and upon 4·32 grains for the carbonic acid and lead.

There was obtained:—

	1.	2.	Average.
Lead oxide ...	92·617	93·08	92·848
Water	2·008		2·008
Carbonic Acid ...		4·764	4·764
Insoluble		·78	·78
			100·400

[1] A. Lacroix. *Bulletin de la Société Minéralogique de France.* Bull. No. 2. Nordenskiöld, in *Geologiska Foreningens de Stockholm*, Vol. III. No. 12, Mai 1887, describes a similar Hydrocerussite from Longban in Sweden. This M. Bertrand—*Bull. Soc. Min.* T. IV. 1881, p. 87, finds to be *uniaxal.* None of these Hydrocerussites have, I believe, been analysed. The Wanlockhead mineral Lacroix finds to be uniaxal, and apparently hexagonal.

92·617	÷	111·5	= ·831	= 4	×	111·5	= 446	= 93·501
4·764	÷	22·	= ·216	= 1	×	22·	= 22	= 4·612
2·008	÷	9·	= ·223	= 1	×	9·	= 9	= 1·887
							477	100·000

Formula $PbO, CO_2 + 3PbO, H_2O$.

Not being a hydrated cerussite, it may be called Plumbonacrite.

This plumbonacrite and the mineral sent by Greg are, to the eye of the writer, it should be stated, indistinguishable in appearance.

Notes on Plattnerite.

1877. Given me some years ago, as probably *wad*, by Dr. Wilson, and as from Belton-Grain Vein, Wanlockhead.

It occurs in the centre of crystalline masses of plumbocalcite, in mammillated masses; these have a structure which is a combination of concentric layers, with a rude rhomboidal fracture or cleavage. The angle of the cleavage faces is about 104°.

The colour is brown, the lustre dull; it marks the fingers, and is softer than calcite. Its specific gravity varies between 8·8 and 8·96.

It yielded a varying quantity of carbonate of lime; one specimen as much as nearly 3 per cent. Traces of arsenic acid, vanadic acid, and phosphoric acid were found; the remainder being only oxide of lead.

1882. Purchased in Leadhills.

Occurs as very singular single and confluent mammillated nodules, along with, perhaps superimposed upon, smithsonite.

This leads to the belief that the specimen was got in the Bay Vein.

The nodules are smooth in their central portions; but these are set round with concentric rings of corrugated or rough rings.

The central portions are brilliantly smooth and black; the rings are rough and black.

The lustre of the fracture, which is conchoidal, is vitreous; and, the colour of a fractured surface being somewhat brown, the appearance is like that of pitch. The specific gravity is 9·27. Not being willing to sacrifice so rare a specimen, a qualitative examination was alone made. Oxide of lead with traces of vanadium were alone found.