Dundasite from North Wales.

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THE mineral dundasite was first described by W. F. Petterd in 1893, in a 'Catalogue of Minerals known to occur in Tasmania'[1]. It was found in small, silky, milk-white, spherical aggregates incrusting a 'ferro-manganese gossan' at the Adelaide Proprietary mine, Dundas. In this catalogue, and in a subsequent one dated 1896, it was stated, as the result of qualitative tests, to be a hydrated carbono-phosphate of lead and aluminium; but a quantitative analysis (see below under II), made later by S. Pascoe, showed that the mineral is a hydrated carbonate of lead and aluminium, and that the traces of phosphoric acid were due to a thin coating of pyromorphite. In this analysis the water and carbonic acid were determined together, by loss on ignition, and consequently hitherto no chemical formula has been attributed to the mineral. In his 'Notes on unrecorded and other minerals occurring in Tasmania'[2], in which this analysis appears, Mr. Petterd mentions another locality for dundasite in Tasmania—viz. the Hercules mine, Mt. Read, where it was found in patches on a mass of cellular quartz through which were scattered crystals of cerussite and gibbsite.

At a recent meeting of the Mineralogical Society, Mr. H. F. Collins showed me specimens of a mineral which had been found[3] in small, silky, white tufts upon cerussite in the 23 ft. level, Francis lode, Welsh Foxdale mine, near Trefriw, Carnarvonshire. These specimens he kindly placed at my disposal for determination.

Chemical analysis showed that the mineral must be referred to dundasite. In physical characters it is precisely similar to the Tasmanian mineral, of which a specimen, obtained from Mr. Petterd, is in the British Museum collection. It occurs in small (mostly not more than 1 mm. in diameter), white, spherical aggregates or tufts consisting of a felted mass of minute,

[1] Papers and Proceedings of the Royal Society of Tasmania, for 1893, 1894, p. 26.

[2] Papers and Proceedings of the Royal Society of Tasmania, for 1902, 1903, p. 22.

[3] To Mr. G. J. Williams, H.M. Inspector of Mines, appears to be due the credit of having first noticed these tufts of a mineral unknown to him on some cerussite specimens from the Welsh Foxdale mine.

radiating, silky needles. Under the microscope these needles are seen to be fairly strongly refractive (equal to mono-bromo-naphthalene, 1·66) and doubly refractive (some of the larger needles show yellow and red of the first order), to give straight extinction, and to compensate across their length with a quartz-wedge cut parallel to the optic axis : no definite optic axial figure was observable through them in convergent light.

In the specimens presented to the British Museum by Mr. Collins, the tufts of dundasite are associated with beautiful, small, glassy spherules, which analysis showed to be allophane; and both these minerals were thickly distributed in the interstices of a mass of loosely cohering, long-prismatic crystals of cerussite.

The material for analysis was obtained by picking out spherules from a quantity of débris, derived apparently from the breaking up of various specimens. Most of these spherules were tinged slightly yellow from impurity of oxide of iron, but otherwise they appeared to be fairly pure and free from cerussite. The result of the analysis is given under I, as compared with that of dundasite from Tasmania under II, while under III is given the theoretical composition corresponding to the formula, $PbH_2(CO_3)_2.Al_2(OH)_6$.

	I. (N. Wales).	Molecular ratios.	II. (Tasmania).	III. $PbH_2(CO_3)_2.Al_2(OH)_6$.
PbO	43·20	0·1938	41·86	45·95
Al_2O_3	21·39	0·2093	26·06	21·07
Fe_2O_3	1·61	—	5·50	—
CO_2	16·45	0·3739	} 28·08	18·14
H_2O (above 100°)	13·60	0·7556		} 14·84
H_2O (at 100°)	1·41	—		
Insoluble ...	1·80	—		—
	99·46		101·50	100·00

Weight of material used in analysis 0·2140 gram. The water was determined by Penfield's bulb-tube method, and the carbonic acid was estimated by difference between the water and the total loss on ignition. The density of the mineral was determined, by immersing in methylene iodide diluted with benzol, to be between that of axinite and apatite, i. e. about 3·25. That of dundasite from Tasmania was found to be practically the same. The numbers obtained in the analysis suggest the formula $PbO.Al_2O_3.2CO_2.4H_2O$ or $PbH_2(CO_3)_2.Al_2(OH)_6$.

In physical characters and also in chemical composition the mineral

shows a close relationship to dawsonite, the hydrated carbonate of sodium and aluminium, to which the formula $Na_2O.Al_2O_3.2CO_2.2H_2O$ has been attributed.

Characters of dundasite :—

Occurs in white, spherical aggregates or tufts of minute, radiating needles. Hardness, 2. Density, 3·25. Lustre, vitreous. Colour, white. Transparent. Refraction and double refraction, fairly strong: needles give straight extinction and are positive. Chemical formula,

$$PbO.Al_2O_3.2CO_2.4H_2O.$$