Sixth supplementary list of British Isles minerals (Welsh)

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FOLLOWING publication of the *Manual of the Mineralogy of Great Britain and Ireland* (Greg and Lettsom, 1858), supplementary lists of known British minerals have appeared sporadically (Spencer, 1898, 1931, 1958; Embrey, 1977, 1978; Livingstone and Macpherson, 1983). The principal aim of these works has been to establish which mineral species occur in Great Britain and Ireland, information which, in the area under consideration is of fundamental importance to the science of mineralogy.

The task of updating the original work of Greg and Lettsom (1858) is daunting, and a regional approach is perhaps the most realistic way of tackling such a proposition. The situation of known Scottish mineral species has been tackled excellently by Macpherson and Livingstone (1982) and Livingstone and Macpherson (1983). In the former publication they listed known Scottish mineral species, in effect updating the monumental work of Heddle (1901). In the latter publication they provide a (fifth) supplementary list of British minerals, relating to those known to occur in Scotland.

Unfortunately there is no such mineralogy for Wales as that produced by Heddle. Similarly, the mineral collection in the National Museum of Wales has no equivalent collection such as that of Heddle's in the Royal Museum of Scotland. Consequently an attempt has been made over recent years to compile a list of known mineral species in Wales; only when the most comprehensive of lists has been drawn up can a collecting policy for a National Collection be formulated. This list is now in an advanced state of preparation, thanks to the generous assistance of numerous mineralogists who have willingly provided information of both a published and unpublished nature.

When assembled, the data illustrated numerous mineral species, and in a number of cases interesting mineral varieties, new to Britain. Accordingly it was considered desirable to present these as a (sixth) supplementary list of British minerals (Welsh). Meanwhile the task of compiling a list of known Welsh mineral species continues and the author would be pleased to receive information from mineralogists which might prove suitable for inclusion.

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References

Embrey, P. G. (1977) In Greg and Lettsom. *Manual of the Mineralogy of Great Britain and Ireland 1858.* Reprinted with additions 1977, Lapidary Publications, Kent.

——(1978) *Mineral. Mag.* **42,** 169–77.

Greg, R. P., and Lettsom, W. G. (1858) *Manual of the Mineralogy of Great Britain and Ireland.* John van Voorst, London.

Heddle, M. F. (1901) *The Mineralogy of Scotland.* 2 volumes. Edinburgh.

Livingstone, A., and Macpherson, H. G. (1983) *Mineral. Mag.* **47,** 99–105.

Macpherson, H. G., and Livingstone, A. (1982) *Scott. J. Geol.* **18,** 1–47.

Spencer, L. J. (1898) *Rep. Br. Assoc. Adv. Sci.* 875–7 (1899).

——(1931) Ibid. 378 (1932).

——(1958) *Mineral. Mag.* **31,** 787–806.

Aeschynite Orthorhombic

$(Y,Ca,Fe,Th)(Ti,Nb)_2(O,OH)_6$

Occurs as small euhedra in matrix and intergrown with Ti, Fe, Mn, and Sc-rich Ti and Nb oxides in altered rhyolites of Ordovician age in Central Snowdonia (e.g. Gallt y Wenallt), Gwynedd. Identification by ED analysis, although it remains

to determine which *RE* is dominant. [A. Kearsley (1986) pers. comm.]

Altaite PbTe Cubic

First reported from 'Bontddu, entre Dolgelly et Barmouth, Galles du Nord' although no determinative data given. A. Des Cloizeaux (1893) *Man. Mineral.* **2,** 306. Optical and electron microprobe results confirm its presence. J. W. G. Gilbey (1968) unpublished Ph.D. thesis, University of London. Recently verified by ED analysis. [J. Naden (1986) pers. comm.]

Asbolan (*var. zincian asbolan*)

Occurring as concretionary deposits in abandoned lead/zinc mines in Gwynedd. Composition approximates to $Mn_{2.0-2.6}Zn_{0.9-1.8}O_{4.1-5.3}(OH)_{1.6-3.4}(H_2O)_{0.8-3.3}$. D. Roberts (1986) unpublished Ph.D. thesis, University of Wales.

Braunite $Mn^{2+}Mn_6^{3+}SiO_{12}$ Tetragonal

J. H. Collins (1871) *Handb. Mineral. Cornwall Devon*, 19, states 'it is said to have been found in the manganese mines near Launceston'. Confirmed from Tŷ Coch Mine near South Cornelly, Mid Glamorgan, where it forms euhedral to subhedral crystals, associated with hausmannite in iron-manganese ore. A. J. Criddle and R. F. Symes (1977) *Mineral. Mag.* **41,** 85.

Calaverite(?) $AuTe_2$ Monoclinic

Tentatively identified from Panorama Mine, Aberdyfi, Gwynedd. J. W. G. Gilbey (1968) unpublished Ph.D. thesis, University of London. However, it has been suggested that Panorama Mine dump was seeded with material from Clogau Mine. [Pers. comm. from L. Haynes *via* J. Naden.]

Dahllite (*syn carbonate-hyroxylapatite*)

$Ca_5(PO_4,CO_3)_3OH$ Hexagonal

Occurs as pearl-like bodies in cells of *Favositella* at Ty Mawr, Rumney, South Glamorgan. Identification on the basis of optical and physical properties. K. P. Oakley (1934) *Proc. Roy. Soc. Lond.* Series B, **116,** 296.

Electrum (Au,Ag) Cubic

'Alloy' was reported by D. Forbes (1867) *Phil. Mag.* **34,** 340, from Clogau Mine, Gwynedd, although recently the maximum Ag content of gold from Clogau Mine has been shown by electron microprobe analysis to be only approximately 15 wt. %. [J. Naden (1986) pers. comm.]

However electrum *sensu stricto* (with Ag > 20%) has been reported from Cefn Coch. A. R. Andrew (1910) *Geol. Mag.* **47,** 264.

Fibroferrite $Fe^{3+}(SO_4)(OH)\cdot 5H_2O$ Monoclinic

Present as copious mounds of moist granular buff material occurring on the floor of Cae Coch Mine, Trefriw, Gwynedd, together with jarosite and rare copiapite. Identification by X-ray diffraction and wet chemical analysis. D. B. Johnson *et al.* (1979) *Environ. Pollut.* **18,** 107.

Florencite $CeAl_3(PO_4)_2(OH)_6$ Trigonal

Present in mudstones of Ordovician age from the Corris area, Gwynedd. ED analysis shows it to be florencite-(Ce), but the nature of the material does not permit characterization of this new species. [A. Kearsley (1986) pers. comm.]

Galenobismutite $PbBi_2S_4$ Orthorhombic

Forms rims around chalcopyrite, galena and tetrahedrite group minerals, inclusions within sphalerite, and a cement to framboidal pyrite at Parys Mountain, Anglesey. G. Sivaprakash (1977) unpublished M.Phil. thesis, University of Aston, and C. Pointon and R. A. Ixer (1980) *Trans. Inst. Min. Metall.* (Sect. B: Appl. Earth Sci.) **89,** B143–55.

Glaucophane Monoclinic

$Na_2(Mg,Fe^{2+})_3Al_2Si_8O_{22}(OH)_2$

J. F. Blake (1888) *Geol. Mag.* **5,** 125, described glaucophane from the Monument, Menai Bridge, Anglesey, Gwynedd. However, N. Holgate (1951) *Mineral. Mag.* **29,** 795, suggested that the mineral was in fact crossite. J. M. Horák and W. Gibbons (1986) *Mineral. Mag.* **50,** 533, and W. Gibbons and M. Gyopari (1986) *Mem. Geol. Soc. Am.* **164,** 217, have shown that the analysis by Holgate was a bulk analysis of zoned crystals and that both glaucophane and crossite are in fact present. Thus the original description by Blake has precedent for the first British occurrence of glaucophane.

Hessite Ag_2Te Monoclinic

Reported as occurring as discrete, anhedral crystals in tellurbismuth at Clogau Mine, Gwynedd. J. W. G. Gilbey (1968) unpublished Ph.D. thesis, University of London. More recently confirmed by optical identification and electron microprobe analysis as small (30–40 μm) grains in galena ('silver glance') and tellurbismuth. [J. Naden (1986) pers. comm.]

Hollandite $Ba(Mn^{4+},Mn^{2+})_8O_{16}$ Monoclinic

Manganese mineralisation associated with minor N-S vertical faults in yellow tuff on Mochowgryn and around Nant yr Helfa, Gwynedd shown to be hollandite on the basis of chemical analysis, X-ray powder photography and oscillation photographs. B. D. T. Lynas (1973) *J. geol. Soc. London* **129,** 481.

Hydronium jarosite Trigonal

$(H_3O)Fe_3^{3+}(SO_4)_2(OH)_6$

Abundant deposits in all underground workings at Parys Mountain, Anglesey, Gwynedd. Identification by X-ray diffraction and wet chemical analysis. [D. A. Jenkins (1986) pers. comm.]

Hydrozincite (*var. nickeloan hydrozincite*)

Pale green hydrozincite at Parc Mine, Llanrwst, Gwynedd contains up to 4% by weight nickel and has been described as nickeloan hydrozincite. A. K. Alwan and P. A. Williams (1979) *Mineral. Mag.* **43,** 397.

A second occurrence at Parc Mine has been reported. R. E. Bevins *et al.* (1982) *J. Russell Soc.* **1,** 19.

Iridosmine(?) (Os,Ir) Hexagonal

Reported from the 'Dolgelly Gold Belt', Gwynedd. See A. R. Andrew (1910) *Geol. Mag.* **7,** 162. Requires confirmation.

Jamborite(?) Hexagonal

$(Ni^{2+},Ni^{3+},Fe)(OH)_2(OH,S,H_2O)$

British Museum (Natural History), specimen BM 1971,363, from Bedwas Colliery, Mid Glamorgan, is labelled '?jamborite on millerite'.

Kobellite $Pb_{22}Cu_4(Bi,Sb)_{30}S_{69}$ Orthorhombic

As rims around chalcopyrite, galena and tetrahedrite group minerals, as inclusions within sphalerite, or as a cement to framboidal pyrite at Parys Mountain, Anglesey, Gwynedd. C. Sivaprakash (1977) unpublished M.Phil. thesis, University of Aston and C. Pointon and R. A. Ixer (1980) *Trans. Inst. Min. Metall.* (Sect. B: Appl. Earth Sci.) **89,** B143–55.

Kutnahorite $Ca(Mn,Mg,Fe^{2+})(CO_3)_2$ Trigonal

Identified in the manganese ore beds of the Hafotty Formation, of Cambrian age from the Harlech Dome, Gwynedd. [M. Bennett (1986) pers. comm.]

Lanthanite-(Ce) Orthorhombic

$(Ce,La,Nd)_2(CO_3)_3 \cdot 8H_2O$

Forms colourless plates covered with malachite tufts and associated with chalcoalumite, brochantite and posnjakite in Level 2, Britannia Mine, Gwynedd. A new species. R. E. Bevins *et al.* (1985) *Am. Mineral.* **70,** 411.

Lawsonite Orthorhombic

$CaAl_2Si_2O_7(OH)_2 \cdot H_2O$

Occurs in narrow bands in blueschists at various localities in the Mona Complex of southeast Anglesey. Identification by optical examination and electron microprobe analysis. W. Gibbons and A. Mann (1983) *Geology* **11,** 3–6.

Matildite $AgBiS_2$ Hexagonal

Identified as grains (30–40 μm) in galena from an ore shoot on the 4th level, below the main adit level, Clogau Mine, Dolgellau, Gwynedd. [J. Naden (1986) pers. comm.]

Nagyagite $Pb_5Au(Te,Sb)_4S_{5-8}$?Orthorhombic

Forms isolated rim contact between gold and other tellurides at Clogau Mine, Gwynedd. J. W. G. Gilbey (1968) unpublished Ph.D. thesis, University of London. However, the occurrence is dubious. [J. Naden (1986) pers. comm.]

Namuwite Hexagonal

$(Zn,Cu)_4(SO_4)(OH)_6 \cdot 4H_2O$

As pale green hexagonal plates from Aberllyn Mine, Llanrwst, Gwynedd. A new species. R. E. Bevins, S. Turgoose and P. A. Williams (1982) *Mineral. Mag.* **46,** 51.

Parisite $(Ce,La)_2Ca(CO_3)_3F_2$ Trigonal

Occurs in large radiating masses intergrown with synchysite in altered rhyolites of Ordovician age in central Snowdonia (e.g. Gallt y Wenallt), Gwynedd. Identification by energy dispersive analysis. [A. Kearsley (1986) pers. comm.]

Plagionite $Pb_5Sb_8S_{17}$ Monoclinic

Identified from Bwlch Mine, Deganwy, Gwynedd, occurring in association with stibnite, semseyite, zinckenite and robinsonite. Identification by electron microprobe analysis and by X-ray diffraction. R. E. Bevins, D. H. M. Alderton and J. M. Horák (in press) *Mineral. Mag.*

Platiniridium(?) (Ir,Pt) Cubic

Reported from the 'Dolgelly Gold Belt', Gwynedd. See A. R. Andrew (1910) *Geol. Mag.* **7,** 162. Requires confirmation.

Polybasite $(Ag,Cu)_{16}Sb_2S_{11}$ Monoclinic

Present as inclusions in galena, associated with freibergite in the 'Dolgelly Gold Belt', Gwynedd. J. W. G. Gilbey (1968) unpublished Ph.D. thesis, University of London.

Pyrochroite $Mn(OH)_2$ Trigonal

Recorded on a specimen from Benallt Mine, Llyn, Gwynedd. British Museum (Natural History) specimen BM 1945, 114 and confirmed by X-ray diffraction (3404). [R. F. Symes (1986) pers. comm.]

Rectorite Aluminosilicate of Na (an interlayered clay mineral)

Identified in the clay mineral fraction of fine grained rocks of Carboniferous age in the western part (Anthracite Zone) of the South Wales Coalfield. W. D. Gill, F. I. Khalaf and M. S. Massoud (1977) *Sedimentology*, **24,** 675–91.

Developed in low-grade pelitic rocks in the contact aureoles of certain Lower Palaeozoic intrusions in North Wales. R. J. Merriman and B. Roberts (1985) *Mineral. Mag.* **49,** 305.

Robinsonite $Pb_4Sb_6S_{13}$ Triclinic

Present along with stibnite, semseyite, zinckenite and plagionite at Bwlch Mine, Deganwy, Gwynedd. Identification by electron microprobe analysis. Requires confirmation by X-ray diffraction. R. E. Bevins, D. H. M. Alderton and J. M. Horák (in press) *Mineral. Mag.*

Rutile (var. strüverite) Tetragonal

Small prisms in altered microgranite, associated with brookite and gibbsite, Y Llymllwyd, Nant Francon, Gwynedd. Identification by X-ray diffraction. [D. A. Jenkins (1986) pers. comm.]

Synchysite $(Ce,La)Ca(CO_3)_2F$ Hexagonal

Occurs in certain altered Ordovician (Caradoc) igneous rocks from Central Snowdonia (e.g. Gallt y Wenallt), Gwynedd. Analyses contain significant Y, and thus may be synchysite-(Y). In some cases intergrown with parisite. Identification by energy dispersive analysis. [A. Kearsley (1986) pers. comm.]

Szomolnokite $Fe^{2+}SO_4 \cdot H_2O$ Monoclinic

From Seam 'x' Ebbw Vale Main and '40 yd outbye 1st $\frac{3}{4}$ crosscut on Ebbw Vale Return', Crumlin Colliery, Ebbw Vale, Gwent. British Museum (Natural History) specimens BM 1985 MI 33592 and BM 1985 MI 33593. Identification by X-ray diffraction (X1623).

Tetradymite Bi_2Te_2S Trigonal

Reported as occurring at Clogau St. David's Mine, Dolgellau, Gwynedd. This was later thought to be tellurbismuth. A. W. G. Kingsbury (1965) *Mineral. Mag.* **35,** 424. However, subsequent analysis has shown that both tellurbismuth and tetradymite occur at Clogau Mine, Gwynedd, the latter occurring in intimate association with tellurbismuth. J. W. G. Gilbey (1968) unpublished Ph.D. thesis, University of London.

Electron microprobe analyses show that tetradymite from Clogau—St. David's Mine consistently contains 8 wt. % Pb. [J. Naden (1986) pers. comm.]

Unnamed copper aluminium sulphate

Green encrustations coating grass from Simdde Dylluan, Drws-y-coed, Gwynedd. Partial analysis suggests this mineral is the Cu-analogue of glaucocerinite, although difficulties exist regarding purity of the material. G. Raade, C. J. Elliott and V. K. Din (1985) *Mineral. Mag.* **49,** 583–90.

Wehrlite BiTe Trigonal

Intimately intergrown with galena at tetradymite grain boundaries, and as inclusions (40–100 μm) in galena, in an ore shoot on the 4th mine level, below the main adit level, Clogau Mine, Dolgellau, Gwynedd. Identified by electron microprobe analysis. [J. Naden (1986) pers. comm.]

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