

# Eighth supplementary list of British Isles minerals (English)

GEORGE RYBACK

42 Bell Road, Sittingbourne, Kent ME10 4EB, England

AND

PETER C. TANDY

Department of Mineralogy, British Museum (Natural History), London SW7 5BD, England

THE supplementary lists of British Isles minerals record those minerals found in Great Britain, Northern Ireland, and the Republic of Ireland that are not included in Greg and Lettsom's *Manual* (1858). Seven such lists have been published to date:

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

Second: *Idem* (1931) *Ibid.*, 378.

Third: *Idem* (1958) *Mineral. Mag.*, **31**, 787–806.

Fourth: Embrey, P. G. (1977), as appendix to reprinted edition of Greg and Lettsom (1858), where the first three lists are also reprinted. Fourth list reprinted in *Mineral Mag.*, **42**, 169–77.

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

Sixth (Welsh): Bevins, R. E. (1988) *Ibid.*, **52**, 121–4.

Seventh (Irish): Ryback, G., Nawaz, R., and Farley, E. (1988) *Ibid.*, **52**, 267–74.

The last three, together with the present English list, represent a set equivalent to one of the earlier lists, the faster pace of new discoveries dictating the division into smaller regional lists. An occurrence qualifies for inclusion in this English list only if it is both the first in the British Isles and from an English locality, although the practice of mentioning, where appropriate, additional finds in whatever region has been continued.

To keep the supplementary lists realistically brief, none of them routinely includes corrections of or deletions from Greg and Lettsom's *Manual* (1858), nor new and perhaps more significant occurrences of species already on record. (A mineral should not normally appear in more than one list.) Nevertheless, the lists are useful in bringing together a great deal of scattered infor-

mation and, although they deal mainly with published work, in recording some occurrences that may otherwise remain unpublished.

Greg and Lettsom's *Manual* (1858), now widely available in its reprinted form, still remains the only general reference work on British Isles minerals. Its age limits its usefulness and also perpetuates a somewhat antique image of the state of regional mineralogy in these countries. While a replacement for Greg and Lettsom's *Manual* is not yet envisaged, the outlook for English mineralogy has improved recently. The classic minerals of Cornwall and Devon are splendidly described by Embrey and Symes (1987), although their book does not aim to catalogue all the minerals or localities in these counties. Young (1987) and Cooper and Stanley (1990) have dealt comprehensively with all the known occurrences in the Lake District, and in the Caldbeck Fells area within the Lake District, respectively, and these works should be consulted for further details of any Lake District mineral mentioned in our list.

More than 850 species are now known from the British Isles, and 580 or so from England. Of these latter, about 116 are listed here as certain new additions, together with a few interesting varieties of species already recorded from the British Isles; the remainder of the 144 entries concerns occurrences that need further work or are in some way doubtful. The list documents over 170 published occurrences and 70 unpublished ones, and includes the following new species: ashoverite, barstowite, ferrokësterite, sweetite, tristramite, and vochtenite.

'NHM' refers to the Natural History Museum (statutory name British Museum (Natural History)). NHM identifications were by powder X-ray diffraction unless otherwise stated.

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#### *Akaganéite* $\beta\text{-Fe}^{3+}\text{O}(\text{OH},\text{Cl})$ Tetragonal

Significant component of siderite–calcite–Fe sulphide concretions being formed in reduced intertidal marsh and sandflat sediments, Warham Marshes, Norfolk (Pye, 1988). Cf. Greigite. As a secondary mineral at Gravel Hill mine, Perranzabuloe, Cornwall (C. Sparrow, pers. comm., 1991; XRD by Monica Price, Oxford).

#### *Alloclase* $(\text{Co},\text{Fe})\text{AsS}$ Monoclinic

Overgrowths (<0.5 mm) on arsenopyrite in a quartz–chlorite–apatite vein at Scar Crag, Causey Pike, near Keswick, Cumbria (Ixer *et al.*, 1979).

#### *Alluaudite* Monoclinic $\text{NaCaFe}^{2+}(\text{Mn},\text{Fe}^{2+},\text{Fe}^{3+},\text{Mg})_2(\text{PO}_4)_3$

A green alteration product of triphylite and possibly triplite in pegmatite at Megiligar Rocks, Tremearne, Breage, Cornwall; XRD pattern and electron microprobe analysis consistent with those of alluaudite (Stone and George, 1983).

#### *Alumohydrocalcite* Triclinic $\text{CaAl}_2(\text{CO}_3)_2(\text{OH})_4 \cdot 3\text{H}_2\text{O}$

White powdery patches in massive allophane veins in sandstone, old museum specimens from Scarborough, North Yorkshire; and, associated with halloysite, as white powdery aggregates between nodules of scarbroite in the infill of solution pipes in sandstone, Weston Favell, Northamptonshire (Ryback, 1988). With allophane, gibbsite, etc. in fissure-fill in limestone, Woodleaze quarry, Tytherington, Avon (Alabaster, 1989a).

#### *Andersonite* Trigonal $\text{Na}_2\text{Ca}(\text{UO}_2)(\text{CO}_3)_3 \cdot 6\text{H}_2\text{O}$

Small masses of intergrown bright yellow-green pseudocubic crystals ( $\leq 3$  mm), with schrockingerite and gypsum, on walls of a level in Geevor

mine, St. Just, Cornwall (Elton and Hooper, 1992).

#### *Andradite*, stannan

In tin-bearing skarns at Meldon, Devon (El Sharkawi and Dearman, 1966).

#### *Antimony* Sb Trigonal

From Pengenna mine, St. Kew, Cornwall; Hannaford, near Barnstaple, Devon; and localities in the Lake District, Cumbria (Ixer and Stanley, 1980). Inclusions (<5  $\mu\text{m}$ ) in galena at nine localities in the Lake District (Stanley and Vaughan, 1981). Rare isolated granules ( $\leq 20$   $\mu\text{m}$ ) in quartz, Wet Swine Gill, Caldbeck Fells, Cumbria (Fortey *et al.*, 1984). [Also, as rare inclusions in galena, at Tynagh mine, Co. Galway, Eire (Clifford *et al.*, 1986). Earlier records are doubtful: Cornwall (First Supplementary List); Dolgelly gold field, Gwynedd, Wales (Andrew, 1910).] Arsenian antimony forms microscopic inclusions in arsenic in pegmatite at Meldon, Devon (von Knorring and Condliffe, 1984).

#### *Argentopyrite* (?) $\text{AgFe}_2\text{S}_3$ Orthorhombic

As euhedral crystals (<150  $\times$  30  $\mu\text{m}$ ), twinned 'stars' and aggregates of grains in an unusual Ag–Ni–Co mineral assemblage at Tynebottom mine, near Alston, Cumbria; the dimorph sternbergite occurs as grains within the argentopyrite aggregates (Ixer and Stanley, 1987). [The specimens, in the Kingsbury Collection in NHM, may not be from this locality (C. J. Stanley, pers. comm., 1990).]

#### *Ashoverite* $\text{Zn}(\text{OH})_2$ Tetragonal

A new species, from an oxidised vein exposure at Milltown quarry, near Ashover, Derbyshire, forming groups of colourless 0.5 mm square plates on fluorite (Clark *et al.*, 1988; Rust, 1991b). Cf. Sweetite.

#### *Barbosalite* $\text{Fe}^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2$ Monoclinic

Present in the cores of spherules of 'andrewsite' from Wheal Phoenix, Linkinhorne, Cornwall (Dunn, 1990). Cf. hentschelite.

#### *Barium-pharmacosiderite* Trigonal (?) $\text{BaFe}_3^{3+}(\text{AsO}_4)_6(\text{OH})_8 \cdot 14\text{H}_2\text{O}$

An electron microprobe analysis is given of a specimen from Cornwall (Peacor and Dunn, 1985). [Also, as small yellow cubes, from Tynagh mine, Co. Galway, Eire; XRD and qualitative

EDS analysis (A. de Haller specimen; P. Perroud, pers. comm., 1989.)

**Barstowite**  $\text{Pb}_4(\text{CO}_3)\text{Cl}_2\cdot\text{H}_2\text{O}$  Monoclinic

A new species, forming aggregates of tiny subparallel elongate colourless crystals, as an alteration product of phosgenite in lead veins at Bounds Cliff, St. Endellion, Cornwall (Stanley *et al.*, 1991).

**Bayerite**  $\text{Al}(\text{OH})_3$  Monoclinic

Detected by XRD within a nodule containing gibbsite and quartz, from the infill of solution pipes in Upper Chalk at Newhaven, East Sussex (Wilmot and Young, 1985).

**Berthierite**  $\text{FeSb}_2\text{S}_4$  Orthorhombic

Occurs in antimony ore at Wheal Prosper, St. Ewe, Cornwall (NHM identification, 1982, R. W. Barstow specimens). Also at Wet Swine Gill, Caldbeck Fells, Cumbria, as robust prisms up to 2 mm long (Fortey *et al.*, 1984), and at Hogget Gill, Patterdale, Cumbria (A. Russell specimen in NHM, see Young, 1987). [Earlier records from Cornwall (Greg and Lettsom, 1858; Collins, 1892) are uncertain.]

**Boléite**  $\text{Pb}_{26}\text{Ag}_{10}\text{Cu}_{24}\text{Cl}_{62}(\text{OH})_{48}\cdot 3\text{H}_2\text{O}$  Cubic

Rare tiny blue cubes, with cumengéite, pseudoboléite, cerussite, phosgenite, malachite, etc., from Tolcarne Beach, Newquay, Cornwall (V. Holyer specimen in National Museum of Wales; XRD identification, 1983, by P. A. Williams). Also from Newport Beach, near Falmouth, Cornwall; presence of Ag confirmed by microprobe analysis (NHM identification, R. Cook specimen).

**Cancrinite**  $\text{Na}_6\text{Ca}_2\text{Al}_6\text{Si}_6\text{O}_{24}(\text{CO}_3)_2$  Hexagonal

As an alteration product of nosean in phonolite, Wolf Rock, off Cornwall (Harrison *et al.*, 1977).

**Carbonate-cyanotrichite**  $\text{Cu}_4\text{Al}_2(\text{CO}_3,\text{SO}_4)(\text{OH})_{12}\cdot 2\text{H}_2\text{O}$  Orthorhombic

Bright blue matted acicular crystals and coatings on copper, cuprite and childrenite, in places grading into chalcocalumite, from New East Wheal Russell (=South Wheal Crebor), Tavistock, Devon (Starkey, 1986). [Cyanotrichite (lettsonite) was listed in the First and Third Supplementary Lists; cf. Macpherson, 1983.]

**Carnotite** (?)  $\text{K}_2(\text{UO}_2)_2\text{V}_2\text{O}_8\cdot 3\text{H}_2\text{O}$  Monoclinic

Bright yellow earthy from South Terras mine, St. Stephen-in-Brannel, Cornwall; identified by qualitative chemical tests (Gramaccioli, 1955). [Unconfirmed. Francevillite occurs at this locality (Fourth Supplementary List).]

**Chalcocalumite**  $\text{CuAl}_4(\text{SO}_4)(\text{OH})_{12}\cdot 3\text{H}_2\text{O}$  Monoclinic

Pale blue to almost colourless, radiating, with copper, cuprite and brochantite, on childrenite, at South Wheal Crebor (=New East Wheal Russell), Tavistock, Devon (Braithwaite and Cooper, 1982); cf. carbonate-cyanotrichite. White spherules ( $\leq 0.05$  mm) investing quartz crystals, with malachite, mimetite, brochantite, and chrysocolla, at Penberthy Croft mine, St. Hilary, Cornwall (NHM identification, 1985, D. Clough specimen). [Also from two localities in Wales (Bevins *et al.*, 1985; Saich and Rust, 1987).]

**Clausthalite**  $\text{PbSe}$  Cubic

A suite of rare selenides accompanies the dendritic gold of Hope's Nose, Torquay, Devon: clausthalite, eucairite, fischesserite, klockmannite, naumannite, penroseite, tiemannite, trüstedtite, tyrrellite, and umangite. They occur as microscopic grains and patches in calcite (Stanley *et al.*, 1990). Analyses and optical data for clausthalite, eucairite, fischesserite, penroseite, tiemannite, and tyrrellite were published earlier (Cridle and Stanley, 1986). Clausthalite is also reported from Budleigh Salterton, Devon (P. Nancarrow, pers. comm. in Stanley *et al.*, 1990).

**Coffinite**, yttrian phosphatian

Forms the cores of radioactive nodules in Triassic sediments from the Knowle borehole, near Solihull, West Midlands;  $\text{U}_{0.64}\text{Y}_{0.21}\text{P}_{0.17}\text{SiO}_4$  (Harrison *et al.*, 1983). [Similarly from the Avoniel borehole, Belfast, N. Ireland; microprobe analyses (Parnell, 1988a).]

**Corrensite** (Interstratified chlorite + vermiculite or smectite)

In clay fraction of Keuper mudstone at Wilkesley, near Audlem, Cheshire (Poole and Whiteman, 1966). In Keuper marl at a number of localities in Yorkshire, the Midlands, and South Wales (Davis, 1967). In the Rhaetic of St. Audries Bay, near Watchet, Somerset; Seaton, Devon; and unspecified localities in between (Myall,

1979). [Also in Ordovician pelites in Snowdonia, Wales (Merriman and Roberts, 1985).]

*Coulsonite* (?)  $\text{FeV}_2\text{O}_4$  Cubic

Mentioned as a possible former constituent, now replaced by hematite, in basal breccias of the Mercia Mudstone Group at Newhurst quarry, Shepshed, Leicestershire (King, 1983). Some material was examined at NHM but results were inconclusive and it remains an unconfirmed occurrence.

*Cumengéite*  $\text{Pb}_{21}\text{Cu}_{20}\text{Cl}_{42}(\text{OH})_{40}$  Tetragonal

Pale blue microcrystalline crusts with bournonite, bindheimite, cerussite, etc., from vein exposure at Newport Beach, near Falmouth, Cornwall (Dean, 1982; Dean *et al.*, 1983). Also from Daymer Bay, near Polzeath, and Trerubies Cove, near Delabole, Cornwall (NHM identifications, 1986, R. E. Starkey specimens).

*Cuprosklodowskite* Triclinic  
 $(\text{H}_3\text{O})_2\text{Cu}^{2+}(\text{UO}_2)_2(\text{SiO}_4)_2 \cdot 2\text{H}_2\text{O}$

Bright-green velvety botryoidal crust on a specimen from West Wheal Owles, St. Just, Cornwall, is shown to be cuprosklodowskite. The X-ray pattern is significantly different from that of sklodowskite (D. Hudson specimen; NHM identification). Similar and possibly identical material from Geevor mine, St. Just, is under investigation (N. J. Elton and J. J. Hooper, pers. comm., 1992).

*Cuprotungstite*  $\text{Cu}_3^{2+}(\text{WO}_4)_2(\text{OH})_2$

Yellowish-green glassy massive, with wolframite and metatorbernite, Wheal Gorland, St. Day, Cornwall (NHM specimen, collected by A. W. G. Kingsbury in 1955). Green crusts ( $\leq 10 \mu\text{m}$ ) on scheelite, from a quartz-scheelite-ferberite vein at Buckbarrow Beck, Corney Fell, Cumbria (Young *et al.*, 1986).

*Cyrlivite* Tetragonal  
 $\text{NaFe}_3^{3+}(\text{PO}_4)_2(\text{OH})_4 \cdot 2\text{H}_2\text{O}$

Yellow bipyramids (0.2–0.7 mm) with chalcociderite in kaolinised granite at Gunheath china clay pit, St. Austell, Cornwall (Ince, 1986).

*Delafossite*  $\text{CuFeO}_2$  Trigonal

Small spherules on quartz, Cornwall (An 1860 specimen from the Allan–Greg Collection in NHM, studied by Buist *et al.*, 1966). Blackish pointed crystals ( $< 0.5 \text{ mm}$ ) with malachite and cuprite on quartz, Tolvaddon mine, Marazion,

Cornwall (NHM identification, P. Wallace specimen collected in 1986).

*Dioptase*  $\text{CuSiO}_2(\text{OH})_2$  Trigonal

Bright green crystalline crusts, with rosasite, serpierite, and adamite, Potts Gill baryte mine, Caldbeck Fells, Cumbria (NHM specimen, collected by A. W. G. Kingsbury in 1953; cf. Hartley, 1984).

*Epidote*, stannian

With cassiterite, malayaite, stannian titanite, and amphibole in skarn at The Crowns, Botallack, St. Just, Cornwall; 0.63–2.84%  $\text{SnO}_2$  (Van Marcke de Lummen, 1986a).

*Eucairite*  $\text{CuAgSe}$  Orthorhombic

See under clausthalite.

*Ferberite*  $\text{FeWO}_4$  Monoclinic

Recorded from Cornwall, at Penhale mine, St. Cleer, and at Wheal Arthur and East Calstock mine, Calstock (Dines, 1956). The wolframite from 'Godolphins Ball in Cumberland' [Godolphin mine, Breage, Cornwall], analysed by Kerndt (1847), appears to have been ferberite. With scheelite and chalcopyrite in a quartz vein at Buckbarrow Beck, Corney Fell, Cumbria; microprobe analyses (Young *et al.*, 1986).

*Ferroaxinite* Triclinic  
 $\text{Ca}_2\text{Fe}^{2+}\text{Al}_2\text{BSi}_4\text{O}_{15}(\text{OH})$

An old analysis of axinite from Cornwall (Whitfield, 1887) fits manganose ferroaxinite. In Cornwall, ferroaxinite is recorded from Botallack mine and Roscommon Cliff, St. Just, and from Liskeard (Dunn *et al.*, 1980). Both magnesian and manganose varieties occur in contact skarns at Meldon, Devon (Chaudhry and Howie, 1969). [Magnesian ferroaxinite also from Ballyconneely, Connemara, Co. Galway, Eire (Benjamin, 1968).]

*Ferrocolumbite*  $\text{FeNb}_2\text{O}_6$  Orthorhombic

Subhedral platy crystals ( $\leq 5 \text{ mm}$ ) from pegmatite veins in kaolinised granite at Gunheath china clay pit, St. Austell, Cornwall; analysis shows substantial substitution by Ti, W, and Sc (Hodkinson and Clark, 1977). Cf. manganocolumbite.

*Ferrokësterite* Tetragonal  
 $\text{Cu}_2(\text{Fe,Zn})\text{SnS}_4$

Irregular masses up to a few mm across with arsenopyrite and quartz, and as exsolution lamellae in stannite, Cligga Head, Perranzabuloe,

Cornwall (Kissin and Owens, 1989). The name replaces in part 'isostannite' which is now discredited (see under k esterite).

*Ferrostrunzite* Triclinic  
 $\text{Fe}^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2 \cdot 6\text{H}_2\text{O}$

Straw-yellow to golden-yellow radial aggregates up to 1 cm in goethite from Gravel Hill mine, Perranzabuloe, Cornwall (Weiss, 1989). The X-ray pattern is said to match JCPDS 11-133 (strunzite) but an XRF analysis shows a ratio of 10:1 of total Fe to Mn.

*Fersmite* Orthorhombic  
 $(\text{Ca}, \text{Ce}, \text{Na})(\text{Nb}, \text{Ta}, \text{Ti})_2(\text{O}, \text{OH}, \text{F})_6$

Partially replacing a microlite grain in lithium pegmatite from Meldon, Devon (von Knorring and Condliffe, 1984).

*Fischeserite* Cubic  
 $\text{Ag}_3\text{AuSe}_2$   
 See under clausthalite.

*Fraipontite* Monoclinic  
 $(\text{Zn}, \text{Al})_3(\text{Si}, \text{Al})_2\text{O}_5(\text{OH})_4$

Soft white botryoidal crust, with smithsonite and hemimorphite, from Copperthwaite vein, Swaledale, North Yorkshire (NHM identification, 1967, G. Ryback specimen).

*F l ppite* Monoclinic  
 $\text{Pb}_3\text{Sb}_8\text{S}_{15}$

Dark grey patches of fibrous crystals accompanying stibnite in a quartz-stibnite-zinckenite-berthierite vein at Wet Swine Gill, Caldbeck Fells, Cumbria (Fortey *et al.*, 1984; cf. Cooper and Stanley, 1990).

*Glaucodot* Orthorhombic  
 $(\text{Co}, \text{Fe})\text{AsS}$

Microscopic overgrowths on arsenopyrite in a quartz-chlorite-apatite vein at Scar Crag, Causey Pike, near Keswick, and on marcasite at Tynebottom mine, near Alston, Cumbria (Ixer *et al.*, 1979). From Paddy End mine, Coniston, Cumbria (C. J. Stanley, pers. comm. quoted by Young, 1987).

Gold, palladian

The dendritic gold of Hope's Nose, Torquay, Devon, is palladian, with about 1 to over 6% Pd (Clark and Criddle, 1982); may contain up to 16% of palladium (Scrivener *et al.*, 1982).

*Greigite* Cubic  
 $\text{Fe}^{2+}\text{Fe}_2^{3+}\text{S}_4$

Significant component of siderite-calcite-Fe sulphide concretions being formed in reduced intertidal marsh and sandflat sediments, Warham

Marshes, Norfolk (Pye, 1981, 1984); cf. akagan ite. An analysis of greigite from Treore mine, St. Teath, Cornwall (Kingsbury Collection in NHM) is given by Criddle and Stanley (1986) but the locality is in doubt and this occurrence requires confirmation (C. J. Stanley, pers. comm., 1990).

Grossular, stannan

In calc-silicate hornfels at Meldon quarry, and in chert at Red-a-ven mine, Meldon, Devon (Dearman, 1965; El Sharkawi and Dearman, 1966). In a calc-silicate vein at Crowns Rock, Botallack, St. Just, Cornwall (Alderton and Jackson, 1978).

*Hedleyite* Trigonal  
 $\text{Bi}_7\text{Te}_3$

As grains ( $\leq 0.2$  mm) with bismuth, bismuthinite, and jos ite in greisen, Carrock mine, Caldbeck Fells, Cumbria (Cooper and Stanley, 1990).

*Hedyphane* Hexagonal  
 $\text{Pb}_3\text{Ca}_2(\text{AsO}_4)_3\text{Cl}$

Cream coloured radiating crystal aggregates ( $\leq 7$  mm) with duftite on quartz, Brandy Gill, Caldbeck Fells, Cumbria (NHM identification, 1985, R. E. Starkey specimen). [Also from Tynagh mine, Co. Galway, Eire, as white to greenish tufts with malachite (A. de Haller specimen; P. Perroud, pers. comm., 1989).]

*Hentschelite* Monoclinic  
 $\text{CuFe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2$

'Andrewsite' from Wheal Phoenix, Linkinhorne, Cornwall, is a mixture of hentschelite and rockbridgeite, with minor chalcocite, and is discredited as a species (Dunn, 1990. Cf. barbosalite).

*Hetaerolite* Tetragonal  
 $\text{ZnMn}_2\text{O}_4$

Small black octahedra and crystal aggregates in lizardite veins at Eastern Cliff, Kennack Sands, Lizard, Cornwall (Bevins *et al.*, 1987).

*Heterogenite* Trigonal  
 $\text{CoO}(\text{OH})$

Black botryoidal crust c.  $3 \times 2$  cm across on mineralised Permo-Triassic sandstone from Engine vein, Alderley Edge, Cheshire (NHM specimen collected by A. W. G. Kingsbury in 1963).

*Humboldtine* Monoclinic  
 $\text{Fe}^{2+}\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$

Yellow microcrystalline crust ( $4 \times 4$  cm in area), associated with crystals of cassiterite, quartz and tourmaline, from Pendarves mine,

Camborne, Cornwall (NHM identification, 1986, D. Baker specimen).

*Hydro-andradite* Cubic  
 $\text{Ca}_3\text{Fe}_2^{3+}(\text{SiO}_4)_{3-x}(\text{OH})_{4x}$

A fluorine-bearing aluminian hydro-andradite occurs in quartz-rich nodules within metasomatically altered basalt at Botallack, St. Just, Cornwall (Van Marcke de Lummen, 1986b).

*Hydrohetaerolite* Tetragonal  
 $\text{Zn}_2\text{Mn}_4\text{O}_8 \cdot \text{H}_2\text{O}$

On calcite in oxidised veinstuff from Copperthwaite vein, Swaledale, North Yorkshire (NHM identification, 1968, G. Ryback specimen). [Also from Ballygown South mine, Silvermines, Co. Tipperary, Eire, mixed with coronadite, as thin black crusts on limonite containing hemimorphite (NHM identification, 1992, G. Ryback specimen).]

*Idaite*  $\text{Cu}_3\text{FeS}_4$  (?) Hexagonal

As a secondary sulphide in a mineralized fault in Triassic Dolomitic Conglomerate at Clevedon, Avon (Ixer, 1986). A mineral close to idaite was also reported from Alderley Edge, Cheshire (Ixer and Vaughan, 1982).

*Ikaite*  $\text{CaCO}_3 \cdot 6\text{H}_2\text{O}$  Monoclinic

Although ikaite itself has not been recorded from the British Isles, it was the parent mineral of the long-known calcite pseudomorphs called 'jarrowite' or 'pseudogaylussite', from the River Tyne at Jarrow, Tyne and Wear, and from the Clyde at Cardross, Strathclyde, Scotland (Shearman and Smith, 1985).

*Ingodite*  $\text{Bi}_2\text{TeS}$  Hexagonal

With josëite-A, josëite-B, and bismuthinite, as a minor component of 'grünlingite' from Carrock mine, Caldbeck Fells, Cumbria (Zav'yalov and Begizov, 1981a; Cooper and Stanley, 1990).

*Isomertieite*  $\text{Pd}_{11}\text{Sb}_2\text{As}_2$  Cubic

Anhedral to euhedral grains ( $\leq 15 \mu\text{m}$ ) associated with gold at Hope's Nose, Torquay, Devon; mertieite-II occurs similarly (Clark and Criddle, 1982).

*Ixiolite* (?)  $(\text{Ta}, \text{Nb}, \text{Fe}, \text{Mn}, \text{Sn})_2\text{O}_4$  Monoclinic

In granite pegmatite at Megiligar Rocks, Tremearne, Breage, Cornwall; XRD pattern identical with or close to that of ixiolite, but chemical confirmation is required (NHM identification, 1987, N. Talbot specimen).

*Josëite (Josëite-A)*  $\text{Bi}_4\text{TeS}_2$  Trigonal

A major constituent of 'grünlingite' from Carrock mine, Caldbeck Fells, Cumbria, other phases usually present being josëite-B, bismuthinite, and ingodite (Peacock, 1941; Zav'yalov and Begizov, 1981b; Cooper and Stanley, 1990). As minute grains, with bismuthinite and laitarite, at Coniston mines, Cumbria (Stanley and Vaughan, 1982).

*Josëite-B*  $\text{Bi}_4\text{Te}_2\text{S}$  Trigonal  
 See under josëite-A and ingodite, above.

*Kaňkite*  $\text{Fe}_2(\text{AsO}_4)_2 \cdot 7\text{H}_2\text{O}$  Monoclinic

Green botryoidal crusts with zeunerite, King's Wood mine, Buckfastleigh, Devon; pale green crusts, South Terras mine, St. Stephen-in-Branneil, Cornwall (NHM identifications, 1982 and 1984, R. W. Barstow and A. L. Ellis specimens, respectively).

*Kentrolite*  $\text{Pb}_2\text{Mn}_2\text{Si}_2\text{O}_9$  Orthorhombic

A thin red plate on matrix from Higher Pitts Farm, Priddy, Somerset (NHM identification, 1982, A. W. G. Kingsbury specimen). Listed from Colemans quarry, Holwell, Somerset (Alabaster, 1990a).

*Kësterite*  $\text{Cu}_2(\text{Zn}, \text{Fe})\text{SnS}_4$  Tetragonal

With stannoidite and rare zincian stannite at St. Michael's Mount, Marazion, Cornwall; rarely at Cligga Head, Perranzabuloe, Cornwall, with stannite (Moore and Howie, 1984). 'Isostannite' from Cligga Head (Claringbull and Hey, 1955) is kësterite (Kissin and Owens, 1975; Corazza *et al.*, 1986) or ferrokësterite (Kissin and Owens, 1989). [A very old analysis by Johnston referring to 'a kind of tin pyrites' from St. Michael's Mount, and showing  $\text{Zn} > \text{Fe}$ , is given by De la Beche (1839) without other details.]

*Kidwellite* Monoclinic  
 $\text{NaFe}_9^{3+}(\text{PO}_4)_6(\text{OH})_{10} \cdot 5\text{H}_2\text{O}$

Small globules of radiating greenish-yellow fibres, with chalcociderite in quartz-goethite matrix from Wheal Phoenix, Linkinhorne, Cornwall (Braithwaite and Corke, 1980).

*Klockmannite*  $\text{CuSe}$  Hexagonal

See under clausthalite.

*Ktenasite* Monoclinic  
 $(\text{Cu}, \text{Zn})_5(\text{SO}_4)_2(\text{OH})_6 \cdot 6\text{H}_2\text{O}$

Aggregates of tiny blue-green tabular crystals with gypsum, namuwite, schulenbergitte, and

serpierite, Smallcleugh mine, Nenthead, Cumbria; identified by XRD (Rust, 1991a). This material, also found at Brownley Hill mine, is in fact zinc-dominant, ranging in composition from the nearly pure zinc end-member to Cu:Zn nearly 1:1 (Livingstone, 1991).

*Kuramite*  $\text{Cu}_3\text{SnS}_4$  Tetragonal

Grey granular metallic veins with possible covellite, stannoidite, etc., in granite from Gunheath china clay pit, St. Austell, Cornwall; XRD, optical, and electron microprobe identification (C. J. Stanley, pers. comm., 1989; NHM specimen from Capt. E. J. P. Sutton).

*Laitakarite*  $\text{Bi}_4(\text{Se,S})_3$  Trigonal

Grains (<50  $\mu\text{m}$ ) associated with bismuth and bismuthinite, Bonser vein, Coniston mines, Cumbria (Stanley and Vaughan, 1982). [First selenium mineral from the British Isles.]

*Manganocolumbite* Orthorhombic  
 $\text{MnNb}_2\text{O}_6$

Minute inclusions in minerals replacing wolframite at Carrock mine, Caldbeck Fells, Cumbria; highly ferroan, with notable amounts of W, Ti and Sc (Beddoe-Stephens and Fortey, 1981). Minute crystals showing complex oscillatory zoning, from pegmatites in the Meldon aplite, Devon; composition within much of the manganocolumbite-manganotantalite range (von Knorring and Condliffe, 1984). Cf. ferrocolumbite.

*Manganosite*  $\text{MnO}$  Cubic

Pinkish red fibres on a specimen of chrysoberyl said to come from Ford Farm quarry, Sticklepath, Devon, possibly contain manganosite as a constituent along with quartz, possible pseudorutile, and an unidentified 7 Å mineral (NHM identification, 1982, A. W. G. Kingsbury specimen). Also shown to be a constituent of black crystalline material from Roughton Gill, Caldbeck Fells, Cumbria (NHM identification, 1986, Mr. Mings specimen).

*Marialite*  $3\text{NaAlSi}_3\text{O}_8 \cdot \text{NaCl}$  Tetragonal

White fibrous compact aggregates with tourmaline from the New Aplite quarry, Meldon, Devon (A. W. Scoble specimens in NHM, presented in 1959). [The variety dipyre appeared in the Fifth Supplementary List.]

*Mawsonite*  $\text{Cu}_6\text{Fe}_2\text{SnS}_8$  Tetragonal

Replacing small grains of stannoidite in the Hensbarrow granite stock, St. Austell, Cornwall (Manning, 1983).

*Melanotekite*  $\text{Pb}_2\text{Fe}_2^{3+}\text{Si}_2\text{O}_9$  Orthorhombic

Much altered yellow relict crystals in limestone-hosted replacement deposits of Fe and Mn oxides at Merehead quarry, Somerset, and two localities at Westbury-on-Trym, Avon (Alabaster, 1985). Listed from Colemans quarry, Holwell, Somerset (Alabaster, 1990a).

*Mereheadite*

See under unnamed lead and lead-molybdenum oxychlorides.

*Mertieite-II*  $\text{Pd}_8(\text{Sb,As})_3$  Trigonal

See under isomertieite.

*Metaköttigite* (?) Triclinic  
 $(\text{Zn,Fe}^{3+},\text{Fe}^{2+})_3(\text{AsO}_4)_2 \cdot 8(\text{H}_2\text{O,OH})$

Minute yellowish-brown acicular crystals in cavities in quartz, Sandbeds Gill, Bassenthwaite, Cumbria; XRD indicates metaköttigite or a metaköttigite-symplesite intermediate (NHM identification, 1988, N. Thomson specimen).

*Metasideronatrite* Orthorhombic  
 $\text{Na}_2\text{Fe}^{3+}(\text{SO}_4)_2(\text{OH}) \cdot \text{H}_2\text{O}$

Yellow botryoidal material with gypsum and pyrite on a specimen from Trearubies Cove, near Delabole, Cornwall, is a mixture of sideronatrite and metasideronatrite; other specimens carry only sideronatrite (NHM identifications, 1985, R. E. Starkey specimens).

*Metavoltine* Hexagonal  
 $\text{K}_2\text{Na}_6\text{Fe}^{2+}\text{Fe}_6^{3+}(\text{SO}_4)_{12}\text{O}_2 \cdot 18\text{H}_2\text{O}$

Sulphur-yellow botryoidal crust, from cliffs near the sea-level adit, Wheal Edward, St. Just, Cornwall (NHM identification, 1981, G. Ryback specimen).

*Moolooite*  $\text{CuC}_2\text{O}_4 \cdot n\text{H}_2\text{O}$  Orthorhombic

Vivid blue crystalline inclusions ( $\leq 0.5$  mm) in the lichen *Lecidea inops* from Coniston mines, Cumbria (Chisholm *et al.*, 1987).

*Natromontebrasite* Triclinic  
 $(\text{Na,Li})\text{Al}(\text{PO}_4)(\text{OH,F})$

Alteration product of amblygonite in granite pegmatite at Megiligar Rocks, Tremearne, Breage, Cornwall; identification based on electron microprobe analyses (Stone and George, 1983).

*Natron* (?)  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  Monoclinic

An old entry in the locality card-index of the NHM collections refers to natron from Botallack

mine, St. Just, Cornwall, but a recent (1990) search in the collections failed to find any specimens. Listed by Wolloxall (1989) on the basis of this record.

*Naumannite*  $\text{Ag}_2\text{Se}$  Orthorhombic  
See under clausthalite.

*Nordstrandite*  $\text{Al}(\text{OH})_3$  Triclinic

Earthy, white or pale cream, associated with brown Fe oxides and black manganiferous matter, in nodules from the infill of solution pipes in Upper Chalk at Newhaven, East Sussex (Wilmot and Young, 1985).

*Para-alumohydrocalcite*  
 $\text{CaAl}_2(\text{CO}_3)_2(\text{OH})_4 \cdot 6\text{H}_2\text{O}$

With allophane, scarbroite, and dundasite in fissure-fill in limestone, Hampstead Farm quarry, Chipping Sodbury, Avon (Alabaster, 1989a, 1990b). As a vein 8 mm wide in ferruginous sandstone from a quarry at Boughton, near Northampton; identified by XRD (Dept. of Geology, Leicester University specimen; J. Faithfull, pers. comm., 1989).

*Paracostibite* (?)  $\text{CoSbS}$  Orthorhombic

A specimen supposedly from Wheal Cock, St. Just, Cornwall (Kingsbury Collection in NHM) has been analysed (Criddle and Stanley, 1986) and confirmed by XRD; but it may be from another locality and the occurrence needs to be confirmed (C. J. Stanley, pers. comm., 1990).

*Parahopeite*  $\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$  Triclinic

Recorded as having been found by A. W. G. Kingsbury [in the 1950s–60s] at Roughton Gill, Caldbeck Fells, Cumbria (Hartley, 1984); and at Turf Pits mine, Grassington Moor, and Cockhill mine, Bewerley, both in North Yorkshire (Dunham and Wilson, 1985).

*Pararammelsbergite* (?) Orthorhombic  
 $\text{NiAs}_2$

A nickel diarsenide with c. 5% Co and showing the optical properties of pararammelsbergite is noted as a trace component of the mineralisation at Alderley Edge, Cheshire (Ixer and Vaughan, 1982).

*Parkinsonite*

See under unnamed lead and lead-molybdenum oxychlorides.

*Parnauite* Orthorhombic  
 $\text{Cu}_9(\text{AsO}_4)_2(\text{SO}_4)(\text{OH})_{10} \cdot 7\text{H}_2\text{O}$

Bright green crystalline, on an old specimen of spangolite from Wheal Gorland, Gwennap, Cornwall (A. Russell Collection in NHM; XRD identification, 1981). Subsequently confirmed on specimens from five other localities in Cornwall and Devon, submitted by several collectors (NHM identifications). [Also, as pale turquoise spherules with tennantite and with clinotyrolite, at Tynagh mine, Co. Galway, Eire (A. de Haller specimen; P. Perroud, pers. comm., 1989).]

*Penroseite*  $(\text{Ni}, \text{Co}, \text{Cu})\text{Se}_2$  Cubic  
See under clausthalite.

*Pharmacolite*  $\text{CaHAsO}_4 \cdot 2\text{H}_2\text{O}$  Monoclinic  
See under micropharmacolite.

*Philipsburgite* Monoclinic  
 $(\text{Cu}, \text{Zn})_6(\text{AsO}_4, \text{PO}_4)_2(\text{OH})_6 \cdot \text{H}_2\text{O}$

Grass-green globular aggregates ( $\leq 2$  mm) associated with malachite in cavities in vein quartz, Potts, Gill baryte mine, Caldbeck Fells, Cumbria (Braithwaite and Ryback, 1988); also from Low Pike (Young *et al.*, 1990) and Driggith mine (N. Hubbard specimen, identified by IR, 1990). Thin botryoidal crusts in small cavities in quartz, Wheal Carpenter, Gwinnear, Cornwall (NHM identification, 1989, N. Hubbard specimen).

*Phosphuranylite* (?) Orthorhombic  
 $\text{Ca}(\text{UO}_2)_3(\text{PO}_4)_2(\text{OH})_2 \cdot 6\text{H}_2\text{O}$

Bright yellow crystalline crusts on shale from Wheal Edward, St. Just, Cornwall; XRD pattern near that of phosphuranylite, but chemical confirmation would be desirable (NHM specimen, collected by R. W. Barstow).

*Phurcalite* Orthorhombic  
 $\text{Ca}_2(\text{UO}_2)_3(\text{PO}_4)_2(\text{OH})_4 \cdot 4\text{H}_2\text{O}$

Microscopic yellow bladed crystals, often in radiating clusters, with autunite on joints in granite, Merrivale quarry, Dartmoor, Devon (Braithwaite *et al.*, 1989b). One of the 'unidentified uranium mineral(s)' from Merrivale mentioned in the Fourth Supplementary List.

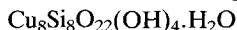
*Picropharmacolite* Triclinic  
 $\text{Ca}_4\text{MgH}_2(\text{AsO}_4)_4 \cdot 11\text{H}_2\text{O}$

Crust of white satiny fibres and massive, with pharmacolite, weilite, wappelerite, etc., from Wanthwaite mine, St. John's in the Vale, Cumbria (NHM specimens, see Young, 1987). [Also



from Silver Glen, Alva, Clackmannanshire, Scotland, with erythrite and Co arsenides (S. Moreton specimen, XRD identification by Royal Museum of Scotland).]

*Planchéite* Orthorhombic



Three A. W. G. Kingsbury specimens in NHM, identified by XRD; blue compact radiating spherules up to 8 mm across coated with chrysocolla, Driggith mine, Caldbeck Fells, Cumbria (collected 1952; cf. Hartley, 1984, and Young, 1987); dark blue grains in turquoise, Gunheath china clay pit, St. Austell, Cornwall (collected 1958); and a broken matrix-free blue compact radiating spherule several mm across, Engine vein, Alderley Edge, Cheshire (collected 1963).

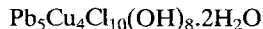
*Pollucite*  $(\text{Cs}, \text{Na})_2\text{Al}_2\text{Si}_4\text{O}_{12} \cdot \text{H}_2\text{O}$  Cubic

Colourless anhedral grains in pegmatite lenses in aplite, Meldon, Devon (Kingsbury, 1964).

Potassium magnesio-arfvedsonite

A new amphibole, occurring as a minor component of a minette intrusion at Pendennis Point, Falmouth, Cornwall (Hall, 1982).

*Pseudoboléite* Tetragonal



See under boléite.

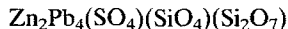
*Pseudorutile* (?)  $\text{Fe}_2\text{Ti}_3\text{O}_9$  Hexagonal

See under manganosite.

*Pyrostilpnite*  $\text{Ag}_3\text{SbS}_3$  Monoclinic

Red-brown platy crystals on quartz, St. Teath, Cornwall; identified by XRD (NHM specimen, collected by A. W. G. Kingsbury in 1959).

*Queitite* Monoclinic



White silky botryoidal crust on leadhillite and susannite, Red Gill mine, Caldbeck Fells, Cumbria (Braithwaite *et al.*, 1989a). [Also from Leadhills, south Scotland (Jackson, 1990).]

*Ranciéite* Hexagonal (?)



Pink-brown powdery from near Newbiggin, Teesdale, Durham (precise locality not known; NHM specimen, XRD identification, 1985).

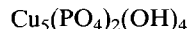
*Redondite* (Messbach-type variscite)

Orthorhombic



Identified by XRD at Pitts Cleve quarry, Tavistock, Devon, and Treore mine, St. Teath, Cornwall (A. W. G. Kingsbury specimens in NHM). [The Devon material was probably that exhibited as variscite at a Mineralogical Society meeting in 1962 (*Mineral. Mag.*, 33, lxiv).]

*Reichenbachite* Monoclinic

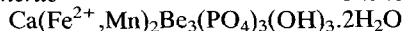


Many specimens of pseudomalachite from the Old Gunnislake mine, Calstock, Cornwall, have been re-identified as the recently described polymorph reichenbachite (R. S. W. Braithwaite and G. Ryback, unpublished work).

*Roquesite*  $\text{CuInS}_2$  Tetragonal

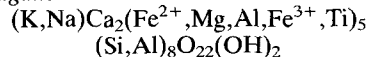
Inclusions (<0.3 mm) in chalcosine, Geevor mine, St. Just, Cornwall; analysis and optical data (Criddle and Stanley, 1986). [First indium mineral from the British Isles.]

*Roscherite* Monoclinic



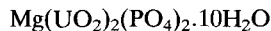
Dark sage-green, radiating, forming spherules up to 5 mm across, on crusts of minute carbonate-fluorapatite crystals lining cavities in quartz, Clitters United mine, Calstock, Cornwall; close to the iron end-member in composition. Also found as flat radiating aggregates on joints in quartz (Clark *et al.*, 1983).

*Sadanagaite* Monoclinic



From the amphibole zone of skarns at Botalack, St. Just, Cornwall (Van Marcke de Lummen, 1985).

*Saléite* (?) Monoclinic



Incompletely characterised uranium minerals giving XRD patterns matching those of saléite, or similar to those of saléite and nováčekite, occur in Cornwall at Wheal Edward, St. Just; Wheal Basset, Redruth; and Roughtor Great Consols, St. Clether (NHM identifications). Specimens have been found by several collectors. [Exact identification difficult since there are no adequate published X-ray data for pure saléite.]

- Schröckingerite*  $\text{NaCa}_3(\text{UO}_2)(\text{CO}_3)_3(\text{SO}_4)\text{F}\cdot 10\text{H}_2\text{O}$  Triclinic  
Greenish yellow spherules ( $\leq 4$  mm) composed of minute pseudohexagonal plates, with andersonite and gypsum, on walls of a level in Geevor mine, St. Just, Cornwall (Elton and Hooper, 1992).
- Schulenbergite*  $(\text{Cu}, \text{Zn})_7(\text{SO}_4, \text{CO}_3)_2(\text{OH})_{10}\cdot 3\text{H}_2\text{O}$  Trigonal  
Rare small blue-green crystals with serpierite and namuwite, Waterbank mine, Ecton, Staffordshire (NHM identification, 1987, S. A. Rust specimen), and similarly from Smallcleugh mine, Nenthead, Cumbria (Livingstone *et al.*, 1990). From Prince of Wales mine, Calstock, Cornwall (NHM identification, J. Betterton specimen). [Also from Wales at Nant-y-Cagal (Eaglebrook) mine, Ceulanymaesmawr, Dyfed, and Dyfngwm mine, Penegoes, Powis (NHM identifications, S. A. Rust specimens).]
- Schultenite*  $\text{PbHAsO}_4$  Monoclinic  
A spray of colourless blades ( $\leq 1$  mm) in cavity in white quartz from Deer Hills vein, Caldbeck Fells, Cumbria (Symes *et al.*, 1991).
- Sodium-zippeite*  $\text{Na}_4(\text{UO}_2)_6(\text{SO}_4)_3(\text{OH})_{10}\cdot 4\text{H}_2\text{O}$  Orthorhombic  
All specimens of 'zippeite' from Geevor mine, St. Just, Cornwall, examined so far have proved to be sodium-zippeite (N. J. Elton and J. J. Hooper, pers. comm., 1992).
- Stannite, zincian  
From Wheal Agar, Illogan, Cornwall, containing 3.1% Zn (Springer, 1968). Small grains (with 5.1% Zn) in the Hensbarrow granite stock, St. Austell, Cornwall (Manning, 1983). From St. Michael's Mount, Marazion (3–4% Zn) and Cligga Head, Perranzabuloe (5–6% Zn), Cornwall (Moore and Howie, 1984). These papers report electron microprobe analyses. Cf. ferrokësterite.
- Stannoidite*  $\text{Cu}_8(\text{Fe}, \text{Zn})_3\text{Sn}_2\text{S}_{12}$  Orthorhombic  
With stannite and mawsonite as small grains in the Hensbarrow granite stock, St. Austell, Cornwall (Manning, 1983). Seen abundantly, closely associated with kësterite, in polished sections of the mineralised veins at St. Michael's Mount, Marazion, Cornwall (Moore and Howie, 1984).
- Sternbergite* (?)  $\text{AgFe}_2\text{S}_3$  Orthorhombic  
See under argentopyrite.
- Strashimirite*  $\text{Cu}_8(\text{AsO}_4)_4(\text{OH})_4\cdot 5\text{H}_2\text{O}$  Monoclinic  
Pale blue compact, from Wheal Gorland, Gwennap, Cornwall (NHM identification, 1985, D. Lloyd specimen). [Also from Tynagh mine, Co. Galway, Eire, as pale blue-green fluffy spherules, sometimes enclosing olivenite (Sarp *et al.*, 1987; P. Perroud, pers. comm., 1989).]
- Strengite*  $\text{FePO}_4\cdot 2\text{H}_2\text{O}$  Orthorhombic  
Pinkish globular aggregates on yellowish fibrous cacoxenite in goethite, Stowe's shaft, Wheal Phoenix, Linkinhorne, Cornwall; and as pale purple globules with goethite and cacoxenite from Burdell Gill, Caldbeck Fells, Cumbria (NHM specimens, collected by A. W. G. Kingsbury; exhibited at a Mineralogical Society meeting in 1962, *Mineral. Mag.*, **33**, lxiv). From Carrock mine, Caldbeck Fells (D. McCallum, pers. comm. in Cooper and Stanley, 1990), and Gravel Hill mine, Perranzabuloe, Cornwall (C. Sparrow, pers. comm., 1991; XRD identification by Monica Price, Oxford). [Also from Ballycornick, Shanagolden, Co. Limerick, Eire, as clusters of pale-lilac needles with cacoxenite (N. Hubbard specimen, IR identification by G. Ryback, 1991).]
- Strunzite*  $\text{Mn}^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2\cdot 6\text{H}_2\text{O}$  Triclinic  
Straw-yellow acicular (1–2 mm) in cavities in goethite, Gravel Hill mine, Perranzabuloe, Cornwall (NHM identifications, 1986–87, M. Merry and C. Sparrow specimens). Cf. ferrostrunzite.
- Sweetite*  $\text{Zn}(\text{OH})_2$  Tetragonal  
A new species, from Milltown quarry, near Ashover, Derbyshire; whitish, transparent or translucent, bipyramidal or occasionally tabular crystals up to 1 mm in size, with fluorite, calcite and baryte (Clark *et al.*, 1984; Rust, 1991b). This was the first of four polymorphs of  $\text{Zn}(\text{OH})_2$  found by S. A. Rust at this locality; cf. ashoverite, unnamed zinc hydroxide, and wülfingite.
- Symplesite* (?)  $\text{Fe}_3(\text{AsO}_4)_2\cdot 8\text{H}_2\text{O}$  Triclinic  
A member of the symplesite-metavivianite series, probably symplesite, forms rare pale greenish flat radiating aggregates on quartz from dumps below Netherrow Brow, Caldbeck Fells, Cumbria (NHM identification, 1987, B. Young specimen; see Cooper and Stanley, 1990). Also at

Wanthwaite mine, St. John's in the Vale, Cumbria (NHM specimen, see Young, 1987). Cf. metaköttigite.

Tennantite, bismuthian (?)

An analysis and optical data are given for tennantite with 7.4% Bi, supposedly from Bicknoller quarry, near Watchet, Somerset (Criddle and Stanley, 1986), but the specimen (Kingsbury Collection in NHM) may be from another locality (C. J. Stanley, pers. comm., 1990).

*Thenardite*  $\text{Na}_2\text{SO}_4$  Orthorhombic

White or colourless curved bladed crystals c. 1 cm long, in abandoned workings of Billingham anhydrite mine, Cleveland (Raymond, 1959). Thick, finely crystalline, colourless or white efflorescences, Mountfield gypsum mine, Battle, East Sussex (Young *et al.*, 1985).

*Tiemannite*  $\text{HgSe}$  Cubic

From Hope's Nose, Torquay, Devon (see under clausthalite). [Also from old mine dumps in Silver Glen, Alva, Central Region, Scotland (Parnell, 1988b).]

Titanite (sphene), stannian

From skarn at Botallack, St. Just, Cornwall;  $\leq 7.0\%$   $\text{SnO}_2$  (Van Marcke de Lummen, 1985, 1986a). Accessory in granite near the Birch Tor and Vitifer mines, Dartmoor, Devon;  $\leq 4.6\%$   $\text{SnO}_2$  (Alderton, 1988).

*Triphylite*  $\text{LiFePO}_4$  Orthorhombic

Intergrown with triplite in granite pegmatite at Megiliggarr Rocks, Tremearne, Breage, Cornwall (Stone and George, 1983).

*Triplite*  $(\text{Mn,Fe,Ca})_2\text{PO}_4(\text{F,OH})$  Monoclinic

Dark brown, irregular piece about  $5 \times 2$  cm across, in granite pegmatite at Megiliggarr Rocks, Tremearne, Breage, Cornwall; composition variable (George *et al.*, 1981; Stone and George, 1983). [Also from lithium-rich pegmatite at Glenbuchat, Aberdeenshire, Scotland (Macpherson and Livingstone, 1982).]

*Tristramite* Hexagonal  
 $(\text{Ca,U}^{4+},\text{Fe}^{3+})(\text{PO}_4,\text{SO}_4,\text{CO}_3).1.5\text{-}2\text{H}_2\text{O}$

A new species, forming greenish fine-grained aggregates of acicular to fibrous crystals in quartz-pitchblende veins at Wheal Trewavas, Trewavas Head, Breage, Cornwall; also at several other old mines in Cornwall (Atkin *et al.*, 1983).

*Trüstedtite*  $\text{Ni}_3\text{Se}_4$  Cubic  
See under clausthalite.

*Tyrrellite*  $(\text{Cu,Co,Ni})_3\text{Se}_4$  Cubic  
See under clausthalite.

*Umangite*  $\text{Cu}_3\text{Se}_2$  Tetragonal  
See under clausthalite.

Unnamed copper calcium sodium phosphate hydrate

Sprays of small aquamarine-blue bladed crystals on chrysocolla from Roughton Gill mine, Caldbeck Fells, Cumbria; may be a new species (Cooper and Stanley, 1990). An apparently identical mineral occurs at Judkins quarry, Nuneaton, Warwickshire (Ince *et al.*, 1990).

Unnamed fibrous iron sulphide

An incompletely characterised mineral, similar to the fibrous iron sulphide from Canada and Cyprus (Jambor, 1969; Harris and Vaughan, 1972), occurs with vallerite at Pol Cornick, Mullion, Lizard, Cornwall (Clark, 1970).

Unnamed lead and lead-molybdenum oxychlorides

Work is continuing on the two new species from Merehead quarry, Somerset, reported in the Fourth Supplementary List. One of these appears to have a very complicated and possibly novel structure. Of the working names 'mereheadite' (yellow) and 'parkinsonite' (red), the latter has recently been approved by the IMA. The appearance of these names in the literature (Alabaster, 1989b) and their popular use among mineral dealers and collectors, prior to any publication defining the species, is regrettable.

Unnamed lead oxide hydrate

Rare white cubo-octahedral crystals in an oxidised vein exposure at Milltown quarry, near Ashover, Derbyshire; XRD pattern matches that of synthetic  $3\text{PbO} \cdot \text{H}_2\text{O}$  (Rust, 1991b).

Unnamed silver iron sulphides (?)

Optical and electron microprobe examination of argentiferous nickel ore from Tynebottom mine, near Alston, Cumbria, revealed two minor phases:  $\text{AgFeS}_2$ , forming lamellar intergrowths with chalcopyrite; and  $\text{AgFe}_8\text{S}_{11}$ , an alteration product of argentopyrite (Ixer and Stanley, 1987; may not be from this locality, cf. argentopyrite).

## Unnamed zinc analogue of ktenasite

See under ktenasite.

## Unnamed zinc hydroxide

A white radiating acicular mineral, identical with synthetic  $\gamma$ -Zn(OH)<sub>2</sub>, occurs together with other polymorphs of Zn(OH)<sub>2</sub> in an oxidised vein exposure at Milltown quarry, near Ashover, Derbyshire (Clark *et al.*, 1988; Rust, 1991*b*). Cf. sweetite.

*Uranopilite* Monoclinic  
(UO<sub>2</sub>)<sub>6</sub>(SO<sub>4</sub>)(OH)<sub>10</sub>·12H<sub>2</sub>O

From St. Just, Cornwall (Chemical analysis by Nováček, 1935, quoted by Palache *et al.*, 1951). Orange encrustation on altered uraninite-bearing veinstuff from Wheal Owles, St. Just (Fronde!, 1952).

*Violarite* FeNi<sub>2</sub>S<sub>4</sub> Cubic

With pyrite and marcasite as microscopic loosely intergrown aggregates within chalcopyrite or silver minerals at Tynebottom mine, near Alston, Cumbria (Iyer and Stanley, 1987; may not be from this locality, cf. argentopyrite). [Also, as an alteration product of pentlandite, at Talnotry, Newton Stewart, south Scotland (Stanley *et al.*, 1987); and from Esgair Hir mine, Ceulanymaesmawr, Dyfed, Wales (Rust and Mason, 1988).]

*Vochtenite* Monoclinic  
(Fe<sup>2+</sup>, Mg)Fe<sup>3+</sup>(UO<sub>2</sub>)<sub>4</sub>(PO<sub>4</sub>)<sub>4</sub>(OH)·12–13H<sub>2</sub>O

A new species, occurring as small brown pseudoquadratic crystal aggregates at Wheal Basset, Redruth, Cornwall (Zwaan *et al.*, 1989).

*Waylandite* Trigonal  
(Bi,Ca)Al<sub>3</sub>(PO<sub>4</sub>,SiO<sub>4</sub>)<sub>2</sub>(OH)<sub>6</sub>

Small (<0.5 mm) colourless or brownish crystals, and bluish crystalline bands, on bismutite, Restormel mine, near Lostwithiel, Cornwall (Clark *et al.*, 1986). Tiny greenish blue crystals in cavities in goethite from Stowe's shaft, Wheal Phoenix, Cornwall, belong to the plumbogummitite group, near waylandite (NHM identification, 1985, N. Hubbard specimen).

*Weddellite* CaC<sub>2</sub>O<sub>4</sub>·2H<sub>2</sub>O Tetragonal

Small (≤1 mm) modified flattened bipyramids in the oxidised vein exposure in Milltown quarry, near Ashover, Derbyshire (Rust, 1983).

*Weilite* CaHAsO<sub>4</sub> Triclinic

See under picroparmacolite.

*Whewellite* CaC<sub>2</sub>O<sub>4</sub>·H<sub>2</sub>O Monoclinic

Colourless glassy crystalline in coal, with calcite, from Meallbank quarry, Ingleton, North Yorkshire (NHM identification, 1964, A. W. G. Kingsbury specimen). [Also, with glushinskite, under the lichen *Lecanora atra* at Mill of Johnston, near Inch, NE Scotland (Wilson *et al.*, 1980).]

*Wickmanite* MnSn(OH)<sub>6</sub> Cubic

Orange-yellow octahedra (≤1 mm) in cavities in axinite, Wheal Cock Zawn, St. Just, Cornwall (Hubbard, 1989).

*Wulfingite* Zn(OH)<sub>2</sub> Orthorhombic

A small star-like cluster of colourless crystals in an oxidised vein exposure at Milltown quarry, near Ashover, Derbyshire (Clark *et al.*, 1988; Rust, 1991*b*). Cf. sweetite.

*Yarrowite* Cu<sub>9</sub>S<sub>8</sub> Hexagonal

Grains (<0.5 mm) replacing bornite and chalcocite, Cannington Park, near Bridgwater, Somerset; analysed (Criddle and Stanley, 1986; C. J. Stanley, pers. comm., 1989). Probably widespread as an alteration product of copper sulphides but previously referred to as 'blaubleibender' covellite, which has now been characterised as the species yarrowite and spionkopite.

*Zwieselite* Monoclinic  
(Fe<sup>2+</sup>, Mn)<sub>2</sub>(PO<sub>4</sub>)F

Dark brown masses in pegmatite at Megiligar Rocks, Tremearne, Breage, Cornwall (NHM identification, 1987, N. Talbot specimen).

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