MINERALOGICAL NOTES

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Variscite and metavariscite from Gunheath China Clay Pit, St Austell, Cornwall

VARISCITE, $AlPO_4.2H_2O$, was first reported in Cornwall by Barstow (1982), who found specimens in the Hensbarrow china clay works, about 5 km NNW of St Austell. The Hensbarrow works are now incorporated within Gunheath Pit (NGR SX 005571). Variscite is uncommon at Gunheath Pit, typically occurring as spherulitic aggregates of virtually colourless crystals showing forms {010}, {201} and {111}. Crystals are elongated along [010] (Fig. 1*a*) and this axis is radial in the aggregates. A specimen collected in 1984 by M J E Grigg and recently given to the author is composed of intergrown variscite spherulites to 2 mm in diameter, many of which contain white powdery cores. The maximum diameter of the cores is about 1 mm. X-ray diffractometry shows the cores to be composed of variscite along with variable amounts of its monoclinic dimorph, metavariscite. This appears to be the first reported occurrence of metavariscite in the British Isles.

The minerals in the cores occur as friable aggregates of microscopic anhedral grains. EDX analysis shows the composition of the cores to be similar to that of the surrounding variscite spherule, but additionally containing traces of K, Si and Fe. The presence of amorphous material and minor amounts of poorly crystalline kaolinite is indicated by XRD. Palache *et al.* (1951) record a similar occurrence at Lucin, Utah, USA, where tiny crystals of metavariscite and varisite occurred together in cavities within variscite nodules.

Metavariscite has been confirmed on a number of other specimens collected from Gunheath during 1984 and 1987. Most have characteristics similar to those described above, but one exhibits a cryptocrystalline crust of nearly pure metavariscite. Refinement of the powder data for this sample gave a = 5.189(6), b = 9.52(2), c = 8.465(7) Å, and β = 90.5(3)°. NIST SRM 675 fluorophlogopite was used as an internal standard to correct for systematic errors. These cell parameters are close to those quoted by Roberts *et al.* (1990). At Gunheath Pit, variscite and metavariscite typically occur on a matrix of granite pegmatite or coarse quartz-tourmaline vein material. Cassiterite occurs in the matrix of several specimens. Wavellite is a common and intimate associate, while turquoise occurs on variscite on one specimen.

On a visit to Gunheath in 1994, variscite was found in an unusual equant habit. Crystals were found singly and intergrown in crusts on the surface of drusy quartz which formed a thin veinlet in a small granite boulder. Forms measured are {100}, {010}, {001}, {201} and {111} (Fig. 1*b*), although {100} is absent on some crystals. Generally the crystals are pale, dull green, translucent to opaque, and reach a maximum size of about 1 mm across. Broken crystals show distinct growth zoning. Many crystals are enclosed by partial or complete brown transparent vitreous crusts to 0.1 mm thick. X-ray diffractometry shows these crusts to be pure variscite, although the brown colour is unusual. Wavellite occurs on one specimen as sprays of acicular crystals to 3 mm intimate with, and often penetrating, variscite.

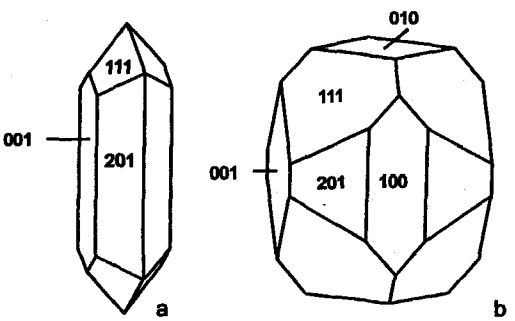

FIG. 1. Crystal habits of variscite from Gunheath Pit (*a*) typical habit, usually forming spherulitic aggregates with [010] radial; (*b*) recently observed equant habit, on one specimen forming faceted spherulitic aggregates with [010] radial; {100} may be absent.

Powdery deposits of pale green chalcosiderite occur on variscite on a few specimens.

Salvador and Fayos (1972) recognise two structural variants of variscite which they term 'Lucin-type' and 'Messbach-type'. The two types appear to share the same space group, but the unit cell of 'Messbach-type' has doubled length along the *c*-axis. The distinction is attributed to differing arrangement of structural water. All variscite specimens from Gunheath Pit so far examined (including powdery variscite from the spherulite cores) are of 'Lucin-type'. Globular variscite from Highdown Quarry, Philleigh, Devon, examined by XRD as part of this study, appears to be a mixture of 'Lucin' and 'Messbach' types. Representative specimens of variscite and metavariscite from Gunheath Pit have been deposited at the University Museum, Oxford.

Acknowledgements

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An unnamed platinum-group mineral from the Iluma Hill mine, Tanzania

IN October 1994, one of the authors (H.B.) visited central Tanzania to collect some data on the geology of the gold mining district in the Dodoman Basement. The area lies within the Tanzanian shield (Stockley, 1948) and consists of schists, amphibolites, quartzites, migmatitic gneisses, contaminated granitoids and intrusive granites. Gold was discovered in this region in 1932. In 1992 mining was started by artisans at Iluma Hill mine near Iluma about 120 km W of Dodoma. The gold ore occurs as a primary mineral in quartz veins hosted by granites, and as eluvial, alluvial grains in palaeo-placers. The primary gold appears as rounded grains between 50 and 400 μm in size and is associated with mm-sized crystals of hematite replacing magnetite and with small subangular grains of pyrite and chalcopyrite. One gold grain (175 μm across) is intergrown with a nearly triangular grain of a so far unknown mineral 25 μm in size. Under reflected light in air, this mineral shows a creamy colour with a brownish tinge. No bireflectance or anisotropy were observed. Two quantitative microprobe analyses (CAMEBAX Microbeam) show that the mineral belongs to the Pd-As-Sb system and has the almost ideal formula $Pd_8(As,Sb,Te)_3$ (Table 1).

TABLE 1. Microprobe analyses of palladium arsenide-antimonide

wt.%						atomic proportions				
Pd	Ir	As	Sb	Te	Sum	Pd	Ir	As	Sb	Te
74.10	0.10	10.20	13.66	1.77	99.83	7.99	0.01	1.56	1.29	0.15
74.70	0.17	10.20	13.37	1.68	100.12	8.03	0.01	1.56	1.26	0.15

Ru, Rh, Os, Pt, Fe, Cu, Ni, S, Se and Bi below the detection limit