

# MINERALOGICAL NOTES

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## Birnessite from Gourrock, Renfrewshire, Scotland

ORIGINALLY discovered at Birness in Aberdeenshire (Jones and Milne, 1956), birnessite has subsequently been identified at two other localities in Scotland: in exhalative sediments in Peebleshire (Nicholson, 1983) and in the cement of a raised beach deposit in Wigtownshire (Nicholson, 1988). This note records the discovery of a fourth Scottish locality for birnessite.

The mineral occurs in Craigmuschat Quarry, Gourrock, as obvious coatings along joint planes and fractures within a trachyte sill. Coatings composed only of the manganese oxide are usually less than one millimetre thick; however, birnessite also occurs as a minor component in iron oxide coatings which attain a maximum thickness of 10 mm. These are composed principally of hematite, but also include goethite, minor baryte and rare calcite. The blue-black to black colour of birnessite makes this mineral quite distinct against the red-bluish hues of the iron oxides. The mineral was analysed by X-ray powder diffraction (XRD) using Co-K $\alpha$  radiation with a scan speed of 1° 2 $\theta$ /min, and identified by the JCPDS Mineral Powder Diffraction File. The diffraction pattern of the Gourrock birnessite is in very good agreement with that of JCPDS PDF card 23-1046, usually within  $\pm 0.01$  Å, permitting confident identification. The only divergence between the two patterns is the principal 7 Å line (7.13 Å for Gourrock birnessite, compared with 7.09 Å for JCPDS PDF card 23-1046). This is not unusual: Burns and Burns (1977) have discussed the problem of birnessite identification, and show that the characteristic dominant *d*-lines of the mineral vary from 7.0–7.2 Å and 3.5–3.6 Å. Representative specimens have been placed in the mineralogical collection of the Hunterian Museum, Glasgow.

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## Birnessite from Treburland Mine, Altarnun, Cornwall

BIRNESSITE was first recognized as a new mineral species in a manganese-oxide-rich pan in fluvio-glacial sand and gravel at Birness, Aberdeenshire, by Jones and Milne (1956). Since then the mineral has been reported as a member of the manganese oxide assemblage in a number of geological environments in localities around the world. Birnessite has been most commonly recorded as a constituent of oceanic manganese oxide nodules (e.g. Crerar and Barnes, 1974; Scott *et al.*, 1974; Cann *et al.*, 1977; Schrader *et al.*, 1980; Sorem and Fewkes, 1980; Glover, 1977) though other parageneses included fluvio-glacial sediments in Finland (Koljonen *et al.*, 1976), soils in Indiana (Ross *et al.*, 1976) and as an oxidation product of manganese carbonates and silicates in Korea and France (Kim, 1974; Perseil *et al.*, 1974). Birnessite has recently been reported from three further Scottish localities; in exhalative sediments in Peebleshire (Nicholson, 1983) in a raised beach deposit in Wigtownshire (Nicholson, in press) and in fractures in a sill in Renfrewshire (Nicholson, this volume). The mineral has not previously been recorded from England.

Birnessite has recently been identified (X8523)\* in specimens collected from the small amount of dump material remaining at the Treburland Manganese Mine, Altarnun, Cornwall [SX 237 795]. Here the mineral forms hard, black, glossy, rather brittle massive crusts up to 10 mm thick which surround masses of medium to coarsely crystalline rhodonite and tephroite. Earthy black pyrolusite commonly coats the surface of the birnessite. Pyrolusite was the main ore worked at this small mine,

\* BGS X-ray.