SHORT COMMUNICATIONS

Pumpellyite from south Ayrshire.

PUMPELLYITE occurs in some of the altered Ordovician spilitic lavas that form part of the Girvan–Ballantrae complex. The mineral is particularly abundant in lavas exposed near outcrops of glaucophane-schist and serpentinite at Knockormal Farm, 1 mile east of Lendalfoot. Although originally described from copper deposits of the Keewanawan (Palache and Vasser, 1925), pumpellyite is probably best known from its occurrence in glaucophane-schists and associated rocks in California, Japan, Celebes, and elsewhere (Irving, Vonsen, and Gonyer, 1932; Switzer, 1950; Tsuboi, 1936; de Roever, 1947). The geological and petrological setting of the Girvan–Ballantrae complex is very similar to that in California, comprising metamorphic rocks of the greenschist type associated with spilitic lavas and basic and ultra-basic intrusives.

The lavas containing pumpellyite are dark green in colour, very fine-grained, and frequently porphyritic. The specimen from which the pumpellyite was separated had a specific gravity of 2·97. The pumpellyite occurs mainly in quartz-veins together with varying amounts of albite and calcite. In most cases the veins occupy shear-planes traversing the rock. Unsheared parts of the lava exhibit a typical variolitic or subvariolitic texture with turbid microlitic plagioclase set in a matrix consisting largely of brown glass charged with abundant iron-ore. The plagioclase is frequently sub-isotropic and altered to dense aggregates of calcite, quartz, albite, pumpellyite, and indeterminate brown subopaque material.

Pumpellyite is generally developed along the walls of the quartz-veins and forms needle-like clusters with a stellate habit (fig. 1). The crystals are elongated parallel to *b* which is also the direction of maximum absorption (β), and the trace of a strong {001} cleavage. When calcite forms a major constituent of the veins the pumpellyite assumes a 'chloritic' habit composed of a dense matt of variously orientated fibres (Hutton, 1937, p. 531). This habit is also characteristic of pumpellyite occurring in many irregular patches throughout the remainder of the rock, including prominent calcite–pumpellyite pseudomorphs after plagioclase phenocrysts. Minor amounts of epidote may accompany the pumpellyite in the calcite veins. The absence of any marked thermal

alteration in the lava indicates that pumpellyite formed at low temperatures in association with processes bringing about albitization of the plagioclase.

Chemical and optical analyses. About 200 mg. of pumpellyite was separated for analysis; the powder is pale yellow with a density of 3·23.

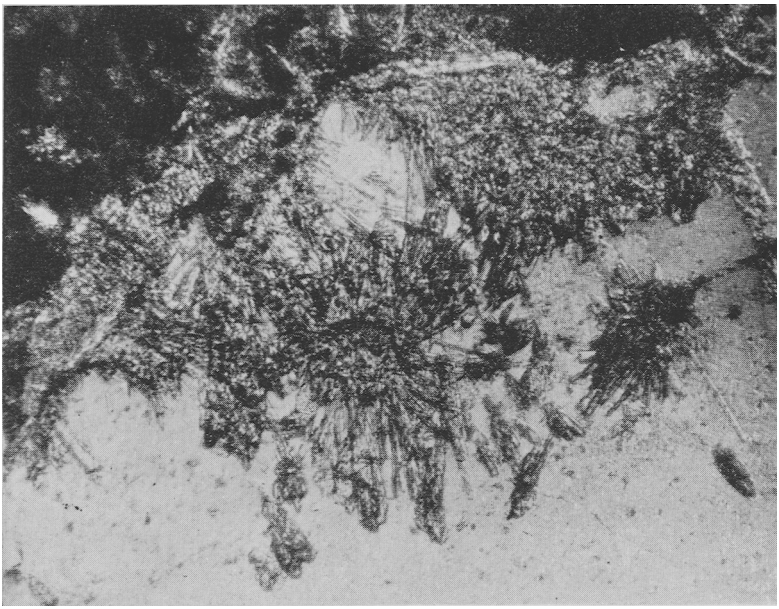

FIG. 1. Needles of pumpellyite showing stellate habit in quartz-vein. Ordinary light, ×90.

The analysis gave: SiO_2 37·20 %, TiO_2 0·18, Al_2O_3 24·84, Fe_2O_3 2·02, FeO 3·11, MnO 0·12, MgO 2·70, CaO 22·91, Na_2O 0·22, K_2O 0·00, H_2O+ 6·60, sum 99·90 %. Sp. gr. 3·23. Recalculated to metal atoms per half unit cell this gives: Si 6·03, Ti 0·03, Al 4·72, Fe''' 0·23, Fe'' 0·33, Mn 0·02, Mg 0·65, Ca 3·90, Na 0·06, OH− 3·00, H_2O 2·03; Al+Ti+Fe''' 4·98; Mg+Fe''+Mn 1·00; Ca+Na 3·96; which shows good correspondence with the proposed formula for pumpellyite: $Ca_4R_6Si_6O_{23}(OH)_3.2H_2O$, where R = (Ti,Al,Fe''',Fe'',Mn,Mg) and (Ti+Al+Fe''') : (Fe''+Mn+Mg) = 5:1 (Irving, Vonsen, and Gonyer, 1932; Coombs, 1953). The optical properties of the mineral are: α 1·691, colourless; β 1·693, blue-green; γ 1·701, colourless; $\gamma-\alpha$ 0·010; $2V\gamma$ 12 to 25° (strong dispersion); $\alpha:a$ 26° ($\beta = b$). Owing to the strong dispersion, values for optic axial

angle and extinction angle are approximate determinations in sodium-light.

University College,
Swansea.

T. W. BLOXAM

D. S. Coombs, Min. Mag., 1953, vol. 30, p. 113.
W. P. de Roever, Geol. Expl. Celebes. Amsterdam, 1947 [M.A. **11**-200].
C. O. Hutton, Min. Mag., 1937, vol. 24, p. 529.
J. Irving, M. Vonsen, and F. A. Gonyer, Amer. Min., 1932, vol. 17, p. 338 [M.A. 5-233].
C. Palache and H. E. Vasser, Amer. Min., 1925, vol. 10, p. 412 [M.A. 3-8].
G. Switzer, Calif. Div. of Mines, Bulletin 161, p. 51, 1950.
S. Tsuboi, Japan. Journ. Geol. Geogr., 1936, vol. 13, p. 333 [M.A. 7-30].

Jarosite and natrojarosite from the Lake District.

JAROSITE ($KFe_3(SO_4)_2(OH)_6$) is a mineral that may easily be overlooked, commonly occurring as soft earthy aggregates or crusts of microscopic crystals, ranging from buff- and golden-yellow to brown in colour; in these forms it can readily be confused with 'limonitic' matter. While it does not appear to have been previously recorded in Britain, we have found that it is by no means rare in the Lake District and we have confirmed it from the following localities:

Grains Gill, Carrock Fell: crusts of very small golden-yellow to brown crystals on white vein-quartz from the 'granitic' suite of veins; it is associated with pale yellowish-buff, fine-grained, earthy ferriferous alunite (B.M. 1956, 76; 1958, 43).

Higher Brandy Gill, Carrock Fell: small compact masses of glistening yellow-brown crystals in the outcrop of an east–west lead–copper vein near the head of the gill on the western side (B.M. 1958, 44); also in similar crystalline patches in vein-quartz derived from an old cross-cut on the eastern side.

Burdell Gill, Caldbeck Fells: in gossany vein-stuff from a north–south iron–manganese vein tried near the head of the Gill, 400 yards south-west of Coomb Height; forms compact brown crystalline masses and small (up to 2 mm.) brown rhombohedral crystals on goethite and saccharoidal quartz. The crystals resemble brownish pharmacosiderite also occurring here (B.M. 1956, 78; 1958, 45).

Netherrow Brow, Caldbeck: in oxidized vein-material derived from an old collapsed cross-cut near the farm of Nether Row, driven on a north-west–south-east vein, as crystalline aggregates, of a golden-brown colour, in saccharoidal quartz (B.M. 1956, 75; 1958, 46); also in similar vein-