A note on pyrosmalite from Nant Francon, North Wales.

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Summary. The presence of pyrosmalite is recorded in a metasomatized slate that is in contact with intrusive rhyolite in the Nant Francon area of North Wales.

PYROSMALITE has been found in a metasomatized slate from Nant Francon. The rock containing the mineral was first described by Williams (1930) in a paper dealing with the geology of the country between Nant Peris and Nant Francon. In this paper Williams briefly described the metamorphic effect of the Bwlch-y-Cywion intrusion on the Ordovician slates which form the country rocks. Near the old Nant Francon road, north-west of Blaen-y-Nant, where the slate is in contact with intrusive rhyolite, there is a small exposure of what Williams called a biotite-garnet rock, developed from the normal chloritic slate of the locality by 'additive' metamorphism.

It has now been found that the minerals contained in the altered slate are: a green mineral of chlorite type, the exact identification of which is not yet certain, and also a brown oxidation product of this; almandine-spessartine garnet; iron ore; apatite; and pyrosmalite.

This is the first recorded occurrence of pyrosmalite in the British Isles. According to Frondel and Bauer (1953) pyrosmalite has been recorded only from the magnetite deposits of Nordmark and Dannemora in Sweden, and manganpyrosmalite from the franklinite deposit at Sterling Hill, New Jersey (Frondel and Bauer, 1953), and from Broken Hill, New South Wales (Hutton, 1956).

The normal unaltered slate in the vicinity of Blaen-y-Nant has well developed cleavage and is composed of chlorite with small grains of quartz, feldspar, and some magnetite. Against the rhyolite the slate has been altered to a massive uncleaved rock, very dark green in colour and weathering to a rusty brown. The complete transition to unaltered slate takes place in some 10 to 20 yards from the contact.

The metasomatized rock is variable. Some sections contain only rounded garnets in a groundmass of the green micaceous mineral, and minor iron ore; in other sections iron ore is a major constituent. Apatite (identified by means of an X-ray powder photograph) occurs sporadically as poikilitic plates up to 2 to 3 mm. across. Pyrosmalite is only a very minor constituent of the rock and occurs as clusters of radiating crystals

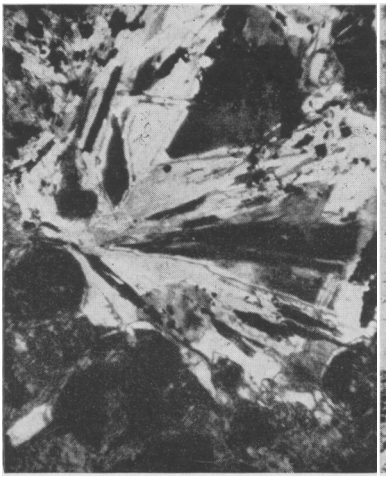

FIG. 1.

FIG. 2.

FIG. 1. Pyrosmalite with garnet, chlorite, and iron ore in metasomatized slate from Nant Francon, North Wales. Crossed nicols. ×100 approx.

FIG. 2. Single crystal of apatite enclosing garnets in metasomatized slate, Nant Francon. Plain polarized light. ×100 approx.

of the order of 0·5 mm. in length. Some sections of the rock are traversed by veins, clearly visible in some hand specimens, between 0·5 and 1 mm. in width, and composed either of carbonate or of well-developed flakes of the green micaceous mineral. Preliminary chemical work on the unaltered slate and its metasomatized equivalent indicates that the major addition has been iron, with some manganese and smaller amounts of magnesium.

Attempts to separate the pyrosmalite by normal methods using heavy liquids and an electromagnetic separator were not successful, but sufficient of the mineral for an X-ray powder photograph was picked out of a thin section. The X-ray powder pattern agrees well with that of manganpyrosmalite (Frondel and Bauer, 1953). In view of the

preponderance of iron over manganese in the Nant Francon rock, it seems likely that the mineral is pyrosmalite rather than manganpyrosmalite. The mineral occurs as radiating clusters of grains with poor basal cleavage. It is uniaxial, negative, and the refractive indices determined on a grain picked out of a thin section are ϵ 1·638 and ω 1·662. The refractive indices of pyrosmalite (Winchell, 1951) are ϵ 1·647, ω 1·682, and those of manganpyrosmalite from New Jersey are ϵ 1·631, ω 1·669 (Frondel and Bauer, 1953).

A further account of the chemistry and mineralogy of this unusual rock will be prepared. Preliminary work has already been carried out, but owing to the fine grain size and abundance of iron ore inclusions, pure mineral fractions are difficult to obtain.

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References.

FRONDEL (C.) and BAUER (L. H.), 1953. Amer. Min., vol. 38, p. 755.
HUTTON (O. C.), 1956. Ibid., vol. 41, p. 581.
WILLIAMS (D.), 1930. Quart. Journ. Geol. Soc., vol. 86, p. 191.
WINCHELL (A. N.), 1951. The elements of optical mineralogy, Pt. 2, 4th edn, New York (Wiley & Sons Ltd.).

Note. A coarsely granular specimen of greenish brown pyrosmalite, B.M. 1958,89, with individual cleavages up to 5 mm. across, has been presented to the British Museum (Natural History) by Mr. A. W. G. Kingsbury; it was collected by the donor at Treburland mine, Altarnun, Cornwall, and its identity has been checked by X-ray powder photograph.

P.G.E.