SHORT COMMUNICATIONS

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Supergene native copper in the Northern Pennine Orefield

PRIMARY copper ore in the form of chalcopyrite is only locally abundant in the Northern Pennine Orefield, and nowhere forms a workable deposit under present-day economic conditions (although its extraction as a by-product may be feasible at some mines). The copper zone of the orefield is central with respect to concentric ore and gangue zones, but chalcopyrite may also be found concentrated in association with quartz at local orebody feeders within mining districts.

Recently, during a visit with British Steel Corporation geologists to Groverake Mine, near Rookhope in Weardale, supergene native copper was discovered in small amounts at the New Firestone Level. The metal forms platy, dendritic growths on etched crystal faces and cleavage planes of fluorite in the Groverake Vein. The growths are often radial around, but separate from, oxidizing crystals of chalcopyrite. Occasionally a thin film of marcasite has formed intermediate between the copper sulphide and metal.

The formation of the native metal may be expressed in general terms by the representative equations:

$$CuFeS_2 + 8O^- \xrightarrow{\text{oxidn.}} CuSO_4 + FeSO_4, \text{ and } CuSO_4 + 2FeSO_4 \xrightarrow{\text{redn.}} Cu + Fe_2(SO_4)_3.$$

A number of the copper-bearing specimens were also found to contain very small botryoidal growths of a pale yellow mineral. This was identified by X-ray powder photography as a member of the copiapite family. Simple qualitative chemical tests suggest it to be the end member ferricopiapite, a complex hydrated ferric sulphate. Copper sulphate, chalcanthite, also occurs as crystals in the workings but was not detected in these particular samples.

Previously, supergene enrichment of ore sulphides in the Northern Pennines has been recorded only from Sedling Mine, Weardale, where Dunham (1932, p. 92) described the occurrence of covelline replacing galena at the Horse Level horizon.

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REFERENCE

DUNHAM (K. C.), 1932. The ore deposits of the North Pennines, a genetic study. Ph.D. thesis, University of Durham.

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