
Black Scar, Middleton Tyas, North Yorkshire

[NZ 231 052]

Introduction

To the east of the main concentration of mainly lead-, zinc-, barite- and fluorite-bearing veins of the Swaledale area in the Askrigg Block portion of the Northern Pennine Orefield lies a group of small deposits characterized by the abundance within them of copper minerals. Dunham and Wilson (1985) have regarded this area as an integral part of the Northern Pennine Orefield, but have pointed out that some of these deposits, around the small village of Middleton Tyas, exhibit several unique features. Apart from a few small, and generally overgrown, spoil-heaps, little remains today to mark the sites of copper mining in this area. Today Black Scar Quarry provides the only remaining accessible outcrop of copper mineralization within the Middleton Tyas area.

The Middleton Tyas copper deposits occur mainly within the Dinantian Undersett Limestone, at the east end of the small Middleton Tyas Anticline. Mining took place here between 1736 and 1779, principally within a few fields close to the centre of the village. Nothing is exposed at any of these sites today, and in the absence of any plans the exact form and shape of the deposits is rather conjectural. It is clear, however, that although the total output from these deposits was estimated at as little as 3500 tons the ore was extremely rich, averaging about 45% Cu (Dunham and Wilson, 1985). An unsuccessful attempt to revive copper working in the area took place in the 19th century, when some mining was undertaken at the nearby Merrybent and Kneeton Hall mines.

The history of this small and unique area of copper mining has been outlined by Angerstein (1755), Jars (1765), and more recently by Raistrick (1936, 1975), and Hornshaw (1975).

Notwithstanding the difficulties of obtaining representative ore specimens and the lack of good exposures of the original deposits, the mineralization has been the subject of studies by Deans (1950, 1951), Small (1977), and Wadge *et al.* (1981). Dunham and Wilson (1985) provided a useful summary of the geology, mineralization and mining history

Description

In their summary of the Middleton Tyas copper deposits, Dunham and Wilson (1985) drew upon early descriptions of the mineralization, and suggested that a number of vein and flat deposits occur within a limited area in and around the village of Middleton Tyas. The deposits appear to have taken the form of 'pipes' or 'flats' within the Undersea Limestone. The upper flat 'resting on clay' appears to have been underlain about 3.6 m below by a second horizon, referred to as the 'underbed', which it seems was typically richer. Minerals present included covellite, chalcocite, cuprite, bornite, native copper, malachite and azurite. Sparse traces of some of these may be found on some of the small remaining spoil-heaps. Dolomitization seems to have been the characteristic wall-rock alteration in these deposits.

The exposure at Black Scar Quarry was assumed by Deans (1951) to represent a lean but representative example of the deposits. The quarry exposes the Undersea Limestone underlain by sandstone and shale in which blue and green staining by supergene copper minerals, including malachite and azurite, is conspicuous. In the southern part of the quarry a shale bed beneath the limestone, which contains numerous rounded nodules rich in chalcocite and covellite, has been excavated for up to 1 m into the face. This may be an example of the sort of 'flat' deposit worked elsewhere at Middleton Tyas during the 18th century. The quarry is today rather overgrown and presents relatively limited opportunities to establish the relationship of this mineralization to any obvious structure. In part of the quarry, blue- and green-stained shale debris covers part of the face, suggesting that copper mineralization may also be present at a higher level, although this cannot be established. It is worth noting that contemporary reports of the Middleton Tyas mines refer to the presence of copper minerals at two distinct levels (Dunham and Wilson, 1985). However, Deans (1951) observed that sand pockets within the limestone contain residual copper minerals, and that fissures filled with clay-gouge locally contained azurite and malachite. The copper-stained debris in the quarry could thus be derived from such a deposit

rather than an upper, mineralized horizon.

Interpretation

In the absence of reliable plans or descriptions of the form of the Middleton Tyas deposits it is difficult to formulate a clear model for their origin. However, in their review of the available evidence, Dunham and Wilson (1985) rejected a syngenetic origin for the deposits in favour of the hypothesis of Small (1977) that the deposits originated by the mixing of low Na:K ratio metal-rich orefield brines from the Stainmore Trough with high Na:K ratio formation waters. In addition, they advocated supergene enrichment of the deposits so formed, by weathering under arid conditions during Lower Permian times. In this way they suggested that the deposits owe much of their enhanced grade to precipitation of copper both on such primary sulphides as chalcopyrite, pyrite and djurleite as well as on diagenetic pyrite nodules within calcareous shales, such as those beneath the Undersea Limestone.

Conclusions

The Black Scar GCR site provides the only opportunity accessible today to examine *in situ* the unique mineralization formerly worked in the Middleton 'ryas area. The exposure, although considerably overgrown, reveals apparently secondarily enriched copper mineralization which may be studied in its stratigraphical context.

References