Mulberry Down Opencast, Cornwall

[SX 019 658]

Introduction

The Mulberry Down Opencast GCR site is situated 2.5 km north-west of Lanivet near Bodmin. At this site a low-grade tin stockwork in country rock ('killas') is exposed in a large open and deep working. The site is of considerable geological and mineralogical importance as the strike of the sheeted-vein structures is almost north–south, a trend almost perpendicular to that of the major Sn-W lodes of Cornwall, as seen for example at the Hingston Down Quarry and Hingston Down Consols GCR site. Also, the stockwork is in killas and not granite; indeed the nearest outcrop of granite (St Austell Granite) is some 3 km south-east. This site constitutes an 'exogranitic' stockwork according to the scheme of Alderton (1993). The mineral assemblage consists of cassiterite, wolframite, arsenopyrite and a little chalcopyrite.

Although often cited as an important example of stockwork mineralization, surprisingly little has been written on the geology of the area. Collins (1912) described the Mulberry opencast as one of the most ancient tin workings in Cornwall. The ore was generally low-grade, but the tin ore occasionally occurred in relatively coarse masses (crystals) in soft killas rocks. Old workings were marked on Thomas Martyn's 1748 map of Cornwall. Dines (1956), and Hosking (1964) recorded details of the site, with Hosking referring to the anomalous strike of the mineralization. Recorded output from 1859 to 1916 (its closure date) is 1350 tons of 'black tin' (unrefined tin ore), the average annual yield being about 30 tons and the maximum 77 tons. Some exploratory drilling and other studies were carried out in the 1980s but there has been no further interest since then.

Description

Ore occurs as a stockwork on the high ground of Mulberry Down, numerous mineralized veinlets traversing the host killas in a general NNE–SSW direction. Mulberry is a major deep opencast pit, with very steep near-vertical sides (see (Figure 7.34)). The pit follows the trend of the veins which are virtually north–south. It is 274 m long and up to 46 m wide, reaching up to 36 m deep, although there are benches at lesser depths. Veinlets occupy joint-fissures ranging from minute cracks up to 15 cm in width, underlying slightly west. The veinlets are often closely spaced, mostly a matter of centimetres but rarely up to 30 cm apart, and are mostly parallel although occasionally running one into another. The killas consists of pale and dark-grey siltstones dipping 45° northwest, which are friable towards the southern end of the quarry but tougher and more siliceous elsewhere. The killas immediately adjacent to the veinlets is of light colour and is usually greisenized and mineralized with tourmaline (especially in the more argillaceous bands) and quartz. The wider veinlets are quartz-rich, and sometimes 'gilbertite' (a variety of muscovite) and topaz are abundant. All the mineralized veins carry relatively coarsely crystallized cassiterite and some wolframite. Arsenopyrite and copper ores (chalcopyrite) are also present. The average content of the rocks of the stockwork is stated to be between 2.75 kg and 3 kg of black tin per ton.

A minor copper lode is recorded as coursing a few degrees south of east and crossing the middle of the quarry, but there is no record that it has been worked for ore. It is also reported that a vein rich in wolframite (iron manganese tungstate) was cut by the tramming level beneath the quarry floor.

The dressing plant, historically known for its multiple heads of stamps, was in the valley 400 m west of the opencut. It was connected by two adits to the workings. The Shallow Adit connects with the middle of the western face of the quarry about halfway between the surface and the quarry floor. This adit is now overgrown and blocked by rocks. The Deep Adit commenced 90 m north-west of Shallow Adit and connected to the floor of the pit, towards the northern end of the quarry, with the tramming level, which ran the full length beneath the opencast. Other adit workings are recorded but all are now not available; some stoping is recorded to have occurred on these. Blocks of rubble of tourmalinized killas can be found in areas around the perimeter of the opencast.

Interpretation

Hosking (1964) believed the Mulberry deposit to be of high-temperature hydrothermal origin and to represent paragenetically early mineralization representative of the upper part of the tin zone, and to be of Hercynian age. Both mineralization and consequent greisenization were hosted by the killas rocks. Some workers, for example Edmonds *et al.* (1975), have commented on the apparent distance from the nearest granite outcrop. However it has been suggested that the Mulberry stockwork is a sheeted-vein complex related to a Li-mica granite at depth, similar mineralization being recorded to the south. The structure and mineralization could be related to north–south granite ridges in the roof of the batholith at depth.

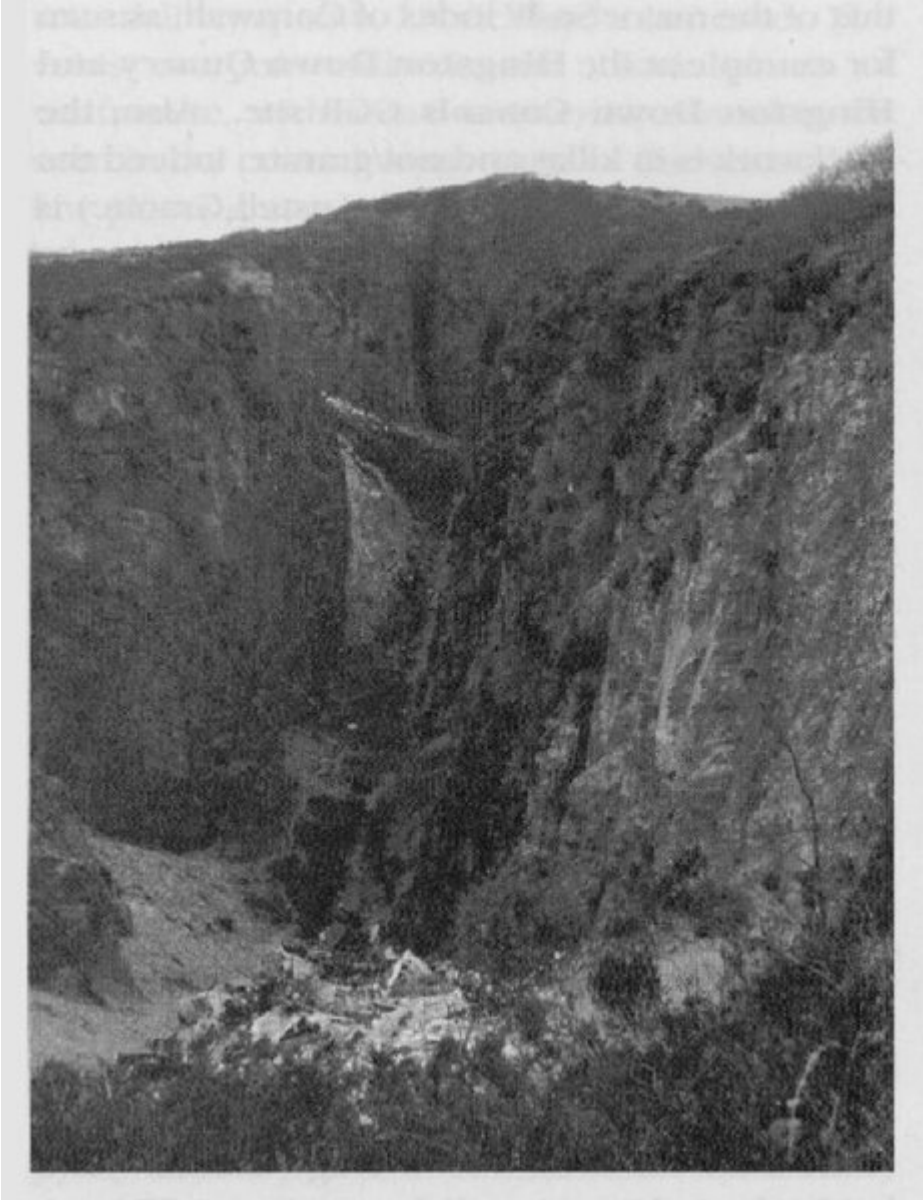
Such mineralized stockworks and sheeted-vein swarms may be separated structurally from mineral lode tin deposits but they may well be related to the same mineralizing event. Alderton (1993) classified the Mulberry deposit as being an example of an 'exogranitic' stockwork belonging to the 'main-stage' mineralization. Vein swarms are generally associated with the fracturing of granite cusps and usually occur within the granite (for example at the St Michael's Mount and Cligga Head GCR sites), but in places they extend for a considerable distance into the overlying metamorphosed sedimentary rocks, as in the case at Mulberry (see Edmonds *et al.,* 1975). Such vein swarms carry numerous sub-parallel, steeply dipping thin veinlets. These are generally bordered by greisen and carry cassiterite, wolframite, and arsenopyrite. Stockworks comprise an intricate network of veinlets usually too small to be worked individually but of economic importance if worked by opencast methods. They are generally found in the sedimentary strata above such granite cusps, and are usually structurally similar to a vein swarm although not always associated with greisenization. Interestingly most of the other north–south structures in the Bodmin area are believed to be of a late, low-temperature, cross-course Fe- (or Pb-Zn-) rich mineralization.

The deposit at Mulberry Down used to be compared to the stockwork seen in the workings at Wheal Prosper, 800 m west of Lanivet, but this is not now available for study. At the latter locality it is recorded that the trend of the mineralized belt was E 10°N and characterized by very thin veinlets of quartz and cassiterite, the killas dose to veinlets being impregnated with cassiterite. This is probably a distal equivalent of Mulberry Down as regards the nature of the mineralizing fluids.

Conclusions

The Mulberry Down GCR site can be seen to be complimentary to the St Michael's Mount and Cligga Head GCR sites and also other described Cornish stockworks, but at the Mulberry Down site the stockwork structures and greisenization occur in killas rather than in granite ('exogranitic'). This allows the effects of mineralization and greisenization on various lithogical units of the country rock to be studied. The interpretation of the north–south trend in relation to granite distribution warrants further study.

References



(Figure 7.34) View of the open pit at Mulberry Down. (Photo: JNCC.)