Birk Fell Hawse Mine, Cumbria

[NY 294 015]

Introduction

A small quartz vein, which crosses Birk Fell Hawse at the head of Tilberthwaite Gill, carries abundant copper minerals, prominent amongst which is bornite. The vein has been worked for copper ores both underground and opencast. The date of most of these small workings is unknown, although Shaw (1970) commented that the opencast pit on the summit of Birk Fell Hawse yielded several tons of 'rich erubescite [bornite] ore' in about 1900.

Description

Birk Fell Hawse, the ridge which separates the Tilberthwaite and Greenbum valleys, is crossed by at least two roughly E–W-trending faults which throw down to the north. These locally carry copper mineralization. The northernmost fault, known as the 'Pave York Vein', has been worked from levels driven to it from the sides of the Greenburn Valley to the north. Birk Fell Hawse Vein, the southernmost of these faults, carries copper mineralization where it cuts acid lapilli tuffs of the Airy's Bridge Formation of the Borrowdale Volcanic Group near the summit of Birk Fell Hawse. At least three short levels have been driven into the vein from the steep slopes east of Birk Fell Hawse. Spoil from these shows chalcopyrite in a gangue of broken country rock, quartz and chlorite. A small opencut (Figure 2.9) on the summit of Birk Fell Hawse exposes the vein which is here up to 0.6 m wide and consits mainly of quartz with bornite as the most abundant copper mineral. Shaw (1970) recorded that several tons of this mineral were obtained here early in the 20th century. A little chalcopyrite, tennantite and arsenopyrite are also present, and thin bright-green coatings of malachite are locally conspicuous. Whereas a small amount of copper-bearing veinstone remains exposed *in situ,* the mineralization is most easily examined in the abundant material on the small spoil-heaps alongside the opencut.

Stanley (1979) described the veinstone as consisting of fractured quartz cemented by bornite, together with smaller amounts of arsenopyrite and chalcopyrite. He noted that polished sections reveal that tennantite forms veinlets in arsenopyrite and also occurs at the margins between arsenopyrite and bornite. Arsenopyrite is locally replaced along fractures by fine-grained chalcocite, and both bornite and chalcocite have also been observed along fractures in chalcopyrite. He further noted that the tennantite is similar in composition to that from the nearby Pave York and Paddy End veins.

Interpretation

The copper-bearing veins of the Birk Fell Hawse and Tilberthwaite area belong, like those of the adjoining Coniston area, to the widespread chalcopyrite-pyrite-arsenopyrite suite of veins of Stanley and Vaughan's (1982a) classification, for which these authors propose a Lower Devonian age of emplacement. Millward *et al.* (1999) presented grounds for regarding some of this mineralization as significantly older, possibly related to the final phases of Ordovician magmatism.

The Birk Fell Hawse Vein is unusual in containing abundant bornite in addition to chalcopyrite and arsenopyrite. Bomite appears to be confined to the vein exposed in the open-cut on the summit of Birk Fell Hawse. Spoil from the levels driven on the vein from the hillside east of and below the opencut show abundant chalcopyrite but no bornite. Stanley's (1979) descriptions of the bornite-bearing veinstone clearly show that the bornite is of secondary origin. Millward *et al.* (2000) have suggested that the occurrence of bornite at Birk Fell Hawse appears consistent with it being the product of supergene enrichment. It is perhaps worth noting that in other Lake District localities, for example at Black Scar, Levers Water (Stanley, 1979), Seathwaite Tarn, Coniston (Stanley and Criddle, 1979), Dale Head (Stanley, 1979; see also Dale Head North and South Veins GCR site report, this chapter) and elsewhere (Young, 1987a), bornite also occurs in situations consistent with its formation by supergene enrichment, although this mineralization is exposed *in situ* only at Birk Fell Hawse.

Conclusions

The outcrops of the Birk Fell Hawse Vein exposed in the old opencut provide a unique opportunity in the Lake District to study a copper-bearing vein in which bornite is the dominant copper mineral. The distribution of this mineral within the vein and its relationship with other minerals is consistent with its origin by supergene enrichment.

References

(Figure 2.9) The Birk Fell Hawse Vein between Borrowdale Volcanic Group wall-rocks, exposed in the old opencut working at Birk Fell Hawse Mine. The vein is composed mainly of quartz with abundant bornite and minor chalcopyrite and arsenopyrite. (Photo: B. Young.)