

A TEM investigation of optical variations in sphalerite

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Extended abstract

DIFFERENT textural varieties of sphalerite from stratiform, stratabound and vein deposits have been subjected to optical, microprobe and TEM investigation. The TEM, with an EDS analytical facility has been used to provide information on the causes of optical and compositional variations in sphalerite.

Sphalerites from the Pb + Zn vein, Force Crag, England, show a distinct colour variation. Microprobe investigation revealed that with increasing intensity of colour the sphalerite became enriched in the trace elements Cu, Fe, Sb, Ag and Pb. TEM study revealed these trace-element-rich zones of sphalerite contained precipitates. The precipitates seem to be of tetrahedrite-like composition and are a possible cause of the colouration in these sphalerites. However, similar colour bands enriched in the trace elements Cu, Sb, Ag and Pb occurring in collomorphic sulphides from the Silvermines orebody in Ireland were found to be devoid of precipitates, suggesting, in this case, the accommodation of these trace elements into the sphalerite structure.

In contrast, a TEM study of collomorphic sphalerite from Navan, Ireland revealed the sphalerite to be totally recrystallised and heavily twinned. Galena particles are evident, occurring within the

sphalerite matrix and as precipitates along the (111) twin planes. It is probable that the galena was exsolved during recrystallisation.

Small, spheroidal, particulate sphalerite from the Navan deposit, Ireland consisted of opaque cores, with overgrowths of iron-poor sphalerite. These cores are rich in Cu, Pb, Ag and Sb, and TEM analysis showed them to be an amorphous intergrowth of sphalerite and sulphosalt-like compositions. It is possible that these cores represent original exhalative particles on which later sphalerites grew from fluids permeating the ore pile.

Examination of doubly polished thin sections of low-iron sphalerite from the Pb + Zn vein, Tyndrum, Scotland revealed opaque bands within the sphalerite. Investigation by microprobe indicated the opaque zones to be enriched in copper and iron (Cu > Fe). TEM study showed that these zones are due to a pervasive, symplectic intergrowth of digenite within the sphalerite. This is probably a post-depositional feature related to the introduction of late copper-rich fluids into favourably orientated permeable zones (cleavages) in the sphalerite.

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