Indium-bearing sulphides from the Hämmerlein polymetallic skarn deposit, Germany – Evidence for late stage diffusion of indium into sphalerite

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The Hämmerlein skarn deposit, located in the Western Erzgebirge (Germany), consists of a cassiterite-dominated Sn mineralization associated with minor Zn-Cu-In sulphide mineralization. In this contribution, we describe the nature of the sulphide-associated In mineralization based on underground mapping, mineralogical methods (microscopy, SEM-based MLA studies and EPMA X-ray element maps) and mineral chemistry data (quantitative EPMA data).

In-bearing sphalerite and roquesite [$CuInS_2$] are closely associated with paragenetically late In-bearing chalcopyrite (average 0.15 wt% In). Sphalerite contains up to 20 wt% In as well as elevated Cu contents (up to 11 wt% Cu). The highest In concentrations occur exclusively at rims and along cracks of sphalerite grains. The appearance resembles diffusion profiles, suggesting that In enrichment is due to an hydrothermal overprint that postdates the formation of sphalerite. Detailed textural observations show that the diffusion fronts in sphalerite grains are thicker where they are in contact to anhedral masses of hematite and magnetite that are regarded as product of a decomposition of In-bearing chalcopyrite. Hematite and magnetite have In concentrations below the detection limit (EPMA). Indium and Cu, released by the decomposition of In-bearing chalcopyrite, were incorporated into sphalerite along grain boundaries and cracks. EPMA element distribution maps indicate that the In enrichment in sphalerite is related to the coupled substitution of $Cu^{+} + In^{3+} \leftrightarrow 2\ Zn^{2+}$ [1].

[1] Johan (1988) *Mineralogy and Petrology* 39, 211–229.