

## Growth textures and chemical compositions of indium-bearing sphalerite from Toyoha polymetallic deposit, Japan

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Sphalerite (ZnS) is economically important indium-bearing mineral, as indium metal is mainly produced from zinc concentrates. At Toyoha deposit, Indium-bearing sphalerite occurs southeast where xenothermal Zn-Pb-Ag-Cu-Sn-In mineralization prevails. We have performed microscale studies of an individual ore sample (M19392 of the Geological Museum, AIST) with high indium concentration (6230ppm) to reveal the mechanism of indium mineralization. The sample is mainly composed of sphalerite with small amounts of galena, arsenopyrite, pyrite and cassiterite. Based on our optical microscopy and electronprobe microanalyses using doubly polished thin sections, indium-bearing sphalerite shows following characteristics.

- 1) It shows crustiform bands with conspicuous sector zoning. The thickness of the bands is 2mm in maximum.
- 2) The crustiform bands show invisible oscillatory variation in In, Sn, Cu, Ag and Fe contents. The metal concentrations in sphalerite vary: 0.06-3.63 atom.% In, <0.00-1.67 atom.% Sn, 0.22-3.55 atom.% Cu, <0.00-1.21 atom.% Ag and 2.98-6.22 atom.% Fe. These chemical compositions show that Cu+Ag and In+Sn are close to 1:1 in atomic proportions; the compositions of indium-bearing sphalerite can be expressed as  $(\text{Cu, Ag})_x(\text{Zn, Fe})_{(4-2x)}(\text{In, Sn})_x\text{S}_4$ , where x is between 0 and 0.29, solid solutions between ZnS and  $(\text{Cu, Ag})(\text{Zn, Fe})_2(\text{In, Sn})\text{S}_4$ .
- 3) Growth zones high in In and Cu, which coincide with zones high in Fe, are opaque and dark-brown in visible light. However, most of these growth zones are transparent in near-infrared light. These petrographical and mineralogical characteristics suggest that indium-bearing sphalerite had a complex growth mechanism. Sector and oscillatory zonings in crustiform bands are evidence for relatively high level of fluid supersaturation and cyclic physico-chemical changes in fluid environment.

Keywords: indium, sphalerite, Toyoha deposit, growth texture, chemical composition