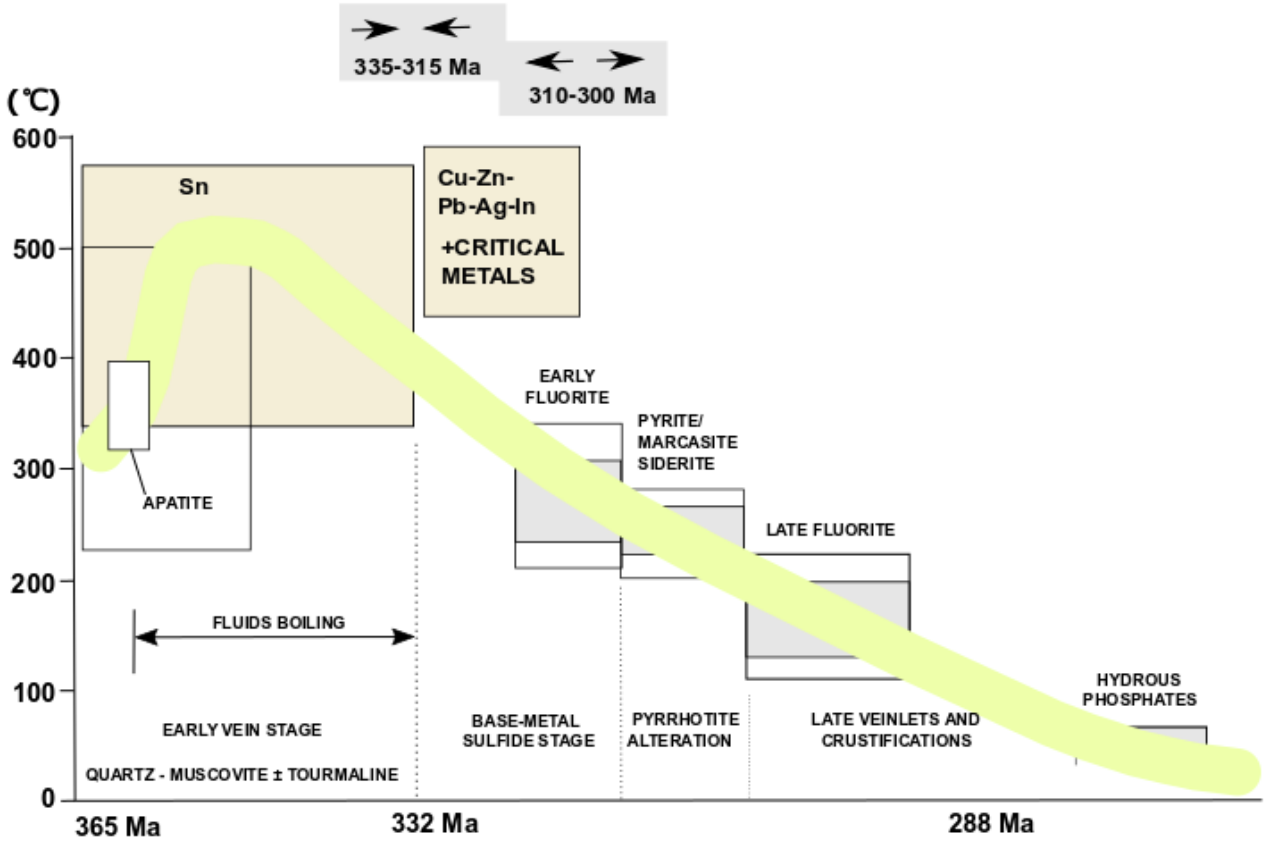
ST.076

Indium Mineralization in the Magmatic-Hydrothermal Deposits of Herberton Mineral Field, Northeast Queensland, Australia

Avish A. Kumar, Ioan Sanislav, Paul Dirks
James Cook University, Townsville, QLD, Australia

The increasing demand for indium is related to its high usage in the manufacture of LCD, touchscreens, and solar panels. Indium does not have a primary mineral that occurs in economic quantity and is sourced as a by-product from copper and zinc ores. Indium can occur in a variety of mineral systems including VMS, porphyry, skarn, SEDEX, polymetallic veins, and magmatic-hydrothermal deposits. In this study, the genesis of indium mineralisation within the magmatic-hydrothermal domains of Herberton Mineral Field was investigated. The largest indium-bearing deposits in the region are the Baal Gammon and Isabel. The Baal Gammon deposit consists of a multistage tin and copper-zinc-indium mineralization. The tin mineralization is hosted almost exclusively by a granitic porphyry dyke that is overprinted by the copper-zinc-indium mineralization. The deposit has a total resource of 2.8 Mt at 1% copper and 39 g/t indium. The Isabel deposit consists of a series of lead-zinc polymetallic veins hosted by brecciated sediments along the contact with a quartz-feldspar porphyry dyke. The deposit has a total resource of 83 kt at 15% zinc and 370 g/t indium. Field relationships suggests that indium mineralization at both deposits was introduced prior to the emplacement of unmineralised, crosscutting porphyry dykes at 288 Ma. The main host for indium is sphalerite, followed by chalcopyrite, and high indium concentrations were also found in stannite at the Baal Gammon deposit. So far, no indium minerals have been identified. Although sphalerite is the main host for indium at the scale of the deposit, there is a very good correlation between indium and copper, suggesting that the incorporation of indium into sphalerite is dependent on the availability of copper. Thermodynamic modelling suggests that the colligative properties of the mineralising fluids play an important role in concentrating and precipitating indium-rich sulphides while the physicochemical parameters dictate its mobility in the hydrothermal environment.


335-315 Ma
310-300 Ma
(℃)
600
500
400
300
200
100
0
Sn
Cu-Zn-
Pb-Ag-In
+CRITICAL
METALS
APATITE
EARLY
FLUORITE
PYRITE/
MARCASITE
SIDERITE
LATE FLUORITE
HYDROUS
PHOSPHATES
FLUIDS BOILING
EARLY VEIN STAGE
QUARTZ - MUSCOVITE ± TOURMALINE
BASE-METAL
SULFIDE STAGE
PYRRHOTITE
ALTERATION
LATE VEINLETS AND
CRUSTIFICATIONS
365 Ma
332 Ma
288 Ma