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Evolution of the ore fluids responsible for late-Variscan Sn-In-polymetallic mineralisation in the skarn ore district Pöhla, Germany based on He-S isotope signature of arsenopyrite

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Polymetallic skarn deposits in the Erzgebirge-Vogtland metallogenic province have been mined since the 15th century for Fe, Cu, As, Zn and Ag, and explored for U, Sb, Sn, W, and In [1, 2]. Post-collisional granite emplacement during late-Variscan (320-300 Ma) generated post-skarn Sn-W-polymetallic mineralisation of different ore-types: skarn-hosted, greisen, stringer zones, vein-type metasomatic zones, veins [1, 3]. The Pöhla-Hämmerlein Sn-In deposit is situated along the Hercynian Gera-Jáchymov fault zone. The structure bound Sn-As-Zn-Cu-In-ore bodies are hosted by skarn layers in two-mica-schists [1, 4, 7]. The main ore-forming phase is apparent as Sn-polymetallic sulfide mineralisation with a strong overprinting of the skarn and the magnetite-sphalerite-I lenses. Overprinting is visible as cross-cutting veinlets and fine-grained dispersed mineralization in the skarn layers. The mineral association of this stage exists predominantly of cassiterite, hematite, arsenopyrite, pyrite, In-rich sphalerite II, In-rich chalcopyrite, quartz, fluorite and chlorite [4, 5, 7].

We are using He and S isotopes to unravel fluid evolution during main stage mineralisation. The homogeneity of arsenopyrite $\delta^{34}S$ (0.1 to 1.6 ‰ VCDT) suggests a single magmatic source for S of arsenopyrite in accordance with associated sulfides and other Sn- and Ag-polymetallic sulfide deposits in the Erzgebirge [3, 6, 7]. $^{3}He/^{4}He$ display a significant range (0.54 to 5.1 Ra; n=7) that indicates strong dilution of mantle magmatic volatiles (likely derived from melts responsible for regional lamprophyres) by cooler radiogenic-He bearing crustal fluids.

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