Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.22821

Genesis and evolution of the Dajing tin-copper polymetallic deposit in Inner Mongolia: constraints from geochronology, mineral composition H-O and in-situ S-Pb isotopes

HONGYU LIU, WEI MEI AND XINBIAO LV

China University of Geosciences, Wuhan

Presenting Author: lhy@cug.edu.cn

The Dajing deposit is a large-scale Sn–Cu vein-type deposit in the Southern Great Hinggan Range, Inner Mongolia. Vein orebodies are hosted in the lacustrine sedimentary rocks of the Upper Permian Linxi Formation. Rhyolite and trachyte, are observed in the hanging wall and footwall of the orebodies. Three mineralization/alteration stages were identified: the early stage, forming cassiterite veins with quartz, arsenopyrite and pyrite; the Cu-Zn stage, forming quartz-chalcopyrite-sphalerite sulfide containing a small amount of galena, the late stage, characterized by sulfide-carbonate veins rich in sphalerite, galena, siderite and calcite.

The ages of cassiterite from cassiterite-quartz veins are determined as 161.3±5.5 Ma and 162.8±4.9 Ma, respectively. The deposit formed slightly earlier than other tin deposits discovered in SGHR, including Weilasituo, Baiyinchagan, and Daolundaba. It represents the first middle-late Jurassic tin deposit uncovered in the area, thus offering a foundation for exploration of this type of middle-late Jurassic tin mineralization.

LA-ICP-MS analysis revealed enrichment of Ti, Fe, Sb, and W in cassiterite from the Dajing, alongside depletion in V, Zr, Hf, Nb, Ta, and U. This implied that the cassiterite formed at lower temperatures than proximal deposits like Weilasituo, Haobugao, and Huanggangliang. However, variations in the concentrations of multivalent elements Sb, V, Fe, and U, along with differences in Sb/W, Fe/Al, and Al/V ratios, indicate that the precipitation of cassiterite in the deposit occurred in a relatively reducing physicochemical environment. Dajing both generations of chalcopyrite are anomalously enriched in Sn. Analysis of ablation signal and elemental correlations suggests that Sn is present in solid solution form within the chalcopyrite formed during the Cu-Zn stage. Conversely, in the second generation of chalcopyrite formed during the Pb-Zn-Ag stage, Sn is found in the form of nanoscale stannite, possibly indicating the decomposition of tin-rich chalcopyrite at low temperature. The $\delta^{18}O_{water}$ and δD indicating that the ore-forming fluids of the Sn-As stage mainly consist of magmatic water, and the following two stages are the mixing of magmatic and meteoric water. The in-situ Pb isotope of galena and the in-situ $\delta^{34}S$ of sphalerite, chalcopyrite, pyrrhotite indicate that the ore-forming metals could be derived from the Jurassic magma.