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The characteristics of ore-forming fluids and possible genetic type of the Hongshanliang copper deposit in Xinjiang

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The Hongshanliang copper deposit is located in the Aqishan-Yamansu belt of the Eastern Tianshan, about 160 km southeast of the Shanshan County, Xinjiang. The Aqishan-Yamansu belt contains abundant Fe (Hongyuntan, Bailingshan and Yamansu), Fe-Cu (Heijianshan, Duotoushan, Shuanglong and Shaquanzi) and Cu (-Ag) deposits (Hongshanliang and Weiquan), with debates of deposit types on submarine volcanic, volcanic, skarn, IOCG types and so on. Recently, these Fe-Cu deposits have been proposed to IOCG types and some researchers suggested the Aqishan-Yamansu belt has similarities with central Andean belt in tectonic setting and mineralization types. As a typical copper deposit, the Hongshanliang deposit is seldom studied due to its poor exploration, which hindered the further tectonic and metallogenic studies in the Aqishan-Yamansu belt. In this study, we select the Hongshanliang to explore its characteristics of ore-forming fluids and ore genesis, which will provide new ideas and directions for further exploration of Cu (-Ag) in the Aqishan-Yamansu belt.

The Hongshanliang copper deposit is hosted in the volcanic/volcaniclastic rocks of the Early Carboniferous Yamansu Formation. In the vicinity of the deposit area, there is three alteration-mineralization zones (I, II and III), with the zone I being the largest orebody with length of 100–500 m. Based on the spatial and temporal relationships among pervasive alterations types, mineral assemblages and veins, five alteration/mineralization paragenetic sequences can be identified at Hongshanliang, including chlorite-pyrite stage (I), quartz-pyrite stage (II), quartz-polymetallic sulfide stage (III), late veins (IV) and supergene alteration (V). Of those stages, copper (or chalcopyrite) mineralization was mainly precipitated in Stage III, occurring as veins of quartz-calcite-chalcopyrite and quartz-sphalerite-galena-chalcopyrite ± pyrite veins. Moreover, the microscopic textural relationships suggest that chalcopyrite coexists with sphalerite and galena, with less pyrite, magnetite and hematite occasionally. Fluid inclusions of W- (aqueous-vapor two phases) and minor S-types (aqueous-vapor-daughter mineral-bearing three phases) were observed in quartz, calcite and sphalerite, but only W-type inclusions were measured. Fluid inclusions in the minerals from Stage II show variable homogenization temperatures of 120–500 °C (with two peaks at 160–180 °C and 320–480 °C) and salinities of 4–20 wt.% NaCl eqv. (peak at 8 wt.% NaCl eqv.). In contrast, the Stage III fluid inclusions have variable homogenization temperatures of 120–360 °C and salinities of 2–14 wt.% NaCl eqv., with peaks at 160–180 °C and 6–10 wt.% NaCl eqv., respectively. Similar peaks of homogenization temperatures (160–180 °C) and salinity (8 wt.% NaCl eqv.) in Stage II and III may indicate superposition of Stage III fluids on Stage II. Such medium–low temperature and low salinity, with fluids superposition on former stage probably indicate the Hongshanliang copper deposit to be a low temperature hydrothermal vein-type or Manto-type deposit.