Gold Ore Deposits in the Gezhen Metallogenic Belt, Hainan Province of South China: An Example of Orogenic-Type Deposit?

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1 Characteristics of Gold Mineralization

As one of the most important gold metallogenic belts in South China, Gezhen gold metallogenic belt has proven and measured resources of about 275t, and accounts for 80% of the Au production in Hainan Province. Gold ore deposits within this belt, which include Tuwaishan, Baoban, Erjia (composed of Beiniu, Fengshuishan and Hongfumenling mines), Hongquan and Bumo deposits from northeast to southwest, are all situated in the Gezhen shear zone and show an equidistant occurrence (Fig. 1). The Mesoproterozoic Baoban Group (1600 ~ 1800 Ma) is the main host unit for these gold deposits (Ma et al., 1997), which are controlled strictly by the NE-trending shear zone. Three types of gold mineralization, namely, altered mylonite-type, altered cataclastic rock-type and quartz vein-type, are identified from the core of ductile shear zones to rim. They are controlled by mylonitic foliation (e.g., SC fabrics), NE-trending altered cataclastic rock belts and the secondary brittle shear- and interlayer fracture zone, respectively.

2 Fluid Inclusion Data and Isotope Compositions

The main phase of primary fluid inclusions from the three types of ores is vapor-liquid phase, followed by liquid phase and vapor phase. Compositionally, the liquid-phase inclusions belong to NaCl-H2O system, while the vapor-liquid phase ones mostly comprise H2O, CO2, CO, CH4 and H2S, and the vapor-phase ones are dominated by CO2. The homogenization temperatures of fluid inclusions range widely from 140°C to 370°C and show regularly decreasing from 300~310°C in the early-stage, through 240~250°C in the middle-stage, and to 180~220°C in the late-stage of mineralization.

However, some characteristics of fluid inclusion composition are different depending on different type of ores. As for the altered mylonite-type ores, salinity of primary fluid inclusions in quartz clusters between 5.0 and 9.3 (avg. 7.24) wt. % NaCl eq., with density of 0.935 g/cm3 and average pH value of 6.65; as for the altered cataclastic rock-type, salinity of fluid inclusions in quartz ranges from 0.5 to 5.0 (avg. 2.5) wt. % NaCl eq., with density of 0.794 g/cm3; and for the quartz vein-type ores, salinity is between 4.0 and 10.5 (avg. 7.24) wt. % NaCl eq., with density of 0.838 g/cm3 and average pH value of 6.67 (Tu and Gao, 1993; Yang et al., 2008).

The δD and δ18O values of quartz vary from -54‰ to -87‰ and from -3.5‰ to +8.1‰ for the altered mylonite-type ores, from -68‰ to -87‰ and from +1.25‰ to +7.62‰ for the altered cataclastic rock-type ores, and from -55‰ to -73‰ and from -5.4‰ to +4.6‰ for the quartz vein-type ores, respectively (Tu and Gao, 1993; Yang et al., 2008). All the δ34S values for pyrite from the three types of ores cluster between +6‰ and +7‰, which are consistent with those for pyrite from host rocks metamorphic rocks and migmatites, but are higher than those for pyrite from the Mesozoic igneous rock. Pb isotopic compositions for sulfides from the three types of ores can suggest a significant orogen-related source of Pb with deep-sourced contribution to gold mineralization.

3 Conclusions

Fluid inclusions components show high CO2 content (mostly ranging from 4.6 to 16.8 mol %), relatively low-
salinity (from as low as 0.5 to 10.5 wt. % NaCl eq.) and are near neutral (PH value at 6.67). The main components of fluid inclusions are H2O + CO2 + CH4 + K+ + Na+ + Ca2+ + Cl− + F− ± SO42− (Tu and Gao, 1993; Hou et al., 1996). Therefore, gold deposits in Gezhen gold mineralization belt can be mostly classified into the orogenic-type.

Considering the petrographical and geochemical features of granitoids intruded from Late Paleozoic to Early Mesozoic (ca. 300 ~ 200 Ma), these deposits might have formed in a syn-orogenic to post-orogenic extensional setting, corresponding to the Indosinian orogeny and closure of the Paleoethys Ocean in South China (Metcalfe, 1996; Xu et al., 2007).

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References


