

The origin of ore-forming fluids of the Wandao gold deposit, southeastern Guangxi, China

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The Wandao gold deposit is located in Dayaoshan polymetallic metallogenic belt of southeastern Guangxi. The exposed strata in Wandao ore district is middle Cambrian Huangdongkou Formation which is of low-grade metamorphic argillaceous sandstone and carbonaceous slate. The Dawangchong and Gulinao granite porphyry bodies, formed in Caledonian, are output in or near mining area. Ore bodies are mainly controlled by the nearly EW-striking structural fracture zone. A single ore body occurs in quartz vein or quartz lenticular in fracture zone which elongates into granite porphyry or in contact zone between granite porphyry and strata. Some previous workers proposed that the ore-forming fluid was predominantly magmatic in origin. In contrast, we argued that metamorphic fluid is an alternatively source of the ore-forming fluid based on a preliminary study of fluid inclusion microthermometry and Raman spectrum.

According to cutting relationship of ore-bearing quartz veins, the Wandao gold deposit can be divided into main mineralization stage and late mineralization stage. Quartz veins in main stage are smoky gray or milky and often associated with pyrite. Quartz veins in late stage are white and cut main stage quartz veins. The size of fluid inclusions in quartz in two stages ranges from 2 μm to 7 μm . The homogenization temperatures of fluid inclusions in the main stage and late stage quartz range from 323.5°C to 384°C and from 237.7°C to 309.6°C, respectively. The main mineralization stage inclusions show salinity range of 1.06-3.23wt% NaCl equiv and trapping pressure estimated between 213-252 $\times 10^5$ Pa. The late mineralization stage inclusions show salinity range of 1.57-3.87wt% NaCl equiv trapping pressure estimated between 157-203 $\times 10^5$ Pa. To sum up, ore-forming fluids in the Wandao gold deposit are middle to high temperature, low salinity and low density ones.

The δD value of inclusion water in two stages changes from -68‰ to -31‰, and $\delta^{18}\text{O}_{\text{quartz}}$ value of quartz changes between 12.6‰ and 15.0‰. According to the formula (Clayton et al, 1972), the $\delta^{18}\text{O}_{\text{water}}$ value are from 5.03‰ to 9.46‰. Laser Raman Spectrum analysis indicate that gases in fluid inclusions are mainly CO_2 , H_2O and a small amount of CH_4 . Hydrogen and oxygen isotope analysis and Laser Raman Spectrum analysis suggest that the ore-forming fluids in the Wandao gold deposit are mainly metamorphic water and the deposit type should be orogenic gold deposit.

Acknowledgments This project is supported by NSFC(41362006), CGS(12120114052501) and GXNSF(2013GXNSFAA019275)