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Gaseous and Liquid Composition of Fluid Inclusion from Different Mineralization Stages in the Dayingezhuang Gold Deposit of the Jiaodong Peninsula, China

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1 Geological Setting and Mineralization

The Dayingezhuang gold deposits, located in the central section of the Zhaoping Fault Zone which is one of the most important gold-hosting faults in the Jiaodong gold province of China, is hosted by the Late Jurassic Linglong type granite . The deposit is a typical Jiaojia-type gold system with quartz-sulfide veinlets, and the ores are characterized by strong silicification, sericitization, sulfidation and K-feldspar alteration. The No. I and II orebodies represent 85% of the proven reserves in the Dayingezhuang deposit, and are dissected by the Dayingezhuang fault (Deng et al., 2006; Yang et al., 2009, 2014).

Based on the characteristics of alteration and mineralization, the cutting relations of veins and paragenesis of ore minerals, we determined three major mineralization stages: gold-quartz-pyrite (I), gold (silver)-quartz-polymetallic sulfides (II) and quartz-calcite (III) (Yang et al., 2009).

2 Decrepitation Thermometry

Zhu et al. (2001, 2003) confirmed that the decrepitation thermometry of fluid inclusion was feasible to divide mineralization stages. This approach has become an important method for forming fluids research (Wang et al., 2007, 2008; Yang et al., 2008).

Employing the decrepitation thermometry to the 14 samples, we identified three concentrated ranges: 330-510℃ , 240-330℃ and 240-330℃ , which are corresponding with each of the mineralization stage above.

3 Gaseous and Liquid Compositions of Fluid Inclusions

Analysis of gaseous and liquid compositions of fluid inclusions of different mineralization stages that was divided by the decrepitation thermometry was carried out at the IGGCAS.14 fluid inclusion samples were prepared for analysis.

The main gasous composition are H_2O and CO_2, whose content are 81.934-98.897 mol% and 1.158-14.927 mol% respectively. C_2H_6, H_2S and N_2 account for 0.004-4.881 mol%, 0.018-0.357 mol% and 0.003-0.717 mol% respectively. The positive ion in the liquid phase composition of fluid inclusions is mainly made up of K^+ and Na^+, with content of 0.139 -5.698μg/g and 0.290 -3.542μg/g, following by Ca^{2+} (0.074 -1.463μg/g). SO_4^{2-}, Cl^- and F^- make up the negative ion, which account 0.528 -6.014 μg/g, 0.445 -4.712μg/g and 0.444 -5.957 μg/g.

4 Discussion and Conclusions

The ore-forming fluids in the Dayingezhuang gold deposits belong to the medium temperature (240-385℃) and rich in CO_2 content, contain a small amount of volatile gases, such as CH_4, C_2H_6 and H_2S. The scheme of NaCl-H_2O-CO_2 (the data of salinity references Yang et al., 2009) and the high level content of C_2H_6 existd in all of mineralization stages indicate that the ore-forming fluids mostly is the metamorphic water (Yang et al., 2008; Wang et al., 2014). Even though the gas-liquid content from different ore stages is similar with each other, we still observed certain rules along the ore-forming evolution. The trend of increasing N_2 content indicates that the ore-

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forming fluids system switch to an open system in the late stage, and atmospheric water began to take part in the ore-forming fluids (Yang et al., 2007). The high quantity of H_2S in the early gold mineralization indicates that the gold possibly was migrated as Au-S complex. The climbing ratios of Cl^-/SO_4^{2-} and Na^+/K^+ shows that the ore-forming system convert from the CO_2-H_2O-K_2SO_4 into CO_2-H_2O-NaCl system with the evolving process (Yang et al., 2009). The concentration of Na^+, Cl^-, K^+ and SO_4^{2-} decreased from early stage to later stage indicates that the salinity of ore-fluid declined. The higher ratio of H_2O/CO_2 in the later stage represents that the fluid boiling may occurred in the middle stage (Phillips and Evans, 2004; Zhang et al., 2007). Overall, we think that a variety of fluid processes, including change of fluid inclusion types and fluid boiling, have been suggested for gold precipitation.

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