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Fluid Inclusions and Isotopes Constraining the Ore Genesis of the Neoproterozoic Jinshan Orogenic Gold Deposit, South China

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1 Introduction

The Jinshan gold deposit is located in the famous Dexing copper-gold polymetallic district in eastern China. This polymetallic district consists of the Neoproterozoic Jinshan gold deposit (180 tons of Au), the Middle Jurassic Dexing porphyry Cu-Au-Mo deposits (6 Mt of Cu and 138 tons of Au) and the Middle Jurassic Yinshan Cu-Au-Pb-Zn-Ag deposit (1.0 Mt of Cu and 107 tons of Au). Ore genesis of the Jinshan gold deposit is hotly debated. Some researchers proposed that it was a typical Neoproterozoic orogenic gold deposit (Li et al., 2010), but others pointed out that it belonged to Jurassic Dexing porphyry-epithermal ore system (Mao et al., 2011).

2 Ore Deposit Geology

The ore-hosting strata exposed in the mine area consist mainly of the Neoproterozoic greenschist-facies Shuangqiaoshan Group rocks. The major structural features in the Jinshan deposit are the NWW-trending Wanjiawu ductile shear zone and the NE-trending Yangshan ductile-brittle shear zone (Fig.1). The orebodies are layer-like, tabular and lenticular and are parallel to the main shear plane. The mineral compositions are simple. The principal metallic minerals include native gold, pyrite and arsenopyrite, with minor sphalerite, chalcopyrite, and galena.

3 Fluid Inclusion and Isotope Studies

In this paper, we would like to conduct detailed fluid inclusion and H-O-S-Pb isotopes to identify the ore genetic type and to constrain the origin of this deposit. Fluid inclusion studies were conducted on the auriferous quartz veins. Three types of fluid inclusions can be

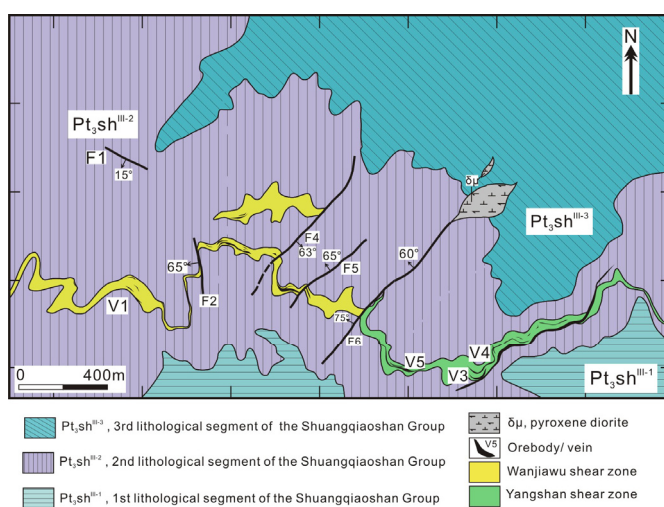


Fig.1 Geological map of the Jinshan gold deposit

identified: H₂O-CO₂ inclusions (type I), CO₂-rich inclusions (type II), and aqueous inclusions (type III) (Fig.2). The pre-ore stage, quartz-pyrite veins primarily contain type I inclusions with constant CO₂ bubble volumetric proportions. The main gold mineralization stage veins have all three types of inclusions with variable gas-phase ratios and CO₂ contents. The post-ore stage carbonate±chlorite veinlets only contain type III inclusions.

Type I inclusions in the pre-ore stage display homogenization temperatures (T_h) of 285–340°C, with salinities of 1.4–6.1 wt.% NaCl equivalent. In the main gold mineralization stage, type II and III inclusions show similar T_h at 208–277°C, but contrasting salinity values with 0.6–3.6 and 3.5–8.9 wt.% NaCl equivalent, and type I inclusions show variable CO₂ phase proportions and have T_h of 241–292°C and salinities of 1.0–7.0 wt.% NaCl equivalent. In the post-ore stage, type III inclusions yield T_h of 109–201°C and salinities of 1.1–6.4 wt.% NaCl equivalent. Petrological observations and microthermometric results show that fluid immiscibility

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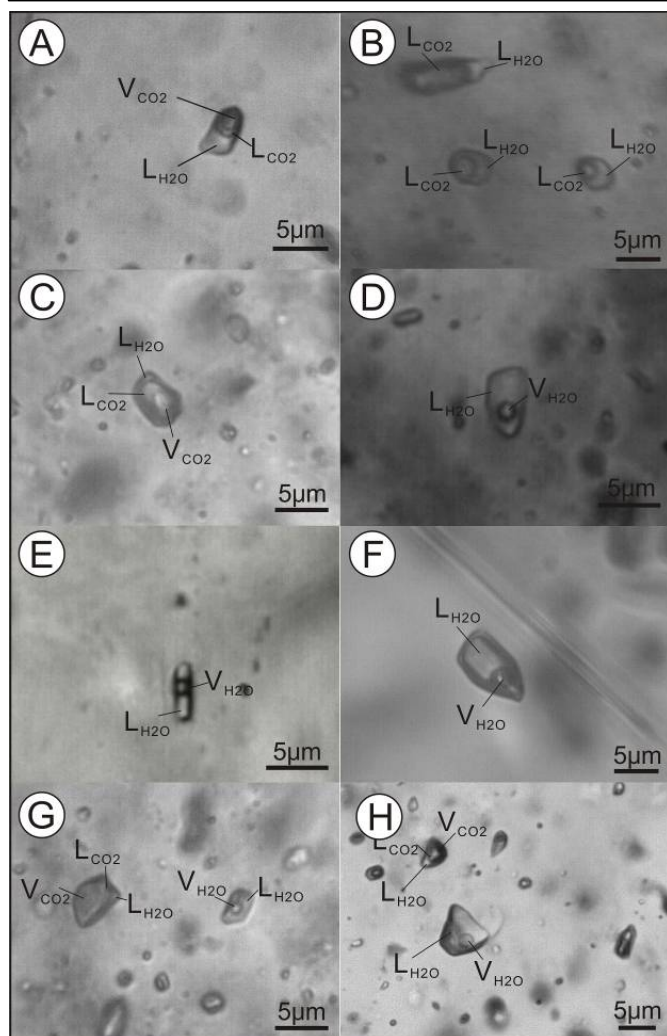


Fig. 2 Fluid inclusion pictures of the Jinshan gold deposit

primarily occurred during the gold mineralization stages.

The oxygen and hydrogen isotope compositions ($\delta^{18}\text{O} = +6.9\%$ to $+11.2\%$, $\delta\text{D} = -71\%$ to -46%) of inclusion water in quartz grains imply that ore fluids were principally metamorphic in origin. The sulfur and lead values of sulfide from the ores are analogous to those from the basement strata, suggesting a predominantly crustal source of the ore sulfides. Our research shows that the Jinshan deposit is a typical orogenic gold deposit.

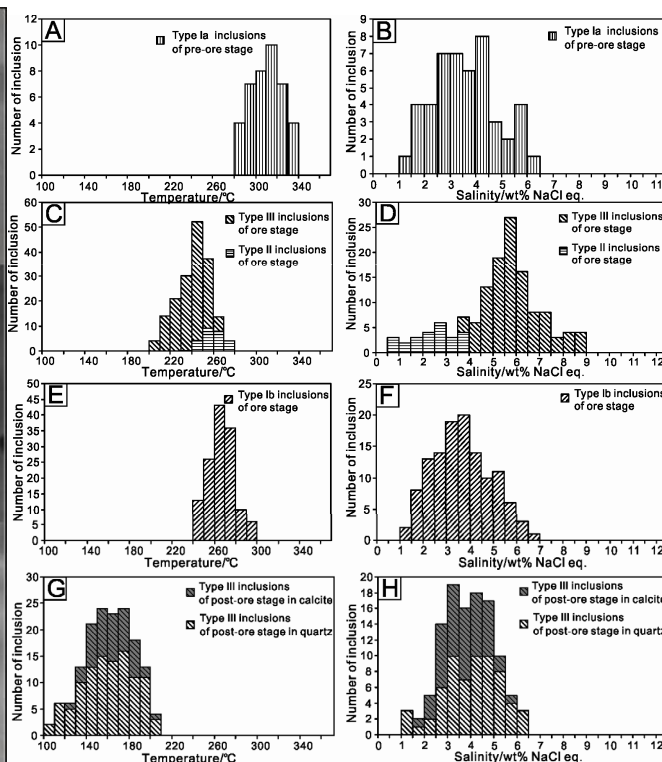


Fig.3 Microthermometri data of fluid inclusion in the Jinshan gold deposit

Acknowledgements

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