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Genesis of the Jincheng Gold Deposit in Luoshan County, Henan Province, China

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1 Introduction

The Tongbai - Dabie area has experienced multistage plate subduction - collision activities, resulting in the development of a series of nearly EW-trending ductile shear zones with different levels, scales, and characteristics (Wu et al., 2012). These ductile shear zones have controlled the northern Tongbai - Dabie Au-Ag-polymetallic ore belt. The Jincheng gold deposit in the Luoshan County of the Henan Province is located in the central section of the Tongbai - Dabie area and the west of Dabie Mountains. It occurs in the east side of the Lingshan granitic mass. The orebodies occur as veins and lens. They are controlled by the ductile shear zone, and hosted by metamorphic rocks of the late Proterozoic Huwangang Formation. Ore - bearing rocks are dominated by altered amphibolite, mica schist and interbedded thin - layer marble.

Based on field investigation and previous research data, this paper presents the regional geological background, the geological features including orebody characteristics, ore fabrics, hydrothermal alteration, and mineralization stages, with an aim to summarize the main ore - controlling factors. Furthermore, the paper points out the genesis of the gold deposit on the basis of ore geological, fluid geological and ore geochemical data.

2 Geological Features

Ores in the Jincheng gold deposit are mainly disseminated, fine - veined, and brecciated. According to paragenetic association of minerals and intercalation relationships of different veins, three ore-forming stages are recognized (Liu, 2012a): quartz - pyrite stage (S1); quartz - polymetallic sulfides stage (S2); quartz - fluor - carbonate minerals stage (S3). The crystalline sequence of minerals were formed from high temperature to low temperature, following the stage from silicates – oxides - sulfides - carbonate minerals. Pyrite is the main gold - bearing mineral, the native gold in early stage (S1) occurs in the boundary of pyrite grains (S1), and the native gold in later stage (S2) occurs as inclusions in pyrites (S2) which are fine - grained and xenomorphic.

3 Discussion

The $\delta^{34}S$ values of pyrite in the main orebody range from -6.9‰ to 5.5‰ with a mean of 2.33‰. The lead isotope compositions show the characteristic of the lower crust, indicating that sulfur and lead were derived from the lower crust, which is similar to those of the Huwan Formation (Ke et al. 2012; Liu et al. 2013;). The $\delta^{18}O_{H_2O}$, δD_{H_2O}, and $\delta^{13}C_{CO_2}$ values in the ore-forming fluids range from -6.0‰ to +4.0‰, -62‰ to -86‰, and -6.3‰ to -2.8‰, respectively (Fig.1a). The O-H-C isotope compositions suggest that the ore-forming fluids were originated from mixing of magmatic and meteoric water (Liu et al., 2012b, Li Hongmei). Thus it is concluded that magmatic water as Jincheng gold mine initial ore-forming fluids carried some minerals this fluids flow throught the deep fault and rise to shallow place, in this process, the fluid extracted mineral elements from the Huwan Formation. During the late stage, meteoric water leached some mineral elements from the metamorphic strata, those mineral elements together with mineral elements from magma make up material source of this deposit.

In hydrothermal mineralization stage, the homogenization temperatures of fluid inclusions in quartz are concentrated in 120 to 340℃, with salinity

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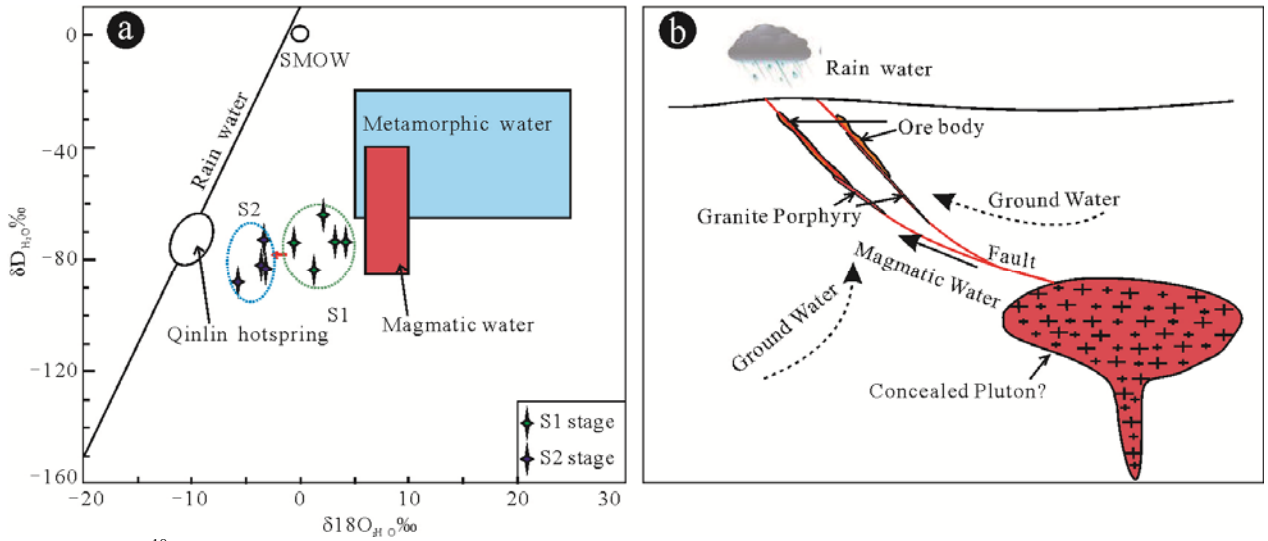

Fig. 1. a, δD-$\delta^{18}O$ diagram of the ore-forming fluid (base map modified after Taylor et al. (1974), data after Liu(2012a)); b, The metallogenic model of Jincheng gold deposit.

concentrated in 0 to 16 ω_{NaCl}%. The homogenization temperatures of fluid inclusions in fluor range from 129 to 180℃, with salinity concentrated in 0 to 10ω_{NaCl}%. The ore-forming fluids migrated and evolved along the ductile shear zones from high temperature to low temperature, from high pressure to low pressure. Finally, the metallogenic materials were gradually enriched in favorable structures. The main mineralization temperatures (quartz - pyrite stage and quartz - polymetallic sulfides stage) are between 180 to 340℃. The ore-forming depth is about 1.5 to 4.0 km, belonging to middle-sallow depth.

4 Conclusion

According to the research works mentioned above, this paper proposes that the Jincheng gold deposit experienced pre-enrichment process influenced by metamorphism and deformation, formed ore-bearing hydrothermal solution by the later activate from the effect magmatic hydrothermal, then mineralization by the infilling and metasomasis when the ore-bearing hydrothermal solution move to the faults which range from brittle to brittle-ductile (Fig.1b). In summary, the Jincheng gold deposit is an orogenic gold deposit controlled by brittle-ductile fracture zone.

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