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Geochemical Characteristics of the Zhesang Gold Deposit in Funing, Yunnan Province

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1 Geological Setting and Geological Features

The Zhesang gold deposit, which located in the structural belt of Yunnan-Guzhou-Guangxi gold triangle area and controlled by Guangnan-Funing fault, is a typical Carlin gold deposit. There were eight gold ore bodies and most hosted in the upper Permian Wujiaping formation. The formation experienced three stages, sedimentary diagenesis, hydrothermal mineralization and supergenic oxidation. Pyrites and arsenopyrites are the two major Au-bearing minerals. Gangue minerals like quartz are closely related with gold mineralization.

2 Geochemical Characteristics

The loss of S and Fe (average 45.39% and 50.60%) in pyrites and the enrichment of S and lack of As ($FeAs_{0.80\sim0.90}S_{1.02\sim1.15}$) in arsenopyrites of the hydrothermal mineralized stages, indicated that the Zhesang gold deposit was low temperature genesis (Xu and Shao 1980). The better gold-bearing pyrites are more rich in As, but the As content and the Au content don't present a positive relationship, which suggests that As did not only derive from the mineralized thermal fluid but also came from As dispersed in the wall-rocks and groundwater (Kolker et al., 2003; Utsunomiya et al., 2003). The depth level (D) of the pyrites lies in the middle of the D interval (1.58~2.90), which indicates that the Zhesang gold deposit is epizonal to mesozonal genesis. The Co content is 0.10 wt percent on average and the Ni content is 0.04 wt percent on average in pyrite. The Co/Ni ratio range from 1 to 3.5, which suggests that the pyrite formed in the moderate temperature phrase and a strong hydrothermal activity happened (Li et al., 2005).

REE for types of rocks and ores (Fig.1) implies that the ore-forming materials are mainly derived from the Wujiaping formation complex. Organic carbon content of the ores reached 0.12%~0.45% and the Au tenor grow with the increase of organic carbon content. $\delta^{34}S_{V\text{-}CDT}$ values of pyrite and arsenopyrite range from 9.2‰ to 10.2‰, which also proves the reaction between organic substance and wall-rocks (Dai et al., 2014; Zhang et al., 2013).

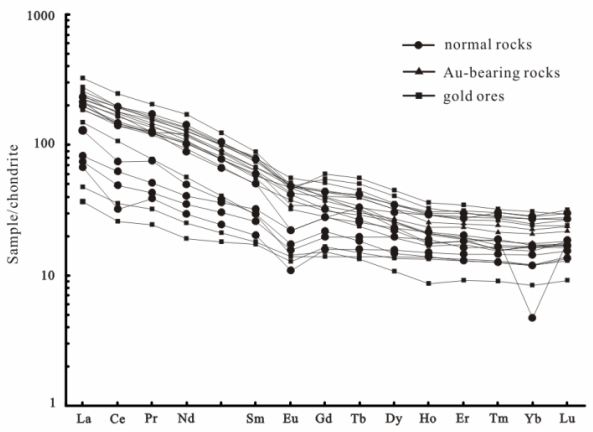

Fig.1 The REE patterns of rocks and ores in the Zhesang gold deposit

Homogeneous temperatures of the fluid inclusions reveal that the ore-forming fluid was a middle-low temperature (80~245℃), hyposaline (0.18%~6.45%) and middle-low density system. REE of quartz veins (Fig.2) indicates that the condition of the ore-forming fluid was reducing and mildly acidic, and its source was dominated by the crust. The $\delta^{18}O_{H2O}$ of the fluid inclusions ranges from -5.6‰ to 5.4‰ and the $\delta D_{V\text{-}SMOW}$ ranges from -40.3‰ to -74.8‰, showing that the ore-forming fluid was mefeoric water.

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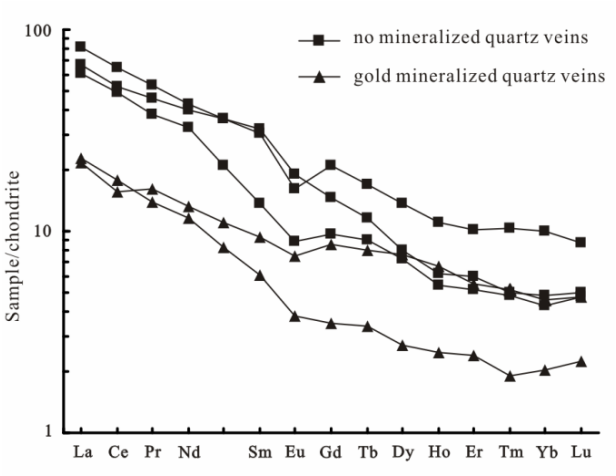

Fig. 2. The REE patterns of quartz veins in the Zhesang gold deposit.

3 Conclusions

Based on above analysis, it is more reasonable to support that gold mineralized in Yanshanian earlier than the Indosinian basic magmatism. The ore-forming fluid was mainly affected by the heat, which was caused by the geothermal anomaly in Youjiang basin during the early Permian and late Permian period, and magma's "baking" to recycle upward. Gold mineralization occurred during the interaction process between the thermal recycle and wall-rocks, and enriched in proper space.

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