1 Introduction

The Liaotun gold deposit, located in Bama county, northwestern Guangxi, is the only one gold deposit for sure spatially closely related to quartz porphyry. The study for this deposit, none but Chen et al. (2014) has defined the upper limit of ore-forming by using 39Ar-40Ar chronology data of muscovite in quartz porphyry. No any other data was published. Based on the latest data of REE and lead isotope measured, this study makes a preliminary discussion on ore-forming material sources.

2 Geology of Ore Field

The ore field is located at the contact zone between platform and basin on the southwest of Longtian isolated carbonate platform of Youjiang rift basin. The strata and rocks in the ore field include carbonates of Carboniferous and Permian system in the platform, and sandstone and mudstone of Triassic around the platform. Triassic system is unconformable or fault contact with underlying Permian system. There are 9 fractures in the mining area, among which F1 and F2 are synsedimentary fractures and F4, F5, F6 and F9 are ore-controlling and ore-bearing fractures for gold ore bodies. Two quartz porphyry dikes occur in the mining area, with striking of northeast, with length of 3km to 6km and width of 3m to 15m(Fig. 1).

3 Characteristics of Gold Deposit

Totally 5 gold ore bodies have been discovered in the deposit so far, which are respectively I-1, I-2, III, IV, and V. They are hosted by fine-medium grained lithic quartz greywacke, sandstone cataclasite, pelitic siltstone in Baifeng Formation of middle Triassic series. The ore bodies were formed in the form of bedded vein, vein or lentoid at the fracture zones of Baifeng Formation and nearby parts where joints and fractures developed. The length of ore bodies ranges from 105m to 390m, and width from 1.81m to 11.92m. Among which, I-1 and I-2 are controlled by fault F4 and cut across by the quartz porphyry. The dip of these two orebodies is northeast and dip angle from 50° to 85°. Orebodies III, IV, and V are controlled respectively by F5, F6, and F9, and with dip from 160° to 179°(locally 340° to 358°), and dip angle from 48° to 88°. The grades of ores from these 5 orebodies range from 0.36 to 10.78×10-6, with average value of 1.34-3.34g/t. Hydrothermal alterations mainly include silicification, pyritization, arsenopyritization, carbonation, kaolinization. Ore structures are mainly disseminated, veinlet, stockwork, brecciated.

4 REE and Lead Isotope

The samples for this study were collected from I and V

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orebodies in open pit of Liaotun gold deposit and northeast striking quartz porphyry dike, including gold ores, wallrocks (siltstone and pelitic siltstone), and quartz porphyry. Selected samples were sent to ALS Chemex (Guangzhou) Co., Ltd. for analyzing. REE were analyzed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS), whose distribution pattern according to the analytical data is shown in Fig.2. The distribution curves of gold ores and wallrocks (silty mudstone) are very similar, indicating that the ore-forming materials during the mineralization may be mainly derived from strata. The distribution curve of altered quartz porphyry near the ore body is close to that of ores, but the distribution curve of fresh quartz porphyry far away from the ore body is far lower than that of ores. This indicates that it is less likely for quartz porphyry to provide ore-forming materials. The higher REE content in altered quartz porphyry is probably the result of ore-forming fluid with high REE bringing in quartz porphyry when fluid flowed through it.

5 Discussion on Ore-forming Material Sources

The lead with high $\mu$ (greater than 9.58) mainly comes from the upper crustal rocks (Doe and Stacey, 1974), while it is usually not related to deep magmatic activity. The values of $\mu$ in the lead isotope composition of the ores and wallrocks are greater than 9.58, which suggest that the lead in the Liaotun gold deposit mainly comes from the upper crustal rocks.

According to REE distribution pattern (Fig. 2), the curves of all samples tilted to the right, showing LREE enriched and HREE depleted. The distribution curves of gold ores and wallrocks (silty mudstone) are very similar, indicating that the ore-forming materials during the mineralization may be mainly derived from strata. The distribution curve of altered quartz porphyry near the ore body is close to that of ores, but the distribution curve of fresh quartz porphyry far away from the ore body is far lower than that of ores. This indicates that it is less likely for quartz porphyry to provide ore-forming materials. The higher REE content in altered quartz porphyry is probably the result of ore-forming fluid with high REE bringing in quartz porphyry when fluid flowed through it.

6 Conclusion

From the above data of REE and lead isotope, the ore-forming materials in the Liaotun gold deposit may mainly derive from clastic rocks of middle Triassic series. It needs to be further studied on whether or not quartz porphyry had provided ore-forming materials and its relationship with mineralization.

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References
