1 Introduction

The position of Dayaoshan tectonic structure belongs to the qin–hang belt. As an important part of copper gold polymetallic metallogenic belt, Guangxi Jin Xiu Zhaibao copper mine is located in the northwest bulge of Dayaoshan. Previous researches focused on the region in terms of gold mine, little attention was paid to the copper ore. As the breakthrough of copper ore, this study has a practical significance on the continuous exploration.

2 Geology of the Deposit

The outcrop of mining area is mainly Lianhuashan group of lower Devonian, wall rock is amaranth monoclinic quartz sandstone and argillaceous siltstone. There are many faults as the main ore-controlling structures, which are mainly foe near north and south. There are no magmatic rocks in outcrop around mining area, but magnetic data shows south deep of mining area periphery has hidden magma bodies.

Eight copper ore bodies in the mine are all in silicified fractured zone, and their sizes and attitudes are strictly controlled by the fault fracture zones with roughly north-south parallel alignment. The ore bodies are thin veins with high grade. The form is mainly vein-like or lenticular. The main ore minerals are chalcopyrite and pyrite, then are bornite, chalcocite and gangue minerals are mainly quartz. Ore structures are massive, veinlet-net veins, disseminated or brecciated. Wall-rock alteration are mainly silicification and chloritization, there are small amounts of barites and carbonatization in some locations. The homogenization temperature of primitive fluid inclusions in the quartz in metallogenic stage is 155–198°C, belonging to medium to low temperature category.

3 Ore Deposit Geochemical Characteristics

3.1 Major elements characteristics

1) The contents of SiO₂ and Al₂O₃ of the surrounding rock and the altered rock are high and similar, but different from the ore body (Fig. 1). This indicates that altered rock keep a certain affinity with surrounding rock, and heated fluid transformation is not very strong, keeping the features in the surrounding rock more.

2) The content of Fe₂O₃ in ore body is 29.905–62.58% (average 53.305%), K₂O + Na₂O is 0.158–0.837% (average 0.243%). And the content of Fe₂O₃ in altered rock is 0.874–13.325% (average 4.080%), K₂O + Na₂O is 2.080–6.103% (average 4.263%). Therefore, the ore body is rich in iron and poor in alkali, whereas the altered rock is poor in iron and rich in alkali, the relationship between them is the ebb and flow, illustrating the altered rock experienced the alkali metasomatism of iron precipitation and alkali.

3) In this mining area, the surrounding rock CuO < 0.05%, Fe₂O₃ < 5.201%, the contents are generally low. But in ore body CuO > 14.48%, Fe₂O₃ > 49.187%, the contents are high. This indicates that the surrounding rocks are not the sources for mineralization.

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Fig. 1. Average value contrast between mining area surrounding rock, altered rock and ore body chemical composition.
4) The Br contents are high both in altered rocks and ore body, the values are between 58.397%–94.334%, which can be speculated that the ore deposits and hydrothermal halide has great relationship.

3.2 trace elements

The trace element analysis results of 16 samples of the mining area are showed in Fig. 2. The mineralization is related to the hot water sedimentation. Surrounding rock, altered rock and ore body trace elements of the mining area have the following features:

1) Crustal source elements are rich, especially to Pb, Zn, Sr and Ba. And mantle source siderophile elements such as Co and Ni are relative low, which indicates that the formation and mineralization in the study area are greatly influenced by crustal source materials. The contents of high field strength elements such as Hf, Ta, Zr and Nb are low, this may reflects the accumulation of fast speed hydrothermal sedimentation.

2) The U/Th values of the surrounding rock samples are 0.12–0.65 (average 0.24 < 1), U/Th value of altered rock samples is 0.13–0.13 (average 0.30 < 1), showing that both of them are related to sea water deposits. The U/Th value of ore samples is 0.26–79.82 (average 14.99 > 1), suggesting that it is hot water deposition.

3) The Co/Ni value of six ore samples in mining area is 2.01–3.70 (average 2.64 > 1), indicating that the ore-forming hydrothermal solution mainly comes through hot water deposition. The Zn/Pb ratio of ore samples is 0.38–0.69 (average 0.60), which also indicates that deposits may be a product of the hot-water sedimentary mineralization.

3.3 Rare earth elements

The total REE contents of the 16 samples from surrounding rocks, altered rocks and ore bodies are not high, Chondrite-normalized REE patterns are right-leaning, and Ce is in weakly or unconspicuous negative anomaly (Fig. 3). The Eu of surrounding rocks and altered rocks is in negative anomaly, but for ore bodies is in positive anomaly. The characteristics indicate that the deposit is greatly influenced by the hot water sedimentation. There are also other basic features: part of the ore body is affected by the deeply hidden magmas, which brought up heat and alkalis, leading to walk-rock assimilation.

4 Conclusion

The mineralization sources of Jinxiu Zhaibao copper deposit have little relationship to surrounding rocks, and hydrothermal solution has weak influences on altered rocks, instead, retain the original characteristics of surrounding rocks. The ore bodies are rich in iron and poor in alkali. Mineralization is associated with hot water sedimentation, as well as be affected by hidden magmas. Considering this, the deposit belongs to the medium to low temperature liquid filling and vein-like sulfide copper deposit.

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