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Study on the Genesis of No.II Ore Body in Jia-Ma Orefield

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Abstract: The paper aims to make a comparative analysis on the mineralization and occurrence conditions of two main ore bodies in Jiama deposit in Tibet and speculates that there are close genesis relationship between the No.I and No.II ore according to actual exploration and drilling. This paper analyzes their deposit structure and metallogenic fluid structure and draws a conclusion that No.II ore is a kind of relatively independent branch ore spatially separated and migrated from No.I ore.

Key words: No.II ore; ore genesis; layer sliding structure; genesis analysis; Jiama

1. Regional geological background

Jiama ore field is located in the middle south of the Tethys Gangdese—Nyenchen Tanggula plate[1], also called as Lhasa miniature terrain. It bounds the two suture zones of Bangong Lake—Nujiang River and the Yarlung Zangbo River, with Qiangtang—Sanjiang terrane in distant north, and the Indian plate in the distant south.

The south area of Gangdese—Nyenchen Tanggula plate is originally an ancient continental crust. It experienced various evolutions, such as passive continental margin, active continental margin, collisional orogenic belt, intercontinental extension and strike-slip. The ore field is based on the ancient continental crust and experienced various complicated evolutions like the passive continental margin, active continental margin, and collisional orogenic belt and so on, which makes the strata in each stage are relatively developed in the continental crust of Cenozoic strata. And the Triassic, Jurassic and Cretaceous strata were most extensively developed during the passive continental margin period. The Jiama ore field is located in the northern part of the central magma arc of the Late Yanshan—Late Himalayan continent of Gangdise.

2. Geological characteristics of the orefield

2.1 Strata in the orefield

The orefield and its neighbor geological areas are passive continental margin volcanic sedimentary rock series, including Middle-lower Jurassic Yeba formation of Triassic Mailonggang mountain formation, Quesang hot spring formation and Duodigou formation of the Upper Jurassic, and Linbuzong formation, Chumulong formation as well as Talongla formation in Lower Cretaceous[2], dominated by Jurassic and Cretaceous. No.I ore and No.II ore field existed right in the strata of Linbuzong formation. Its genesis is closely related to the strata in Triassic, Jurassic and Cretaceous.

2.2 Structure of the orefield

As the genesis area is located in the middle and south of the Gangdese—Nyenchen Tanggula plate, there formed a tectonic line with East-West direction in general. Under the influence of long-term development and strike-slip lateral force, the tectonic line developed a secondary tectonic line with West-North direction and formed

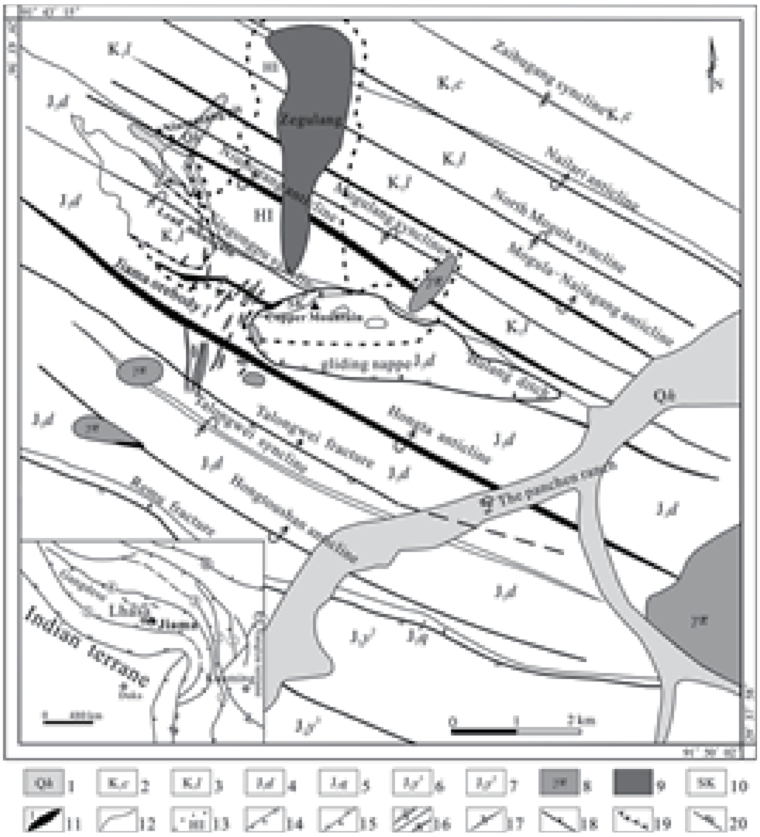

fig. The regional tectonics of the Jiama Orefield

1-Quaternary alluvium and diluvium. 2-Chumulong Group, quartz sandstone with dark gray slate.3-Linbuzong Group, sand slate and hornfels. 4-Duodigou Group, limestone and marble. 5-Quesang spring Group, calcareous siltstone with quartz sandstone. 6-Yeba Group third section, rhyolitic crystal tuff. 7-Yeba Group second section, dacitic and andesitic crystal tuff with rhyolitic crystal tuff. 8-Granite porphyry. 9-Silicified rocks at the surface. 10-Skarn. 11-Iskarn orebody. 12-Stratigraphic boundary. 13-Hornfels alteration boundary. 14-Normal fault. 15-Reverse fault. 16-Overturnedrmal syncline. 17-Overturned anticline. 18-Plate boundary zone and the subduction direction. 19-Ocean crust subduction thrust front. 20-The main boundary thrust fault.

numerous nappe systems with West-North direction under the collision of Eurasia-India plate. JiaMa—Kajunguo slide nappe structure in Jiama ore field and No.IIslide nappe structure are the embodiment of the structure of the ore field[3].It is distributed in the south of Linzhouzhou basin, and located in the middle and south of the Gangdese—NyenchenTanggula plate. Moreover, the front margin of the slide nappe structure shows a thrust fault structure. We can find skarn, hornstone and argillaceous flake zone in the fault structure. There formed many skarn rocks and marble rocks at the front margin of the fault structure.

2.3 Wall-rock alteration

There are various differences in the alteration between No. I deposit and No.II deposit. Although the two deposits are basically formed by Metasomatic contact metamorphism, No. II ore shows different ore characteristics in alteration ore. The skarn rocks, as the main alteration ore of No.II despoit, is mostly formed by the alteration of marble rocks and hornstone under the hydrothermal metasomatism of intermediate-acid magma. Because of the differences in the types and elements of the primary rock as well as factors like degree of fluid migration and intensive process of alteration, it will lead to substantial differences in alterated skarn ore and ore compositions.

3. Characteristics of the ore

3.1 No.I ore

No.I ore is roughly existed in stratiform and clintheriform between the upper sandstone and hornstone in Linbuzong formation and the lower limestone and marble rock stectonic zones in Duodigou formation. The tectonic zones produce tectonic detachment zone. The ore, under 4100-5000 meters under the ground, is generally distributed with NW-SE direction and deviates towards northeast. Controlled by the nappe structure, the distribution of the ore shows the characteristics of precipitous upwards and mitigated downwards trend. The ores mainly include gangue minerals constituted by garnet, wollastonite, diopside and quartz, as well as skarn ores like chalcopyrite, zinc blende, galena, molybdenite and so on.

3.2 No. II ore

No. II ore mainly presents in irregular cystic and lenticular shapes and is distributed in areas that is 4300–5100 meters under the ground. The general distribution trend is in NW-SE direction with a deviation towards the east and an extension from NE towards the east and the inclination is steep. There is obvious enrichment of alteration mineralization in some zones with considerable thickness. At the same time, the mineralization shows different enrichment characteristics at different elevations. Mineralization mainly consists of skarn minerals and small-scale porphyry ores produced by dykes [4].

4. Genesis of No.II ore

4.1 Structure

Both Jiama orefield and No.II ore are influenced by Jiama—Kajunguo slide nappe structure (hereto, the slide nappe structure refers to the geological sliding nappe in Bulanggou—Mogulang in the southeast of the Jiama ore field). Therefore, there appeared a complex and volatile mixed phenomenon in production. The alteration in the ore can be seen in the thermal alteration, such as the alteration of hornstone and marbling.

Jiama No.II ore (the main ore) is mainly distributed at the front margin of the fault structure, which is related to a series of folding caused by Jiama—Kajunguo slide nappe structure. As mentioned above, the diagenesis and mineralization of No.II ore is controlled and influenced by Jiama—Kajunguo slide nappe structure. Therefore, the production state is more complex and often shows mixed phenomena. Changes in ore bodies can be well observed in the formation of hornstones and marbles caused by thermal changes. Due to its complicated mineral composition and similarities with the upper rock mineral composition of No.Iore, we can speculate that this ore is formed by the unbalanced force which leads to the sliding and falling of the rocks in the upper layer of the No.Iunder the force of nappe structure. In this process, there formed a unique structural phenomenon of intermingled distribution of Linbuzong sandstone slate-hornstone and Duodigou limestone-marble in the ore bodies.

The skarns in No.IIore are distributed in irregular cystic forms, which developed in a relatively small area with considerable ore thickness. As mentioned above, a complex tectonic system that runs through the spatial dimension of the ore body is formed due to the slide nappe structure. It is precisely because of the complexity of the tectonic system that a variety of lithologic interfaces are widely distributed, which increases the migration range of ore-forming hydrothermal fluids and is a favorable place for the formation of diagenesis and mineralization. At the same time, in the process of migration of the mineralization fluid, it continuously occurred thermal contact metasomatism with the surrounding rocks, which further formed large-scale alteration and mineralization regions, and promoted the mineralization.

4.2 Mineralization liquid effect

In the exploration process, series of boreholes revealed the existence of some hidden rock bodies, and the quartz veins with various characteristics generally existed in the porphyry, which indicated that there was a significant possibility of fluid dissolution during the ascent of the magma. As for element distribution forms, there appears a reverse belt production of elements such as copper and molybdenum, which show the transformation relationship between high and low temperature elements combination. And it shows sharp influence of the deep fluid in metallogenic, and laterally explains the effects the deep hidden rocks on the mineralized alteration and contributes to the metallogenic formation [5].

5. Conclusion

The formation of No. II ore is evidently showed in such respects as varied geological structure in the ore field and the degree of metallogenic material. The nappe structure and outward extension slide nappe structure constitutes the most powerful structural factors to the mineralization of No.II ore. The minerals associated with the ore-forming fluid carrier moved to the fracture and fold structure space area and created favorable conditions for more mineral accumulations. During this process, medium- acidic magma from the deep magma chamber formed in the process of upward movement, carrying and collecting many favorable mineralization materials, which occurred intensive metamorphism metasomatism with various surrounding rocks like carbonates and laid a strong material foundation for the formation of ore bodies.

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