The research on ore-controlling factors of Haxiyatu iron-polymetallic deposit of East Kunlun

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Abstract. Haxiyatu iron-polymetallic deposit of East Kunlun is located in Qimantage met allogenic belt, the main met allogenic elements are iron, copper, lead, zinc, gold, etc. Based on the geological characteristics and mineralization of ore deposits, this paper concluded that, firstly the brittle contact zone of Jinshuikou rock group and carbonate rock provided a good space for mineralization, secondly the deep minor fractures caused by the regional fracture provided the transport channel for the material. At last, the quartz diorite originated from the mixed source of crust-mantle in the mining area provided a material basis for the mineralization.

1. Introduction

Haxiyatu iron-polymetallic deposit of East Kunlun is located in Qimantage met allogenic belt, Qinghai province. The deposit formed in the early Triassic, and ore-forming elements was given priority to iron, associated with gold, zinc, etc. According to the detailed survey, it is now a medium-sized deposit with huge potential. Previous studies have shown that the deposit was layer-controlled skarn deposit [1], but its specific ore controlling factors has not been explored. Compared with other layer-controlled skarn deposit, the geological features of Haxiyatu iron-polymetallic deposit were different in space. For example, the ore body of Haxiyatu deposit was Paleoproterozoic Jinshuikou group, and the ore body of skarn deposit in East Kunlun was Carboniferous system [2]. The study lag of controlling factors not only restricted the overall understanding of the deposit but affected the next prospecting deployment. Therefore, this paper analyzed the geological characteristics, mineralization and controlling factors of ore deposits, to provide some basis for the study of regional skarn deposits.

2. Regional geological background

Qimantage met allogenic belt was located in west section of East Kunlun, the general trend was NNW. The main strata in this belt included Paleoproterozoic Jinshuikou group, Mesoproterozoic Langyashan group, Ordovician mountain group, the upper Devonian Maoniushan group, Carboniferous Dagangou group and Sijiaoyang group and the upper Triassic Elashan group, etc.

The main lithology is crystalline limestone, marble, clay limestone, dolomitic limestone, dolomite, metamorphic siltstone, slate, phyllite and basaltic-andesite. Many strong structural activities happened in this belt, and there were three NW fractures. From north to south, they were divided into the East Kunlun north Caledonian rift trough, the basement uplift and granite belt and the composite collage belt. The magmatic activiies in the belt were closely related to the mineralization, the Late Paleozoic-Early Mesozoic granite was the main period of regional skarn mineralization [3-7].

3. Geological Characters of the Mining Area

The outcrop in the mining area was Jinshuikou group, which main lithology was biotite plagioclase gneiss and marble. The main mineral composition of the former was plagioclase(55%), quartzs(30%), dark minerals and secondary minerals(15%), and the latter was calcite and dolomite. Due to serious overburden of the mining area. it is preliminarily believed that the fracture was consistent with the regional major fault, and the NW direction was the main one (Fig.1) [8-10].

The magmatic rocks were dominated by quartz diorite and granodiorite in Indosinian period. The contact zone of quartz diorite and Jinshuikou group was characterized by skarnization, while the contact zone of granodiorite and Jinshuikou group has no obvious skarnization. The ore-bearing skarn was developed in the outer contact zone of quartz diorite, and in this area 54 concealed ore bodies were distributed in layered and lenticular. The ore belt was 1400m long, 200-350m thick, trend in south and its dip angle was 45°-75°.

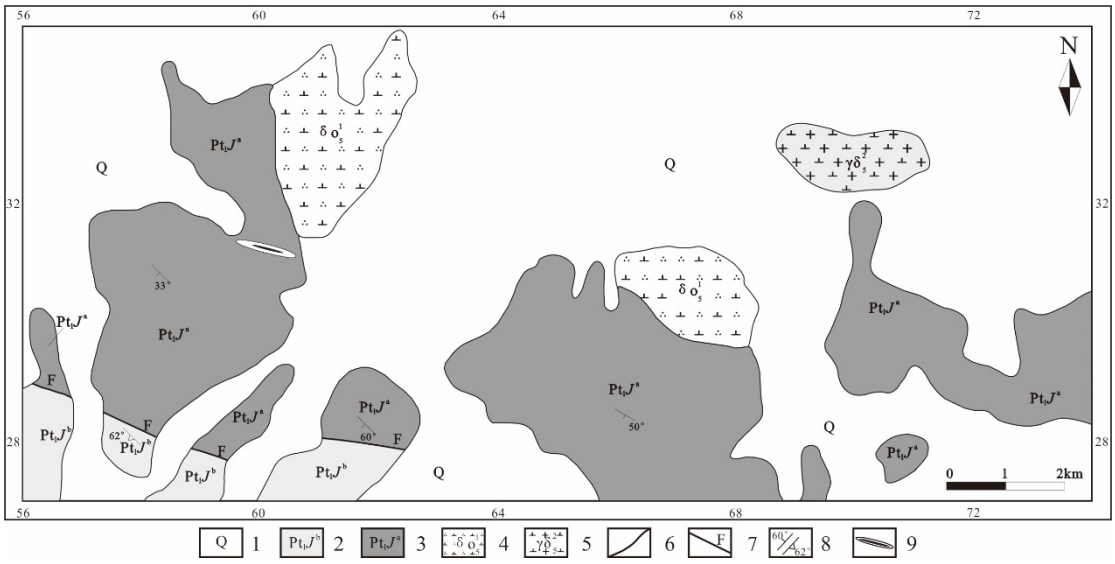

Fig.1. Geological sketch map of Haxiyatu Iron-polymetallic ore district

1-Quaternary, 2-upper Jinshuikou group, 3-lower Jinshuikou group, 4-quartzdiorite,

5-granodiorite, 6-geological boundary, 7-faults, 8-occurrence, 9-outcrops

4. Analysis for Controlling factors

4.1. Sedimentary rock control

The ore-bearing strata was a set of clastic-carbonate rock, deposited on the crystalline basement under stable conditions. Some original layers have been reconstructed by late tectonics and replaced by mylonitic foliation, but most were preserved. The originate lithology of Jinshuikou group was greywacke and argillaceous rock mixed with muddy and sandy limestone, belonging to shallow marine marginal clastic rock construction.

The construction of clastic-carbonate rocks was basically rhythmical output, and sufficient carbonate rocks can provide basic material conditions for skarnization. It was found that the mining area has four features which was beneficial to the skarnization and mineralization.

1 The content of MgO in marble was high, which was quite easy to form magnesianskarn under magma hydrothermalism, providing a good space for later mineralization.

2 The part of Jinshuikou marble contained some clay, iron, etc. The low purity lead to good permeability. When the hydrotherm migrated to the layer, the higher the permeability, the larger the reaction surface between surrounding rock and hydrotherma, which was favorable for the mineral precipitation.

3 The compressive degree of surrounding rock affected the skarnation. According to lithologies, the compressive degree of carbonate rock from high to low was impurity limestone>dolomitic limestone>lime dolomite>limestone>dolomite. The marble in the study area was prone to form fissures under external forces, especially regional fractures, which was beneficial to hydrothermal metasomatism.

4 In terms of dissociation rate of carbonate rocks, the dissociation rate of calcite was so fast that calcium skarn only developed around the contact zone of rock mass. While the dissociation rate of dolomite was slower, so the hydrothermal solution can stay reactive for a long time and the influence range was far away.

4.2. Magmatic rock control

The magmatic activities related to skarn mineralization in Indosinian can be divided into three stages, mainly included arc granite in subduction, granites after the collision and orogeny. Among them, Triassic subduction and collision orogenic event made great influence on the mineralization.

Generally, the magmatic rocks related to iron mineralization in skarn deposits often experienced a long evolution. The quartz diorite invased Jinshuikou group, and the output environment was subduction background of oceanic crust. The intense tectonism caused the migmatization of mantle-crust derived magma, carrying a large amount of gold element that provide the original ore-bearing hydrothermal for later mineralization [12].

According to the production layer of rock mass, quartz diorite was more accord with the strata-bound skarn deposit. The rock and ore body were not similar with the strata-bound skarn deposit in Yangtze river, but have no general features of contact metasomatic skarn.

4.3. Structural control

According to the distribution of ore bodies in the mining area, the favorable met allogenic structure can be divided into two kinds, the fault structure which goes to north east and the interlayer slip structure.

Macroscopically, the geological and geophysical characteristics of the mining area have shown that the three north east faults in this area may be caused by the middle Kunlun fault belt, and have better met allogenic facts, indicating that they may control the migration of met allogenic hydrothermal fluid.

Microscopically, due to the different sedimentary environments, the brittle marble was easy to produce interlaminar fissures, and finally form the interlayer slippage structure. In the met allogenic process, the NE fracture was the migration channel of ore-bearing hydrothermal, also can destroy the stability of marble, especially the marble in different lithology contacts. Because of the weak compressive degree, the interlaminar slip structure was extremely developed. When the ore-containing hydrothermal rising along the NE fracture, it may meet with the interlayer slippage structure of Jinshuikou group and migrant with transversal percolation replacement, then forming a unique layer-controlled skarn deposit.

5. Conclusion

The original sedimentary formation of Jinshuikou group in Haxiyatu iron-polymetallic deposit is the prerequisite for the deposit formation. The magmatic activities and ore-controlling structure also provide favorable conditions for the mineralization. To sum up, Haxiyatu iron-polymetallic deposit is a layer-controlled skarn deposit.

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