The Metallogenic Characteristics and Specific Genesis of the Dongchuan Copper Deposit in Yunnan Province

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Abstract. With the rapid development of the social economy and the continuous deepening of urbanization construction, society has entered a new development process, which has played a good promoting role in the development of various social industries. In this context of comprehensive social development, the demand for mineral resources is constantly increasing, which has also subtly accelerated the depletion rate of mineral resources. As a large-scale mineral resource area, the Dongchuan copper deposit in Yunnan needs to further clarify its internal mineralization characteristics and genetic mechanisms in order to achieve reasonable exploration and development, and accelerate the smooth development of various mineral activities in the future. Therefore, the article first clarifies the genetic mechanism of the Dongchuan copper deposit in Yunnan; On this basis, the main mineralization characteristics of the Dongchuantong deposit in Yunnan are clarified.

Keywords: Dongchuan Copper Deposit, Yunnan; Genetic mechanism; Metallogenic characteristics

1. Introduction

The Dongchuan copper deposit in Yunnan is mainly located in the Kunyang Proterozoic continental rift on the western edge of the Yangtze block, and is a crucial copper resource production area in China's current social development process. The geological evolution history of the Dongchuan copper deposit is also very complex, and the unique mineralization conditions have attracted the attention of major geologists. The Dongchuan copper deposit in Yunnan mainly has the following characteristics. The first point is the Dongchuan copper deposit, which is easily controlled by stratigraphic layers, mainly involving various contents such as copper iron ore and Taoyuan type copper deposit. The second point is that the ore-forming fluid inside the copper deposit continuously shifts along the fault structure, resulting in a multi-stage enrichment situation that can be enriched and mineralized at different layers in the same ore-forming system. Therefore, in order to effectively promote the smooth development of subsequent mineral resources and other work, it is necessary to reasonably arrange the development and research of various mineral resources based on a clear understanding of the genetic mechanism and mineralization characteristics of the Dongchuan copper deposit.

2. The Genetic Mechanism of the Dongchuan Copper Deposit in Yunnan Province

(1) Main sources of ore-forming materials

From a practical perspective, the Dongchuan copper deposit in Yunnan Province contains various ore-forming elements such as copper and iron, which are generally higher in elemental background values than those of the same strata. At the same time, due to the presence of purple sandstone in the Min Formation, it is easy to experience discoloration and alteration. From this, it can be seen that the Yinmin Formation is an important source layer of copper and iron ore in the Dongchuan copper deposit in Yunnan. The iron element content in the Yinmin Formation is relatively high, and the proportion of positive trivalent iron ions is also at a high level. Positive trivalent iron ions are not only the basic element that presents a purple red color in the ore resources within the Yinmin Formation, but also the adsorbent for subsequent copper elements. In terms of the basic source of minerals in the

Dongchuan copper deposit, there is a significant connection between the Yinmin Formation and the covered Dongchuan style copper deposits, both in terms of quality and quantity. Generally, the copper mineralization enrichment phenomenon generated in the Luoxue Formation mainly occurs in relatively stable purple sandstone, which also limits the copper mineralization generated in it to a certain extent by the Yinmin Formation.In marine sandstone type copper deposits, the copper element present inside is mostly produced by terrestrial erosion products. These terrestrial erosion products usually refer to weathering products formed by various copper rich rocks under relatively dry conditions between different rocks. However, due to the formation of the Yinmin Formation strata, they are mainly produced in rift environments after most of the mantle material continues to rise, After being subjected to weathering and erosion, some copper material was formed. The Taoyuan style copper deposit of the Heishan Formation is relatively small in overall scale, and the copper elements and other mineral substances involved in its interior mainly come from the Yinmin Formation and the Luoxue Formation. After diagenesis, the overall structure is not stable enough, which causes the impact of longitudinal and transverse fractures on its interior, forming an open channel, making it easy for cold water on the surface and hot brine underground to circulate in it, During the continuous circulation process, copper is extracted to form a more stable ore-bearing hydrothermal solution. In the subsequent circulation stage, if carbon slate from the Heishan Formation is encountered, it will gradually precipitate and form ore. It can be seen that different copper deposits are mainly in the same ore-forming system, mainly reflected in different layers of the Dongchuan copper deposit in Yunnan, and the source of ore-forming materials is basically the same [1].

(2) Displacement and precipitation of ore-forming fluids

The Dongchuan copper deposit in Yunnan is essentially a layer bound deposit that is limited by different horizons. The rare ore type copper iron ore mainly exists in the Yinmin Formation, while the Dongchuan type copper deposit exists in the Luoxue Formation. After investigating the surface and tunnels, it can be seen that fault structures have a serious impact on the subsequent mineralization of copper deposits. Whether it is those relatively small fractures or those large faults, they are the main channels for the movement of ore-forming fluids in them, and this channel can be called a supply system. From a macro perspective, this supply system is mainly manifested in the fault planes inside the Dongchuan copper deposit, which contain a large amount of ore resources such as bornite and chalcopyrite, and can form more complete layered ore bodies on both sides.At the same time, the development of internal fault structures in the Dongchuan copper deposit is closely related to horizontal faults, such as the Jin Foil Qing fault, Lao Xin Shan fault, or Da Shui Gou fault. For example, in the Jin Foil Qing fault, the Luoxue Formation, Heishan Formation, and Yinmin Formation strata are involved in the fault, and serious damage has also occurred in specific fault planes, The internal development of ores such as chalcopyrite and bornite, and the mineralization on both sides of the fault is relatively strong compared to the strata lacking lateral fault development. In this part of the supply system centered on transverse fractures, it is an important channel for ore-forming fluids to continuously extract ore-forming elements and gradually enter the Luoxue Formation or higher layers. The larger the overall supply system, the more dense the development, and the more able it is to promote the gradual migration of various types of ore-forming fluids towards the upper layers. Even though there may be differences in the migration direction of ore-forming fluids near the fault zone due to objective factors, they still gradually extend towards both sides of the fault, forming a zoning feature.In the ore-bearing strata of the Dongchuan layered ore deposit, the mineralization enrichment is not only influenced by factors such as lateral fault development, but also closely related to the degree of oxidation and reduction in the ore-forming environment. The changes in lithology in the three strata also represent the differences in the corresponding sedimentary environment and reduction characteristics. At present, dolomite, slate, and other rocks have significant permeability characteristics and high porosity within them. They are not only the main migration channels for various ore-forming fluids, but also important places for the precipitation of various ore-forming substances. In the diagenetic stage of dolomite in the Snowfall Formation, due to the death of some algal organisms, organic matter is produced, which makes the Snowfall

Formation have a significant reducibility in the environment compared to other groups. Under the influence of various factors such as compaction and tectonic activity, the ore-forming fluid gradually migrates towards the top on a large scale, and then gradually precipitates and enriches in the reducing environment in the Snowfall Formation, In the first section of the Luoxue Formation, there is a large amount of algal stromatolites, but in the second section, there is no algal stromatolites, which is also the main reason for the superior mineral bearing ability of the Luoxue Formation [2].

3. The Main Metallogenic Characteristics of the Dongchuan Copper Deposit in Yunnan Province

(1) Mineralization of the Dongchuan Copper Deposit in Yunnan Province

The geological conditions and overall tectonic environment inside the Dongchuan copper deposit in Yunnan are relatively excellent. The main ore bearing strata inside are the Heishan Formation, Yinmin Formation, and Luoxue Formation. However, in terms of layered copper ore bodies, they are strictly controlled by the strata, and have significant stratigraphic characteristics. Therefore, it is necessary to conduct in-depth research on various factors such as the ore-forming environment and geological background, in order to clarify the main ore-controlling factors inside the Dongchuan copper deposit in Yunnan. Firstly, there is the structure. In the Dongchuan copper deposit in Yunnan, tectonic action is an important factor affecting the subsequent formation of ore bodies. The first point is the control of ore deposits by contemporaneous faults, which can control the changes in copper, iron, and copper ore bodies. This is mainly due to the abundance of ore bodies on the hanging wall of the fault, and as the distance between the fault and the ore body gradually increases, the ore body will gradually become thinner.The second point is the control of structural fractures on the formation of ore bodies. In most cases, structural fractures belong to important channels established in vein like ore bodies, and these vein like ore bodies are relatively more common in copper deposits in the Dongchuan area. The third point is the superimposed transformation of the ore body by the later structure. Under the action of subsequent magma heating, the ore body along the periphery of the fault plane will gradually enrich due to the influence of hydrothermal action; Secondly, there is magmatic rock. The gabbro rock mass in the Dongchuan copper deposit in Yunnan is closely related to subsequent magmatic activities, and there is also a connection between the copper iron ore body and gabbro, which is also the main ore-controlling factor for the internal mineralization of the copper deposit; Finally, it is necessary to clarify the specific genesis of the deposit. The Dongchuan copper deposit in Yunnan is essentially a typical layer bound deposit, and the main ore source layer involved is the dolomite sandwich rock in the Yinmin Formation, with the enriched section of mineral resources located in the lower part of the Luoxue Formation.

(2) Multi layer ore occurrence of Dongchuan copper deposit in Yunnan

Due to factors such as stratigraphic control, the Dongchuan copper deposit is mainly distributed in three strata. The main internal characteristics are reflected in the following aspects: firstly, it is a rare ore type copper iron ore, which is mainly located in the first layer of the controlled copper deposit, and the ore body is mainly produced in the Yinmin Formation strata. Among them, the Yinmin copper mine is a key part of the thin mining type copper and iron ore, and also one of the most important mines in Dongchuan, Yunnan. The Yinmin copper mine area is mainly located on the west side of the Luoyin anticline, mainly distributed in the Luoyin fracture zone, and the thin mining type copper and iron ore presents a special contact relationship in the ore bearing strata, with the ore body mainly originating from the second member of the Yinmin Formation; Next is the Dongchuan style copper deposit, which mainly refers to layered copper deposits, mainly distributed in areas such as Luoxue and Yinmin, and belongs to the highly representative mineralization type in Dongchuan, Yunnan. The Luoxue Formation mainly occurs in the strata after the Yinmin Formation, and in terms of lithology, it gradually transitions from the original clastic rocks to carbonate rocks, which also causes the overall oxidation environment to gradually transform into a reduction environment.The current Dongchuan style copper mine is mainly located in the first section of the Luoxue Formation, and the

overall ore body presents a layered and quasi layered distribution state. The Dongchuan type copper ore body in the Luoyin fracture zone has a distribution of nearly 10km and a relatively large variation in thickness; Finally, there is the Taoyuan type copper mine, which mainly exists in the Heishan Formation and is composed of carbonaceous slate to dolomite in terms of basic lithology. The distribution of the ore body is basically consistent with the occurrence of the strata, and the subsequent mineralization is relatively uniform. However, the changes in the thickness of the ore layer are relatively large, and there are significant problems such as swelling, shrinkage, and branching. Copper mines often distribute reasonably along the slate and fractures with coarse veins, There will also be cases of mutual association with quartz and calcite veins. In terms of specific ore types, they are mainly divided into oxidized copper ore and layered block copper ore. In terms of copper sulfides, chalcopyrite is also the main core, followed by small-scale bornite [4].

4. Conclusion

In summary, in the current process of social development, with the rapid development of the social economy, the demand for mineral resources from all sectors of society is also constantly increasing, which subtly puts forward stricter requirements for the development of the mineral industry. The Dongchuan copper deposit in Yunnan Province is currently a highly important deposit in China, and has undergone in-depth research on its mineralization mechanism and characteristics. At the same time, it also involves the interaction between various factors. Therefore, in the subsequent development stage, it is necessary to make necessary improvements and optimizations for beneficiation and exploration technologies, in order to steadily improve the overall exploration efficiency and resource utilization of the deposit.

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