The Mayang native copper deposit, also known as Jiuquwan copper deposit, located in the Central of Yuanma Basin and near to the Xuefeng Mount in the southern is a rarely sandstone type native copper deposit. Its production can date back to Spring and Autumn Period about 2,700 years ago. The deposit has produced nearly 2 million tons of copper since 1970s, which more than 90% from native copper.

1 Deposit Geology

The Yuanma Basin, has its maximum length in a NE-SW direction and extends for nearly 240km between Xuefeng Mountain and Wuling Mountain, is usually studied as a secondary tectonic unit of Xuefeng Mountain district (Chen Haihong, 1993, Qiu Yuanxi, 1999, Wang Fuquan, 2002). Despite the great controversy regarding the evolution of the Yuanma basin, all investigators concur that the Yuanma Basin developed during the Mesozoic to Palaeogene epoch, and the filled sequences can be divided into 3 unconformity-bounded stratigraphic units, i.e. the upper Triassic to Jurassic system, the Cretaceous stratigraphy and the Palaeogene series.

The Jinjiang Formation of the upper Cretaceous is well-exposed in the mining area. This Formation, 165m (N) to 728m (S) thick, can be at least divided into 9 cycles, and each cycle has a greenish-grey bottom and a reddish-brown roof. The lithology of the reddish-brown roof is reddish-brown thickly-stratified siltstone and/or politic siltstone, and the reddish-brown color is due to red coatings of hematite and/or goethite. The lithology of the greenish-grey basic rock is dominated by poorly-sorted coarse- to medium-grained conglomeratic sandstone and/or sandstone.

The ore bodies are multistory and mainly occur in the greenish-grey beds of the Jinjiang Formation, and a single ore-body is stratified or lentoid. The main ore mineral is native copper (more than 90% of the total ore output) and chalcosine. Little chalcocite is symbiotic with native copper, but occurs as major ore mineral in several ore-beds near to the earth's surface.

In the layer like ore-bodies, native copper occurs as 3 types: ① The copper, very fine-grained or vermiform, uniformly expands in finely crystalline siliceous fragments. We observed more than 300 fragments in 34 samples, in which did not find the copper intersects the scraps. This mining structure show that the mineralization in siliceous fragments must form in the origin area. ② In most cases, irregular or grained native copper is important as cement and usually replace sericitized feldspar scraps, rock fragment or even other interstitial matter. The mineral associated with native copper is extremely abundant and characteristic and will be detailed described below. ③ Nearly the surface of the earth, native copper formed 3g~40kg tabular or dendritic aggregate with gypsum in faults.

2 Mineral Combination

A variety of natural metal minerals are found in the sample of Mayang deposit, such as iron chromium and silver. These minerals, like native copper, are granular around the fragments.

Calcite prevalently associates with native copper cement. Well crystalline calcite usually accretes with copper in the same space, and solution residue is found between copper and fragment. Finely crystalline calcite is ragged and occurs with not only copper but also some clay mineral. Finely crystalline calcite and copper usually replace the neighbor fragment or mud paste. According this structure, the well crystalline calcite formed earlier than copper cement, but can not decide the order between...
the copper and the finely crystalline calcite.

Albite is also a common authigenic mineral with native copper. It like well crystalline calcite occupies the same space with copper, but does not find solution residue structure.

Barite-celestite, radial aggregate, barite as core and tabular celestite form radial line. Barite-celestite usually occurs with native copper in a connected space.

Chlorinate and Connellite are also common. Chlorinate is very thin and only occurs at the depression edge of native copper. Only one granular connellite be found, the chemical formula is \( \text{Cu}_3\text{Cl}_2(\text{OH})_2\text{H}_2\text{O} \).

Organic matter is found in different ore-beds, native copper is usually in organic matter, which as an evidence of organogenic to this deposit by Zhong Jianhuan (1995).

3 Conclusions

According to the mining structure character and the mineral association of Mayang deposit, we can get some messages about the origin of the native copper mineralization:

The first-formed native copper in the debris, form in the source area. The cement copper structure indicates that the mineralization is diagenetic stage. After the cement copper formed, with the tectonic active formed the tabular or dendritic aggregate copper in faults.

During the cement native copper formed, the other natural metal minerals also formed. The cement copper is symbiotic with hydrothermal mineral and replaces the debris, which shows some character of hydrothermal deposit, and the native copper mineralization may be due to the underground thermal water. It did not form vein deposits, that maybe due to the sandstone is well perviousness than reddish-brown siltstone during the copper formed. The appearing of organic matter indicates the native copper formation must be reducing condition.

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