A Geological-Geophysical Model for the Chating Copper-Gold Deposit, Xuancheng, Anhui Province

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The Chating deposit, located in the Xuancheng ore district, is a newly discovered and large Cu-Au deposit in southeastern Anhui in recent years. It is also a major breakthrough in prospecting in the Middle-Lower Yangtze River. The existing exploration work revealed that the deposit has geological characteristics of a porphyry deposit. It also confirms the effectiveness of geophysics in searching for concealed ore deposits in covered areas. The discovery of the deposit greatly broadens the prospecting potential in the Middle-Lower Yangtze River and adjacent areas.

The Chating deposit is characterized by the development of Mesozoic volcano-sedimentary basins. Its unique geotectonic location and diagenetic and metallogenic geological setting show its importance and special significance. Most of the mining area is covered by Quaternary strata. Volcanic rocks are exposed in the south of the mining area, and red glutenite in the continental basin of the Xuannan Formation of the Cretaceous in the northwest. The Silurian and Devonian strata are mainly composed of shallow-water and littoral facies clastic rocks, and the Permian and early Triassic strata are dominated by carbonates and are exposed in the southeast. The Xinhezhuang anticline in the mining area is oriented in a northeast direction and reversed in the southeast wing, forming the southwest section of the Maoshan nappe or the Maoshan fault zone.

1 Geological characteristics of ore deposits

The Chating orebodies are mainly hosted in quartz diorite-porphyry, and the surrounding rocks are marble of the Nanlinghu Formation of Triassic age. The copper-gold ore bodies controlled by the existing drilling project is about 1000 m long and 400 to 1000 m wide. There are 10 ore bodies and 2 main ore bodies, which account for 38.4 % and 20.8 % of the total ore amount, respectively, and are distributed in lines 37 to 53. The ore bodies are layer-like or lenticular in intrusions, trending NE and slightly NE, and dipping SE at 10-30°. The ore bodies occur at elevations of -80.71 m ~ -19232.45 m, buried depth 97.37 m ~ 1936.77 m, and the mineralization center is located in the 41-45 line. The copper grade in the center of the orebody is high, and the mineralization is continuous, and the copper grade around the orebody gradually becomes lower, and there is a branching phenomenon. It is estimated that the metal content of Cu is 1.69 million tons, the average grade of Cu is 0.31 %, the metal content of Au is 233 t, and the average grade of Au is 0.43 g/t. The industrial Cu metal amount is 560000 tons, the symbiotic and associated Au metal amount is 68 tons, the Cu average grade is 0.58 %, the Au average grade is 0.71 g/t, the low-grade Cu metal quantity is 1.13 million tons, the symbiotic and associated Au metal amount is 165 tons. It is expected that the deposit can reach a large scale.

The main metallic minerals of copper ore are chalcopyrite, pyrite, bauxite, natural gold, silver gold, and magnetite. Arsenite and tetrahedrite were also found by electron microprobe analysis. The main gangue minerals are quartz, anhydrite, garnet and diopside followed by potassium, feldspar, hornblende, plagioclase, epidote, calcite, and so on. The structure of the ore is composed of semiautograin-other granular structure, allotypic crystal structure, inclusion gold structure, intergranular gold structure, including structure, metasomatism (skeleton crystal, residual) structure, erosion structure, speckle structure, solid solution separation structure, filling fine structure, etc. Among them, the granular texture and metasomatic erosion structure are the most common. The ore structures are mainly vein-like structure, scattered disseminated structure, followed by sparse disseminated structure, speckle structure,

wrinkle structure, cataclastic structure. The main useful components of the ore are Cu, Au as companion and symbiotic components, and the other associated components are Ag, S, Mo, and so on. The ore industry type is vein-disseminated ore. Ore grade can be divided into industrial ore and low-grade ore.

The wall rocks of the mining area are strongly altered with obvious zonality. The central part is mainly composed of potassium (sodium) and silicification, the periphery is dominated by sericitization, chloritization and carbonatization, among which the sericite zone is the most developed. Superimposed on other alteration zones, the mineralization is the strongest in the potassium and silicification zones, followed by sericitization zones: In addition, the deposit also developed skarn, marble, anhydrite, carbonate and gypsum and so on. A cryptoexplosive breccia is also developed in the deposit, and the breccia is mainly composed of quartz diorite-porphyry. Chalcopyrite and pyrite are found in breccias and cements. The spatial distribution of the cryptoexplosion breccia is consistent with that of the ore body or mineralized body, and the range of the ore body or mineralization body is slightly larger than that of the cryptoexplosion breccia.

2 Geophysical characteristics of ore deposits

The Chating copper-gold deposit is located in the high gravity zone of a 1:25 000 map. The aeromagnetic plane shows a low, gentle and wide positive anomaly zone in the NE direction. Thirteen geomagnetic anomalies have been found in the surface magnetic survey of the mining area. The magnetic anomalies related to the ore are C8 and C12. C8 anomaly, located in the southwestern part of the Chating deposit, is a single, paraxial magnetic anomaly after polarization. There are IP anomalies on and around the anomaly, and several boreholes have been proved, which show that the copper and gold mineralization is in good condition. The C8 magnetic anomaly is caused by a diorite-porphyry body. The C12 magnetic anomaly is located in the main ore body area of the Chating deposit and is now called the Shangchangcun geomagnetic anomaly. This anomaly is an independent anomaly with a relatively large range of upper chord "crescent" type. The near-ring IP anomaly is also found around the magnetic anomaly and its contact zone. On the plane map, the C12 polarization anomaly region by magnetic method Δ T is approximately consistent with the IP anomaly which is relatively low (η s 6 %), and the local IP anomaly around the polarization anomaly region is relatively high (η s >8 %). The 61 line IP sounding section coincides with the exploration line 45 of ore deposit, and the polar-anomaly-center (points 310) in the profile corresponds to the anomaly area with relatively low resistivity and η s 4 %. The copper-gold deposit is mainly between points 240 and 260, η s 6.5 % is the mineralized enrichment area.

3 Geological-geophysical prospecting criteria

1. The deposit, located in the Xuancheng-Nanling basin where the north-east section of the metallogenic belt in the middle and lower reaches of the Yangtze River extends southeastward in the direction of bell-mouth, is characterized by dual diagenesis and mineralization in the uplift and faulted areas.
2. Magmatic rocks: The ore bodies of the deposit occur in a concealed quartz diorite-porphyry intruding into upper Paleozoic strata from Late Jurassic to Early Cretaceous. There is a close spatial and genetic relationship between the ore body and the crypto-explosive breccia body (simple) in the concealed intrusive rock mass.
3. Stratigraphy: Marble strata and a volcanic rock cover, which play an important role in the mineralization.
4. Wall rock alteration: The deposit has the characteristics of wall rock alteration and zonation of typical porphyry type ore deposit, in addition, gypsum and anhydrite are well developed.
5. Geophysics: The deposit is located in the region of high gravity, a wide and slow geomagnetic anomaly and high value of IP anomaly. The range of copper and gold mineralization is within the 0 isoline of magnetic anomaly, the magnetic anomaly is a relatively low resistivity IP anomaly region, and the periphery of the magnetic anomaly region is a relatively high resistivity and IP anomaly.