Mineral resource potential and key exploration areas of JiangNan metallogenic belt*

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Abstract. The Jiangnan metallogenic belt, with an area of about 167,400 square kilometres，spans Zhejiang, Anhui, Jiangxi, Hunan provinces. Its main body is the same as the northern part of the original Qin-Hang metallogenic belt. Its geotectonics belongs to the plate bonding belt that is formed by the collision of the Yangtze and HuaXia ancient land in the Neoproterozoic. Since the Middle Proterozoic, the stratigraphic development of each era has been relatively complete in this region, the geological structure is complex, and the magma activity is frequent. The ore-forming geological conditions are superior. More than 1,280 important minerals such as coal, iron, copper and gold have been discovered, including more than 300 large and medium-sized mineral deposits. The copper, gold, tungsten, silver, lithium, phosphorus and uranium mineral resources in this area have great potential. The predicted resources in this area are 14 million tons of copper, 500 tons of gold, 4.3 million tons of tungsten and 8.5 million tons of lead and zinc, which have great prospects for prospecting. There are 13 key exploration areas in this metallogenic belt.

1. Introduction

The Jiangnan metallogenic belt spans Zhejiang, Anhui, Jiangxi, Hunan provinces. The administrative divisions belong to Huzhou, Shaoxing, Jinhua of Zhejiang Province, Huangshan, Xuancheng of Anhui Province, Shangrao, Jingdezhen, Yingtan, Fuzhou, Jiujiang, Xinyu, Yichun, Pingxiang of Jiangxi Province, Yueyang, Zhuzhou, Xiangtan, Hengyang of Hunan Province, with an area of about 167,400 square kilometres. The main body is consistent with the northern section of the original Qinhang metallogenic belt. The tectonic unit consists by three levels continental margin of units such as the Chencai hyperplasia belt, the Shaoxing-Jinhua ancient magmatic arc and the Xinyu-Dongxiang proliferating belt, the Jiangnan ancient island arc, the north-eastern Jiangxi tectonic melange belt, the Huaiyushan-Tianmushan passive continental margin basin, and the lower Yangtze passive.

2. Regional Geological Characteristics

The Jiangnan metallogenic belt is located on the south-eastern margin of the Eurasian block, and the inner side of the continent of Pacific western margin. In the geotectonic structure, it belongs to the plate-binding zone formed by the collision of the two ancient blocks of the Yangtze and Huaxia in the Neoproterozoic. The north-west is adjacent to the Yangtze block, which is bounded with the Jingdezhen-Xiangtan-Pingxiang deep fault zone. The south-east is adjacent to the Huaxia block with the boundary of the Shaoxing-Pingxiang-Beihai deep fault zone. Since the Middle Proterozoic, the stratigraphic development of each era has been relatively complete. The Proterozoic and Early Paleozoic strata were dominated by active sediments, and the Devonian and later strata were shallow sea or continental stable

sediments. The distribution of the Mesoproterozoic is scattered, and the Lengjiaxi group in north-eastern Hunan is mainly a thick silty sandy metamorphic clastic rock, which generally contains a basic-ultrabasic rock combination. The Neoproterozoic Erathem is widely exposed, including the Qingbaikou, Nanhua and Sinianstrata. The Qingbaikou strata mainly includes the Banxi Group in north-eastern Hunan, the Xikou Group in the northeast of Fujian, and the Shuangxiwu Group in the west of Zhejiang. Metamorphic medium- and deep-sea clastic rocks are carbonated rocks, and the Shuangxi Dock Group in western Zhejiang is an important ore-bearing horizon for gold, copper, lead and zinc in the region. The Nanhua-Sinian strata is composed of glutenite, hailstone, manganese-bearing carbonate rock and siliceous rock in the south-west of Hunan Province, with over-type sedimentary characteristics. There are unstable conglomerates at the bottom of other vast areas, mainly shallow metamorphic sediments and fine debris turbidite deposition, containing siliceous iron, pyrite volcanic rocks, carbonate interbeds, siliceous layers at the top, manganese, Iron, sulfur, gold ore deposits. The Lower Paleozoic Cambrian is an excessive type of shallow-sedimentary carbonaceous shale and limestone in the southwestern part of Hunan. The other areas are shallow metamorphic deep-sea sedimentary turbidite deposition, which is an important part of tungsten, tin and silver. The Ordovician is mainly composed of shallow metamorphic pen-sand sediment, carbon siliceous and siliceous mudstones. Sandstone and conglomerate appear in the upper middle part, and volcanic rocks and carbonate rock layers are partially interposed, which are silver and lead ore layers. Bit. The Upper Paleozoic Devonian is mainly constructed of a set of coastal-shallow marine clastic rocks, which is an important ore-bearing horizon of tungsten-tin-lead-zinc; the carbonate rocks in the Carboniferous are important ore-bearing lithologies of tin-lead-zinc polymetallic minerals. The Permian is the main coal-bearing horizon in the area. The Cretaceous strata of the Mesozoic and Cenozoic is continental sedimentary, with gypsum and glauberite in the lower strata, and copper, uranium and gypsum in the upper strata.

The area has experienced five tectonic evolution stages such as Sibao, Jinning, Caledon, Haixi-Indos and Yanshan-Himalayan. The geological structure is complex, and the surface is the largest in the northeast, northnorth-east and east-west tectonic belts. According to the tectonic layer, the fold structure of the study area can be divided into basement folds (Sibao, Jinning, Caledon) and caprock folds (Haixi-Indosin, Yanshan). The Caledon and pre-Caledon basement folds have the common features of tightness, homoclinicity and even lying. Due to the late tectonic movement, the direction of the tectonic line changes in some sections; the Indosinian caprock is mainly composed of transitional folds. It is obviously controlled by the basement structure; the folds of the Yanshanian caprock are weak, generally broadly pleated or arched, controlled by the extensional fault basin formed after the Indosinian period.

The fault structure development followed with the northeast to northnorth-east as the main direction, and the other followed with the east-west and the north-west direction, partly development with the north-south direction arc-shaped fault. The fault is mainly characterized by deep and large faults in the northeast to the same distance and parallel distribution, namely Shaoyang-Resource-Yongfu-Laibin fault zone, Changshou Street-Shuangpai-Gongcheng-Dali fault zone (Yifeng-Jingdezhen) Fault zone), Chaling-Zhangzhou-Bobai-Chuzhou fault zone (Pingxiang-Shaoxing fault zone), Wan'an-Renhua-Sihui-Wuchuan fault zone.

The Jiangnan bond belt is a tectonic-magmatic activity belt. The magmatic activity in the area is relatively frequent. In addition to the surface of thousands of large and small rocks, there are many hidden rocks (bands). The rock types are mainly acidic and medium-acid granites, and a small amount of neutral and alkaline. And the basic-ultrabasic rocks formed from the Jinning period to the Yanshanian period. The Yanshanian magmatism was the strongest and the evolution was the most complete. The Yanshanian granitoids are mainly formed in the Early Middle Jurassic, and have a tendency to expand to the northwest and southeast, and extend to the southeastern coast. Therefore, this zone may be the source of the Yanshanian South China magmatism. In addition, the belt is widely distributed with potassium metamorphic rocks or alkaline rocks and aluminium A-type granites, so the belt is not only a high εNd, low TDM granite belt, but also an alkali-rich volcanic-intrusive rock belt. These alkali-rich rocks are obviously related to the deep tectonic activities of the ancient plate joints, and are formed in the tectonic setting of the upwelling of the asthenosphere and the thinning of the lithosphere. The non-

ferrous and precious metal mineralization in the area is related to the multi-stage evolution of magma, especially the Yanshanian volcanic-porphyry, shallow-super-shallow porphyry and medium-acid granite.

3. Regional Mineral Characteristics

The Jiangnan metallogenic belt is located in the middle of the South China continental segment of the Eurasian plate tectonic magmatism belt. It has excellent ore-forming geological conditions and is an important prospecting zone for non-ferrous, rare, rare earth and radioactive minerals in southern China. The belt has discovered more than 1,280 important minerals such as coal, iron, copper, lead, zinc, gold, silver, tungsten, key, manganese, antimony, diamond, Ni, tan, phosphorus, sulfur, fluorite and barite. There are more than 300 large and medium-sized mineral deposits. The minerals are mainly Neoproterozoic basic-ultrabasic iron-type iron ore (Zhuji Shijiao) and marine volcanic-sedimentary copper deposit (Shaoxing Xiqiao); Yanshanian porphyry copper deposit (Dexing Copper Factory, Fujiawu, etc.) and tungsten-molybdenum ore (Yangchuangling, etc.), magmatic hydrothermal tungsten-copper ore (Dahutang, Zhuxi), gold deposit (Dexing Jinshan), lead-zinc mine (Taolin), iron ore (Xinyu iron) Mountain), skarn type copper deposit (Tian Paishan), tungsten mine (Xianglushan), iron ore (Yangjiaqiao).

Mineralization and deposit formation existed in different stages of tectonic movements in the region. The Indosinian and Yanshan periods are the peak period of mineralization in this area, which are concentrated in the 180-100 Ma area, and belong to the Middle Jurassic-Early Cretaceous. Yanshan period mineralization is mainly composed of copper, gold, lead, zinc, silver, antimony, tin and other minerals, mainly to form deposits related to small rock masses, and shows that copper, gold and silver, lead and zinc, tungsten and tin are mixed or mixed. The mineralization characteristics of the dyeing are mainly related to the role of the medium-acid rock-acidic magma, and the deep-sourced same-type porphyry mineralization.

4. Resource Potential

As an important tectonic-magmatic-metallogenic belt in China, the Jiangnan metallogenic belt has excellent geological conditions. Metal resources such as copper, tin, tungsten, uranium, gold, lead and zinc occupy an important position in eastern China, and are distributed along and in the vicinity of the belt. A series of large-super large deposits, such as Dexing Copper Mine, Yongping Copper Mine, Jinshan Gold Mine, Lengshuijing Silver-Lead-Zinc Mine, Shizhuyuan Tin Polymetallic Mine, Shuikoushan Lead-Zinc Mine, etc. More than 800 deposits above.

The recent major prospecting progresses of tungsten, tin, copper and silver mines in this area are: the largest tungsten deposit in the world is discovered in the Dahutang tungsten-copper mine in Jiangxi, and another super-large tungsten deposit is found on the periphery of the Dexing Zhuxi copper mine. The expansion to the north of Fujian and the expansion of tungsten mineralization from the Nanling to the northern Qinhang metallogenic belt are expected to change the development pattern of tungsten resources in China. In addition, significant progress has been made in the Yinan Yinshan silver metal mine, the Xitian tin polymetallic mine, the Jiurui Xiangutai copper mine, the Chengmenshan and the Wushan copper mine, which shows superior prospecting potential.

The prediction results of the national mineral resources potential evaluation show that the copper, gold, tungsten, silver, lithium, phosphorus and uranium mineral resources in this area have great potential, and the predicted resources are 14 million tons of copper, 500 tons of gold, 4.3 million tons of tungsten, and 8.5 million tons of lead and zinc. Tons, with great prospecting prospects.

5. conclusion

According to the national mineral resources potential evaluation and prediction results combined with the progress of mineral exploration in recent years, the ore prospecting in the area should be dominated by copper, gold, tungsten, silver, lithium, phosphorus and uranium. The prospecting target is Neoproterozoic basic-ultrabasic rock iron ore, marine volcanic-sedimentary copper deposit, Yanshanian

porphyry copper-molybdenum and tungsten-molybdenum ore, magmatic hydrothermal tungsten-copper-copper, lead-zinc and skarn copper. There are 13 key exploration areas in the metallogenic belt, as shown in Table 1.

Table 1 List of main features of key exploration areas in Jiangnan metallogenic belt

No.	Survey area	Minerals	Deposit type	Forecasting the amount of resources
1	Key exploration area of iron ore in Yuzhong area, Jiangxi	Fe	Sedimentary metamorphism	Expected to explore the resources of iron 600 million tons
2	Jiangxi Dongxiang-Dexing Copper and Gold Mine Key Exploration Area	Cu, Au	Porphyry	It is expected to submit 4.8 million tons of Cu and 135 tons of Au.
3	Jiangxi Xiushui Dahutang Tungsten-Copper Polymetallic Mine Key Exploration Area	W, Cu	Hydrothermal type	Expected new resources of $WO_3$900,000 tons, Cu 900,000 tons
4	Hunan Chaling Xitian Tin Polymetallic Mine Key Exploration Area	Sn	Skarn type, quartz vein type, hydrothermal type	It is expected that the newly added resources will be 300,000 tons of tungsten and Sn, 500,000 tons of Pd and Zn, and 100,000 tons of Au.
5	Xiuning County, Anhui Province - Key Investigation Area of Jindu Metal Mine in Jixian County	Au	Altered granite type	50-100 tons of Au, 200,000 tons of lead and zinc
6	Key Exploration Area of Lianyunshan Gold Mine in Pingjiang County, Hunan Province	Au, Cu	Broken altered rock type	It is expected to submit 50 tons of resources,100,000 tons of Cu
7	Key Exploration Area of Jindong Gold Mine in Pingjiang County, Hunan Province	Au	Quartz vein type, fractured altered rock type	Expected new Au resource reserves of 10 tons
8	Liuyang, Hunan - Key Exploration Area of Guanling Gold Mine in Fuling	Au	Ductile shear zone type quartz vein type, fractured altered rock type	Au 41.04 tons.
9	Key Exploration Area of Dagangshan Lithium Mine in Yichun City, Jiangxi Province	Li	Altered granite type	1.12 million tons of Li
10	Zhuxi, Fuliang County, Jiangxi Province-Key Exploration Area of Tiaoqian Tungsten Mine	W, Cu	Magma hydrothermal type	It is expected that the newly added resources will be 1 million tons of W and 500,000 tons of Cu.

11	Zhejiang Shaoxing County Yantie Mine Key Exploration Area	Fe	Skarn type	Expected new resources of 30 million tons of Fe
12	Key Exploration Area of Pingshui Gold Mine, Shaoxing County, Zhejiang Province	Au	Magma hydrothermal type	New Au 8.3 tons Pre-received resources: 150,000 tons of Cu, 5 tons of Au
13	Key Exploration Area of Lingshan Copper Mine, Longyou County, Zhejiang Province	Cu, Pd, Zn	Magma hydrothermal type	It is expected to add 30,000 tons of Cu and 183,000 tons of lead and Zn.

Acknowledgment
The research was funded by a CGS project (121201004000150012)

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