

YANG Xiaoyong, DUAN Liuan and SUN Weidong, 2014. Geological and Tectonic Constraints on the Tianjingshan Gold Deposit in the Jiangnan Block, South Anhui. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 824-826.

Geological and Tectonic Constraints on the Tianjingshan Gold Deposit in the Jiangnan Block, South Anhui

YANG Xiaoyong^{1*}, DUAN Liuan¹ and SUN Weidong²

¹ CAS Key Laboratory of Crust-Mantle Materials and Environments, University of Science and Technology of China, Hefei 230026, China

² CAS Key Laboratory of Isotope Geochronology and Geochemistry, Guangzhou Institute of Geochemistry, Guangzhou 510640, China

1 Introduction

Orogenic gold deposits are the most important type in the world, which are mainly controlled by three key factors (Sun et al., 2013): (1) abundant andesitic rocks (SiO_2 of 55–60 wt.%) at depth, which have systematically higher Au contents than other rock types; (2) a pervasive transition from greenschist facies to amphibolite facies metamorphism within a short period, which releases S^{2-} -rich fluids that may scavenge Au from host rocks; and (3) deformation and fracturing under a compressive/transpressive tectonic regime. Previous studies showed that orogenic Au deposits were usually formed approximately 50–200 million years after the formation of the corresponding juvenile crust. The crust ages of the North China and Yangtze cratons are much older than the associated deposits, which has drawn the attention of economic geologists (Goldfarb et al., 2007; Sun et al., 2013). Moreover, the whole of eastern China has been affected by the change in the direction of Pacific plate motions.

This paper focuses on the Xiaohe gold deposit in Jiangnan block, south Anhui by means of geological survey, element analysis and statistical research on geochemical database of sedimentary rocks, magmatic rocks and gold deposits around the deposit. The systematic statistics on both Xiaohe and Jinshan gold deposits nearby on major and trace elements has been made for discussing relationship between gold formation and geologic strata, magma rock and regional structure. We established engineering in this deposit and obtained good ore bodies in the Xiaohe gold deposit which proves that this region is good for prospecting large-scale gold deposit in south Anhui.

2 Regional Geological Background

From the tectonic perspective, other locations favourable for orogenic Au deposits in eastern China are the south and north margins of the Jiangnan block. The Cathaysia block was subducting underneath the Jiangnan block along the Jiangshao faults in the south margin of the Jiangnan block during the period of approximately 1000–900 million years and collided with the Yangtze blocks (Zhou et al. 1990; Chen and Jahn, 1998; Ye et al. 2007).

Due to orogeny in the Jiangnan block, tectonic activities and regional magmatic activities period were very strong, causing fine-grained porphyritic granitic diorite, granitic porphyrite, middle fine-grained porphyritic monzonitic granite along the Jiangnan block. This area has undergone multiphase structure, magmatic rocks and ore-forming activity, which is an important nonferrous and precious metal metallogenic belt in China.

Constructed mainly by Jiangxi, Zhejiang and Anhui fault zone (the part is called the Jiangwan - block fault zone), this block controls Qiantang block of the Yangtze craton, which was the collision of a dynamic metamorphic belt, consisting of a series of NW-trending reverse faults, shear zone, extrusion fracture zone, closely spaced fissure zone and the low order to NW fracture and SN and nearly EW to conjugate shear fracture, which has the characteristics of strong ductile shear zone (Fig.1).

3 Characteristics of Au Mineralization

Previous studies showed that orogenic Au deposits are usually formed in compressive/transpressive tectonic environments and are closely related to compression, fracture, and ductile shear zones. Some scholars suggested that orogenic Au deposits are usually formed within a

* Corresponding author. E-mail: xyyang555@163.com

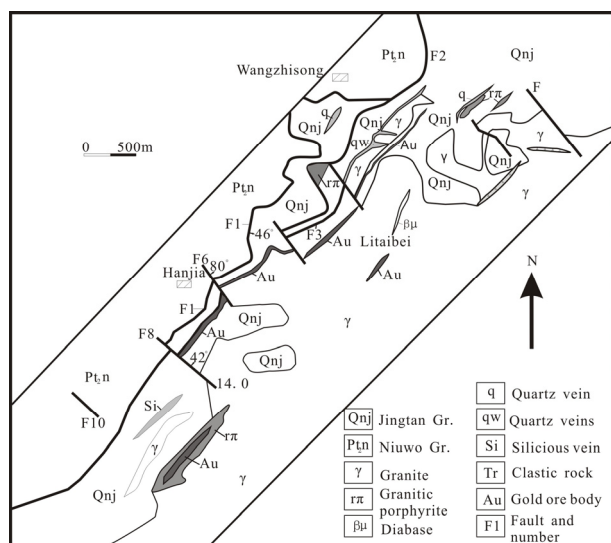


Fig. 1. Geological sketch map of the Tianjingshan Au deposit [modified after Duan *et al.* (2011)].

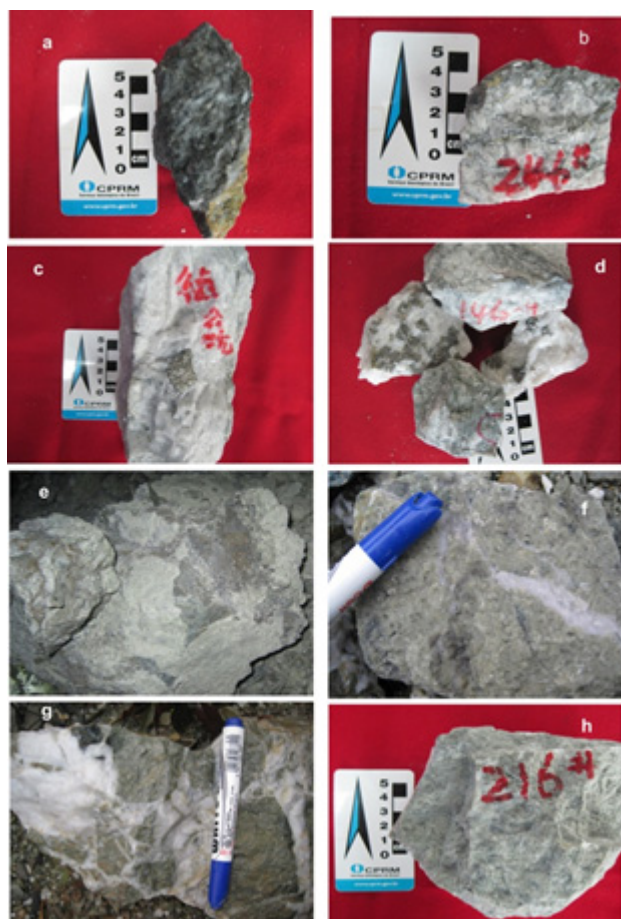


Fig. 2. Gold ores in the Tianjingshan region, Jiangnan block (after Duan *et al.*, 2011).

a: Au-bearing quartz breccia; b: poly-metallic metal veins; c: pyrite quartz vein; d: Au vein; e: pyritization in altered granite porphyry; f: beresitization in granitic cataclasite; g: breccia in granitic alteration rock and Au-veins; h: propylitization in granite porphyry.

short period of time after faulting, called ‘golden after shocks’ (Cox and Ruming, 2004). In the Cretaceous, the South China block was more severely affected by the Pacific plate than the North Chinablock (Sun *et al.* 2007); therefore, it very likely formed orogenic Au deposits when the drifting direction of the Pacific plate changed at approximately 122–125 million years. Favourable regions of Au deposition included the orogenic belts along the south and north margins of the North China craton and the Jiangnan block. The best future exploration targets would be accessory faults and kink points of the large NE-trending Cretaceous faults that cut across greenschist facies metamorphic rocks.

Quartz vein type gold ore is mainly composed of quartz (> 93%), sulphur (3-5%) and natural gold, belongs to the less sulfide ore. Metal minerals are mainly pyrite, sometimes containing a small amount of chalcopyrite, galena, sphalerite, natural gold, and the gangue minerals are mainly quartz, sericite, carbonate rock and barite, etc. Ore it form granular structure, fracture structure, since the form - half euhedral crystal structure, the structure of the package structure, metasomatism and metasomatic illusion, ore structure are mainly block structure, dyeing, fine vein and vein structure and brecciated structure.

At present, the Jinshan Au deposit (with proven Au reserves of over 200 tons) and other small Au deposits (e.g., Tianjingshan Au deposit in South Anhui Province, Fig.2) in this region have great potential for future exploration (Duan *et al.*, 2011).

4 Conclusion

1) Orogenic Au deposits in Jiangnan block are mainly controlled by ore-forming fluids are mainly released during prograde metamorphism from greenschist to amphibolite facies, during which the ductile shearing occurred widely, caused great number of fractures under compressive/transpressive tectonic regime.

2) The Tianjingshan region has a great potentiality for favourable forming a large gold deposit, having good condition to Au exploration in the Jiangnan block.

Acknowledgements

This study was supported by the Natural Science Foundation of China (Grant Nos. 41173057 and 41090372) and Project of Geological Science and Technology of Anhui Province (2011-K-8).

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