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Mineralization Process of Huangjinping Gold Deposits

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1 Geological Background

Being located in the north of Kangdian Axis north-south trending structural zone, Dadu river gold mineralization belt occupies a special position which is a junction of tectonic zones including northwestern trending of Xianshuihe, northeastern trending of Longmen Mountains and north-south trending of Panxi. After experiencing basement formation during the Pre-Sinian, formation of passive continental margin during the Sinian-Middle Triassic epoch, collision orogeny during the late Triassic epoch-Cretaceous and intracontinental orogeny during the Cenozoic, it is easy for Dadu river mineralization belt to produce gold deposits which lie in both basement and cap rock. Meanwhile, gold ore is located in the basement in Huangjinping gold deposits.

2 Geochemistry Characteristics of REE

The host rock of Huangjinping gold deposits is the intermediate-basic metamorphic rock which experienced migmatization in Kangding complex. The structure to control ores is brittle-ductile shear fracture zone at the mine. When the ore solution pass it, auriferous mineralization belt and gold ore formed by filling metasomatism. Dykes develop well in mine such as amphibolite, metamorphic diabase and felsic dykes.

To figure out the mineralization process of Huangjinping gold deposits, trace elements of some samples have been tested which including pure quartz, pure pyrite, granitic mass, doleritic vein and quartz-diorite dike. Standardized by chondrite, some characteristics on pure quartz in ore-bearing quartz veins can be listed as follows. The content of total REE is 0.207 ppm (Fig. 1). The La/Yb ratio varies in the range of 2.30-4.70 ppm, displaying the approximate numeric range with quartz from mantle-derived hypogene deposits. The pattern, with high LREE and low HREE by chondrite-normalized, is similar with

the REE pattern of ultrabasic rocks, while the REE pattern of crust is quite different. In conclusion, ore-forming materials come from hypogene mantle.

The chondrite-normalized REE patterns of whole rocks are generally similar, but different from quartzes' and pyrites' relating to mineralization closely (Fig. 2). The fact exhibits that doleritic veins and quartz-diorite dikes intruding into granitic mass of Kangding complex may not provide the metallogenic substance. Diabase dykes are formed by the condensation of basic basaltic magma coming from the mantle and the deep crust which intrude into shallow crust through the magma conduit and crystallization. However, under a compressional stress, it is so difficult that mafic magma from the deep crust or mantle condense and crystallize and form diabase dykes after intruding upward into the shallow crust. Therefore, the formation process of Huangjinping gold deposits indicates a sort of extensional stresses in region offering channels for both mafic magma's rising and emplacement and hydrothermal fluid's activity after mafic magmatism as well.

General characteristics of the whole disseminated auriferous pyrites present a LREE enriched pattern and low contents of HREE (Fig. 3). The comparability of La/Sm and Gd/Sm having been chondrite-normalized exhibits the similar fractionation feature between LREE and HREE. Most pyrite samples exhibit weak negative Eu anomalies and others exhibit weak positive Eu anomalies. Meanwhile, all the samples present no abnormalities of Ce. One phenomenon should be noteworthy that all the pure pyrite samples have different levels of Nd anomalies. Excluding the possibility of Nd having been contaminated, one explanation may work. In the process of evolution of the mantle, it occurs an obvious differentiation to Sm/Nd. Generally believed that element content changes of mantle material composed mainly of silicate is equal to the changes of chondrite after the earth's core-mantle differentiation, but modern rocks and mantle materials present obvious ^{142}Nd positive anomalies with chondrite-normalized. Because of the short period of ^{146}Sm decay

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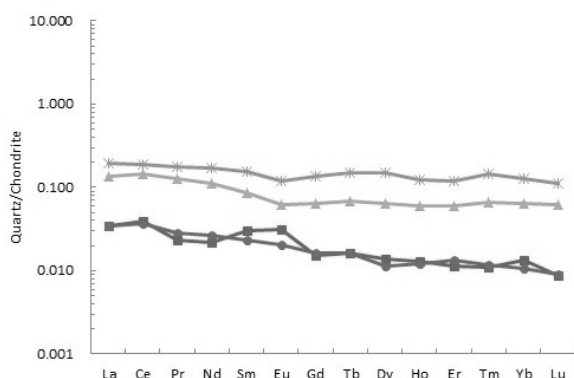


Fig. 1. Chondrite-normalized REE pattern of quartz

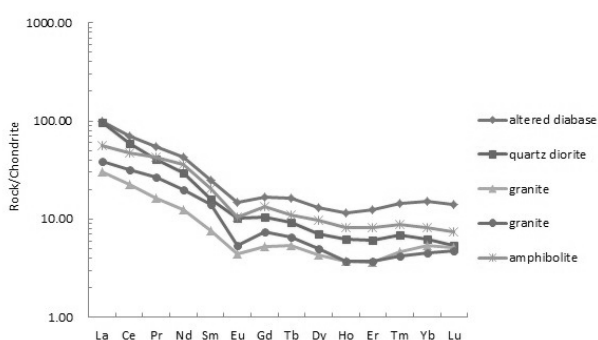


Fig. 2. Chondrite-normalized REE pattern of rock

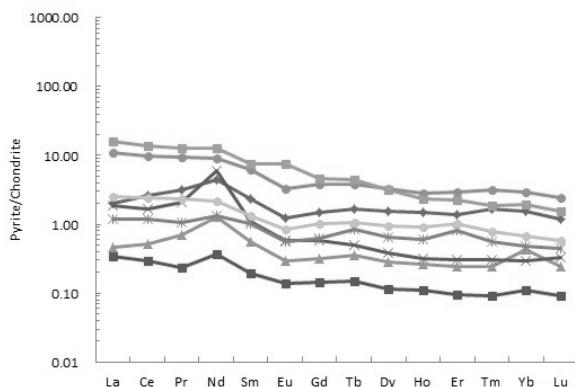


Fig. 3. Chondrite-normalized REE pattern of pyrite

almost completely, 400-500 Ma since the earth having been formed, mantle differentiation happens in large areas and results in depleted mantle with high Sm/Nd ratio and enriched mantle with low Sm/Nd ratio when the earth have been formed about 4.56-4.0 Ga. So origin of pyrites is related to enriched mantle.

3 Geologic Phenomenon and Mineralization Process

From the objective geological phenomenon of the mining trenches of Huangjinping gold deposits, the mineralization process can be summarized simply. Under compressive stresses, the granite pluton experiences shearing slide and forms stable fracture surfaces. Whereafter, early formed compression shear fracture surfaces within the granite pluton are pulled separated by the terminal tensile stresses. Under the force of regional tensile stresses, mafic magma intrude upward into the shallow crust and form diabase dykes along the shear fracture surfaces. Late period of mafic magmatism, despite the lack of power to driving basic magma rising emplacement, deep basic magma chamber which is not yet completely condensing releases heat to drive large-scale auriferous siliceous hydrothermal fluids to migrate along the channels where the basic magma has intruded once. When the auriferous siliceous hydrothermal fluids move to fracture surfaces within granite masses, auriferous quartz veins are formed which dislocate and include early diabase dykes produced before. Finally, another period of relatively pure siliceous hydrothermal fluids intruding upward lead to the formation of milky pure quartz across the gold-bearing quartz veins.

Acknowledgements

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References

- Chen Jun and Wang Henian. 1997. Water-rock interaction involved in ore-forming process traced by rare earth elements distribution. *Journal of Nanjing University (Natural Science)*, 33 (Geofluid issue): 28-35.
- Chen Zhiliang, Liu Yuping, Wei Shaoqing, Li Jianzhong and Tang Wenqing. 1997. Study on ore-field structures of main gold mining areas along Dadu river, Kangding, Sichuan, China. Beijing: Geological Publishing House.
- Li Xiaofeng, Mao Jingwen, Zhu Heping and Wang Ruiting. 2005. Characteristics of rare earth elements in fluids inclusions of the Heijintaizi gold deposit, Dadu river areas, Sichuan Province. *Acta Petrologica Et Mineralogica*, 24(4): 311-318.
- Mao Jingwen, Hua Renmin and Li Xiaobo. 1999. A preliminary study if large-scale metallogensis and large clusters of mineral deposits. *Mineral Deposits*, 18(4): 291-299.
- Pi Qiaohui, Chen Yuelong, Li Yongquan and Liu Xuemin. 2010. The source of old terrestrial rocks: evidence from ^{146}Sm - ^{142}Nd isotopes of Archean rocks. *Geology in China*, 37(1): 88-93.