WANG Liang, WANG Genhou, LEI Shibin, CHANG Chunjiao and JIA Liqiong, 2014. Re-Os Dating of Molybdenites from Houshihua Gold Deposit in Wuchuan County, Inner Mongolia, and Its Geological Significance. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 889-890.

Re-Os Dating of Molybdenites from Houshihua Gold Deposit in Wuchuan County, Inner Mongolia, and Its Geological Significance

WANG Liang[1,2], WANG Genhou[1], LEI Shibin[2], CHANG Chunjiao[2] and JIA Liqiong[1]

1 School of Earth Sciences and Resources, China University of Geosciences, Beijing 100083, China
2 Gold Geology Institute of Chinese Armed Police Force, Langfang 065000, Hebei, China

The Houshihua gold deposit is located in Halaheshao Village, 38km southwest of Wuchuan County, Inner Mongolia. Its mineralization age is still a quite controversial subject, which directly restricts the understanding of metallogenic mechanism and regularity. In this paper, we present the results of Re-Os isotopic age of molybdenites sampled from auriferous quartz vein within the Houshihua gold deposit in an attempt to constrain the timing of the mineralization, the tectonic setting in which the deposit was formed and also to provide more evidence for multi-stage Au-Mo mineralization in the northern margin of the North China Craton.

1 Deposit Geology

The Houshihua gold deposit lies in the middle segment of the northern margin of the North China Craton. In the research area, the exposed stratum is the lower Proterozoic Wulashan Group consisting of the high-grade metamorphic rocks in amphibolite-granulite facies. The entire mining area is located in the north limb of Daqingshan anticlinorium. The NE-striking F4 fault is the main ore-controlling structure along which several large ore veins occur. The largest intrusion, which is gneissic plagioclase granite, is exposed in the southeast as a part of the Liudingzhangfang intrusion.

More than 30 auriferous quartz veins, 270-1200m in length and 0.7-100m in width, have been discovered in the mining area so far. The ore veins pitch to NE generally, and most of them occur as veins, pods and lens. The ores can be divided into the quartz-type and altered rock-type. Pyrite and molybdenite are the dominant metal minerals and are accompanied by chalcopyrite, sphalerite and galena. Minor accounts of the metal minerals chalcocite, arsenopyrite, altaite, tetradymite and melonite also occur. Quartz is the dominant gangue mineral, with subordinate sericite, chlorite, potassium feldspar and calcite. Ore textures mainly include euhedral and hypidiomorphic-granular texture, metasomatic relict texture, poikilitic texture and crushed texture. Ores have massive structure, sparse disseminated structure, veinlet-disseminated structure, brecciated structure and honeycombed structure. Alteration around the ore veins consists mainly of K feldspathization and silicification as well as sericitization, epidotization, chloritization and carbonatization. The ore-forming process can be divided into four important mineralization stages, including pyrite-potassium feldspar-quartz stage, pyrite-molybdenite-quartz stage, quartz-polymetallic sulfide stage and pyrite-quartz-carbonate stage.

2 Samples and Analytical Results

The five molybdenite samples in this study are collected from the III ore vein. The molybdenites are associated with the gold-bearing pyrites occurring in the fissures of the gold ore veins, belonging to the pyrite-molybdenite-quartz mineralization stage. Therefore, the Re-Os age of molybdenites can indicate the age of Mo mineralization as well as Au. Five molybdenite samples yield the Re-Os isotopic model ages ranging from 280.3±3.8 to 283.0±3.9Ma, with a weighted average age of 282.0±1.8Ma（MSWD=0.28）,and an isochron age of 281.9±1.8Ma（MSWD=0.57）. Initial ^{187}Os of the samples calculated by the intercept on the ^{187}Os axis is nearly zero with uncertainty, indicating that the model age measured with the contents of ^{187}Re and ^{187}Os in molybdenite is reliable(Stein et al.,1997). The weighted average age is in excellent agreement with the isochron age, which indicates that Mo and Au mineralization in the Houshihua deposit took place in the early Permian.

3 Implications for Geodynamic Setting and Ore Prospecting

In recent years, lots of late Carboniferous-early Permian

* Corresponding author. E-mail: liang-wang@sohu.com

I-type granites have been identified in the northern margin of the North China Craton. Their geochemical characteristics are similar to the arc magmatic rocks in the subduction setting, which implies that, in late Carboniferous-early Permian, the northern margin of North China Craton was affected by the southward subduction of the Paleo-Asian Ocean and was an Andean active continental margin. The age consistency of the Houshihua gold mineralization and the continental-arc magmatic events in the northern margin of the North China Craton reveals that the Au-Mo mineralization in the Houshihua gold deposit is the important product of the continental-arc tectonic-hydrothermal event in subduction setting.

Recently, a lot of Au-Mo deposits related to Indosinian magmatic rocks, occurring in the post-collisional extension environment after the collision between the North China Craton and Siberian plate, have been discovered in the middle segment of the northern margin of the North China Craton, such as Xishadegai Mo deposit, Jinchangyu Au deposit，Hadamengou Au deposit and Dasuji Mo. With these discoveries, Indosinian tectonic-magmaitc event and Au-Mo mineralization get more and more attention. For quite a long time, however, there has been no significant progress on prospecting and evaluating the metallogenic event formed in the Paleo-Asian Ocean subduction setting, even which is also favorable for ore-forming process. There are few reports of related hydrothermal mineralization except for the Houshihua quartz-vein Au deposit and the Bilihe porphyry Au deposit(Re-Os：272.7±1.6 Ma; Qing et.al,2011), although many late Carboniferous-early Permian continental-arc magmatic activities have been identified in the northern margin of the North China Craton.

The reason for this is that the deposits have been eroded, rather than no deposit forming during that period because of long-term uplift process. The Inner Mongolia uplift is not a long-term developed paleo uplift. The intensive uplift and erosional process only occurred from late Paleozoic to early Mesozoic, responding to the Paleo-Asian subducted beneath the North China Craton and collided with it along the northern margin(Zhang et.al,2007). It's probably because of intensive erosion that most of epithermal deposits in continental arc setting had been eroded. The Bilihe porphyry Au deposit is preserved due to the gentle uplift of early Paleozoic accretion zone in the northern margin of North China Craton.

The dating results of the Houshihua gold deposit confirm the existence of late Hercynian metallogenetic event related to the subduction of Paleo-Asian Ocean in the northern margin of the North China Craton, which can also guide prospecting for late Hercynian Au-Mo polymetallic deposits in the northern margin of the North China Craton and surrounding areas. In the continental-arc area of the middle segment of the northern margin of the North China Craton, the key prospecting area for Au and Mo deposits is the area where the brittle fracture belt overlaps with the ductile shear zone. In addition to prospecting for porphyry deposit in the early Paleozoic accretion zone in the northern margin of North China Craton, it is also important to consider the quartz-vein deposit in the deep around the porphyry deposit.

References

Qing Min, Ge Liangsheng, Tang Mingguo, Qu Wenjun, Yuan Shisong and Zhao Yusuo, 2011. Molybdnite Re-Os isotope age of Bilihe large-size porphyry gold deposit in Sunid Right Banner of Inner Mongolia and its geological significance. *Mineral Deposits*, 30(1): 11–20 (in Chinese with English abstract).

Steiger, R.H., and Jäger, E., 1977. Subcommission on geochronology:convention on the use of decay constants in geo- and cosmo-chronology. *Earth and Planetary Science Letters*, 36: 359–362.

Zhang Shuanhong, Zhao Yue, Liu Jian, Hu Jianmin, Chen Zhengle, Li Sen, Pei Junling, Chen Zhenyu and Zhou Jianxiong, 2007. Emaplacement depths of the Late Paleozoic-Mesozoic granitoid intrusions from the northern North China Block and their tectonic implications. *Acta Petrologica Sinica*, 23(3): 625–638 (in Chinese with English abstract) .