

WANG Sai, YE HuiShou, YANG YongQiang, YANG ChenYing and LV XingQiu, 2014. Molybdenite Re-Os Isochron Age of the Huoshenmiao Mo Deposit in Luanchuan Henan Province and Its Geological Implications. *Acta Geologica Sinica* (English Edition), 88 (supp. 2): 621-622.

## Molybdenite Re-Os Isochron Age of the Huoshenmiao Mo Deposit in Luanchuan Henan Province and Its Geological Implications

WANG Sai<sup>1</sup>, YE HuiShou<sup>2</sup>, YANG YongQiang<sup>1</sup>, YANG ChenYing<sup>1</sup> and LV XingQiu<sup>1,2</sup>

<sup>1</sup> China University of Geosciences, Beijing 100083, China

<sup>2</sup> MLR Key Laboratory of Metallogeny and Mineral Assessment, Institute of Mineral Resources, Chinese Academy of Geological Sciences, Beijing 100037, China

### 1 Introduction

The Luanchuan ore district located in the southern margin of the North China Craton is one of the most important polymetallic ore district of China, many porphyry-skarn molybdenum deposits, skarn polymetallic pyrite deposits and hydrothermal silver-lead-zinc vein deposits have been discovered. In recent years, with the Geological Survey Work, the Huoshenmiao skarn molybdenum deposit was discovered in the west of the ore district showing that it has a huge potential for prospecting. However the degree of study of Huoshenmiao molybdenum deposit is very low, the previous studies mainly focused on deposit geology and the Huoshenmiao intrusion (Xu *et al.*, 1989; He *et al.*, 2013), and some problems are still lack of research including the mineralization age and the relationships with Nannihu-Sandaozhuang and Shangfanggou molybdenum deposits. In this paper, based on the deposit geology, six molybdenite samples were selected for precise Re-Os dating, aims to determine the mineralization age and clarify the relationships with Nannihu-Sandaozhuang and Shangfanggou molybdenum deposits, providing the theoretical basis for searching for mineral resources in the west of the ore district.

### 2 Deposit Geology

The Huoshenmiao molybdenum deposit is located in the west of the Luanchuan fold belt and north of the Shijiagou-Huoshenmiao anticline. It is covered by Mesoproterozoic Luanchuan Formation clastic, carbonate and alkaline volcanic rocks. The main structure in the deposit is fault, including 7 major faults, which can be

divided into 2 groups (NNW and NE) based on their strike, and the F<sub>3</sub> fault host the southern boundary of the ore body. The Huoshenmiao intrusion located in the west of the deposit mainly consists of tonalite and granite porphyry, which invaded into Sanchuan marble, is closely related to molybdenite mineralization. Geochemical studies show that it characterized of high K and alkaline, belong to weak peraluminous I-type granite (Xu *et al.*, 1989).

The molybdenum body is hosted by the skarn which is located in southeast of the contact zone of the Huoshenmiao intrusion and Sanchuan marble. It is lenticular in shape, 500 meters long and 50~150 meters thick. The main ore-forming types include disseminated, lumpy, veinlet-stockwork and film-like molybdenite mineralization, and the major alteration types of wall rock comprise skarnization, potassic alteration, silification, sericitization, pyritization, phyllitic alteration, epidotization, chloritization and carbonation.

### 3 Molybdenite Samples Tested

The Re-Os isotope analyses were performed in the Re-Os Laboratory, National Research Center of Geoanalysis, the Chinese Academy of Geological Sciences in Beijing, using the Thermo Electron TJA X-series ICP-MS and the results are listed in Table 1. Whether the HSM-B10 defines a distinctly different mineralization age or not needs further study. Nevertheless, the five other samples give Re-Os model ages of  $146.1 \pm 2.0$  to  $148.1 \pm 2.1$  Ma and a weighted mean age of  $147.01 \pm 0.95$  Ma, MSWD=0.49. The data, processed using the Isoplot program, yield an isochron age of  $145.7 \pm 3.9$  Ma, MSWD=0.83.

\* Corresponding author. E-mail: wangainb@163.com

**Table 1 Re-Os isotope data for molybdenite from the Huoshenmiao Mo deposit**

Sample	Weight(g)	Re/(μg/g)		<sup>187</sup> Re/(μg/g)		<sup>187</sup> Os/(ng/g)		Mode age/(Ma)	
		Value	2σ	Value	2σ	Value	2σ	Value	2σ
HSM-B9	0.05041	65.40	0.94	41.10	0.59	100.7	0.8	146.9	2.7
HSM-B1	0.02012	64.95	0.48	40.82	0.30	99.49	0.81	146.1	2.0
HSM-B2	0.02084	47.89	0.39	30.10	0.25	74.35	0.61	148.1	2.1
HSM-B7	0.02028	39.00	0.31	24.51	0.20	60.03	0.48	146.8	2.1
HSM-B10	0.00388	164.5	1.4	103.4	0.9	279.5	2.8	162.0	2.5
HSM-B11	0.02118	41.15	0.36	25.86	0.22	63.52	0.54	147.2	2.2

## 4 Mineralization Age and its Significance

In this study, five molybdenite samples (except HSM-B10) have similar mode ages, the weighted mean age ( $147.01 \pm 0.95$  Ma) consistent with the isochron age ( $145.7 \pm 3.9$  Ma), and consistent with mineralization ages of other molybdenum deposits (Nannihu-Sandaozhuang ( $146.1 \pm 1.1$  Ma, Xiang *et al.*, 2012); Shangfanggou ( $144.8 \pm 2.1$  Ma, Mao *et al.*, 2005)) in Luanchuan ore district, showing that the Huoshenmiao molybdenum deposit formed in Late Jurassic.

By comparing the existing mineralization ages and diagenetic ages (Mao *et al.*, 2005; Yang *et al.*, 2012; Xiang *et al.*, 2012) considered that there were two large-scale magmatism (158 Ma and 145 Ma) in Late Jurassic in Luanchuan ore district, and the Huoshenmiao, Nannihu-Sandaozhuang and Shangfanggou molybdenum deposits were the products of the second one. Currently many porphyry-skarn molybdenum deposits (Nannihu-Sandaozhuang, Shangfanggou, Dawanggou and Majuan), skarn polymetallic pyrite deposits (Luotuoshan, Yinhegou and Yuku) and hydrothermal silver-lead-zinc vein deposits (Lengshuibegou, Yindonggou and Yangshu'ao) have been discovered exhibiting zoning outward the granites (Nannihu, Shangfanggou, Shibaogou and Majuan) in the east of the ore district, forming many metallogenic series. The Huoshenmiao molybdenum deposit is located in the west of the ore district where has similar metallogenic conditions, so there may be molybdenum deposits, polymetallic pyrite deposits and silver-lead-zinc deposits around the Huoshenmiao intrusion in the west of the ore district.

## Acknowledgments

The work was supported by the National Science Foundation of China (Grant Nos. 41272104), National crisis mines resources prospecting special research project (Grant Nos. 20089949) and the Geological Survey Project (Grant Nos. 1212011220869).

## References

- He Yaqing and Chen Fengqun, 2013. Geological characteristics and ore indicators of Huoshenmiao Mo deposit in Luanchuan County. Mining Technology, 13(3): 115-118 (in Chinese with English abstract).
- Mao Jingwen, Xie Guiqing, Zhang Zuoheng, Li Xiaofeng, Wang Yitian, Zhang Changqing and Li Yongfeng, 2005. Mesozoic large-scale metallogenesis pulses in North China and corresponding geodynamic settings. Acta Petrologica Sinica, 21(1): 169-188 (in Chinese with English abstract).
- Xiang Junfeng, Mao Jingwen, Pei Rongfu, Ye Huishou, Wang Chunyi, Tian Zhiheng and Wang Haolin, 2012. New geochronological data of granites and ores from the Nannihu-Sandaozhuang Mo(W) deposit. Geology in China, 39(2):458-473 (in Chinese with English abstract).
- Xu Zhaowen and Ren Qijiang, 1988. Characteristics of magmatic evolution of Shibaogou, Huoshenmiao and Daping granitoids in Luanchuan County, Henan province, and their relation to Mo-mineralization. Journal of Nanjing University (Earth Sciences Edition), 1:95-105 (in Chinese with English abstract).
- Yang Yang, Wang Xiaoxia, Ke Changhui and Li Jinbao, 2012. Zircon U-Pb age, geochemistry and Hf isotopic compositions of Shibaogou granitoid pluton in the Nannihu ore district, western Henan Province. Geological in China, 39(6): 1525-1542 (in Chinese with English abstract).