WANG Yaying, CAI Jianhui, YAN Guohan and YAN Zhijiao, 2014. Lithogeochemistry of the Taershan-Erfengshan Alkaline Complex and its Metallogenic Significance. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 49-50.

Lithogeochemistry of the Taershan-Erfengshan Alkaline Complex and its Metallogenic Significance

WANG Yaying[1], CAI Jianhui[1], YAN Guohan[2] and YAN Zhijiao[3]

1 *MLR Key Laboratory of Metallogeny and Mineral Assessment, Institute of Mineral Resources, Chinese Academy of Geological Sciences, Beijing 100037, China*
2 *The Key Laboratory of Orogenic Belts and Crustal Evolution, Ministry of Education, School of Earth and Space Sciences, Peking University, Beijing 100871, China*
3 *Department of Geoscience and Resources,China University of Geosciences, Beijing 100083, China*

1 Introduction

Large-scale metallic mineralization occurred in the North China Craton during the Mesozoic, which formed a great amount of important mineral deposits (Hua et al., 1999). The Mesozoic metallogenesis was closely related to the Mesozoic tectonic inversion and lithosphere thinning of the North China Craton, causing the large-scale curst-mantle interaction and a series of magmatic activities, which favored the formation of large mineral deposits (Mao et al., 2005; Zhai, 2010). Studies on the magmatic activities are therefore important for the associated mineralization.

2 Geological Setting

The Taershan-Erfengshan alkaline complex, Shanxi Province, is located in the central part of the North China Craton. It includes several tens of intrusive bodies and the total area is about 50 square kilometers. The dominant rock types are monzodiorite, syenite and quartz monzonite. SHRIMP zircon U-Pb dating yields an emplacement age of 129.0 ± 4.3 Ma for syenite, suggesting that it is a product of alkaline magmatism during the Early Cretaceous. Skarn iron deposits developed in the contact zones between monzodiorite intrusive bodies and wall rocks (the Ordovician carbonate).

3 Lithogeochemistry Characteristics

3.1 Major and trace elements geochemistry

All samples are intermediate-acid rocks with their SiO_2 ranging from 60.74 to 66.89 wt%. The rocks have high total alkalis ($K_2O + Na_2O$ = 7.06–1.70 wt%), showing that they belong to the alkaline series.

All rocks have similar rare earth patterns which are characterized by LREE enrichment, HREE depletion and weak Eu negative anomaly (average δEu = 0.96). The primitive mantle normalized trace element diagrams show that the rocks are enriched in LILE (Rb, Ba, K and Sr) and depleted in HFSE (Nb, Ta, P and Ti).

3.2 Sr-Nd-Pb isotopes geochemistry

The Sr and Nd isotopic compositions of the Taershan-Erfengshan alkaline complex are uniform. Three samples yield initial $^{87}Sr/^{86}Sr$ ratios from 0.7050 to 0.7064, and negative $\varepsilon_{Nd}(t)$ values from −22.9 to −13.0, which show similar characteristics with EMI end member, indicating that they have a deep magma source related to the Mesozoic enriched EMI lithospheric mantle of the North China Craton. Lead isotopic ratios of these rocks are also uniform ($^{206}Pb/^{204}Pb$=17.203–17.979, $^{207}Pb/^{204}Pb$=15.331–15.427, and $^{208}Pb/^{204}Pb$=37.422–38.022), showing crust-mantle mixing characteristics.

4 Petrogenesis and Metallogenic Significance

According to the Rb-(Nb+Y) discrimination diagram (figure not shown), the Taershan-Erfengshan alkaline complex are formed in an extensional tectonic setting. These rocks' formation time is coeval with the Mesozoic tectonic regime inversion occurring in the North China Craton (Zhai et al., 2004). Combined with the isotope geochemistry, the magma source of the Taershan-

* Corresponding author. E-mail: 404911550@qq.com

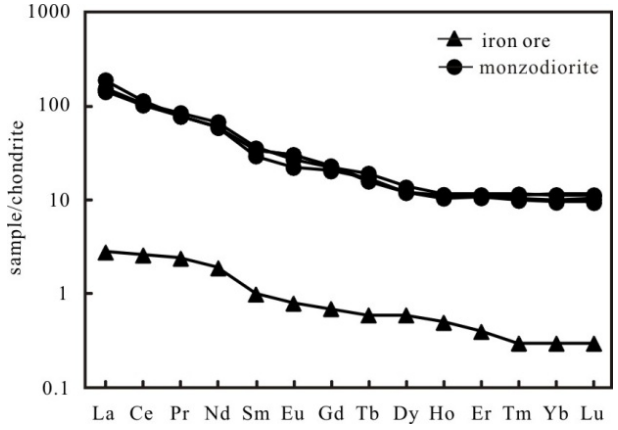

Fig. 1. Chondrite normalized REE patterns of iron ore and monzodiorite rocks in Taershan-erfengshan area.

Erfengshan alkaline complex is related to the upper mantle as well as the lower crust of the North China Craton, which suggests that it was formed by the curst-mantle interaction due to the Mesozoic tectonic regime inversion.

The lead isotopic compositions of iron ores from the nearby Skarn iron deposits and monzodiorite rocks from the Taershan-Erfengshan alkaline complex are very similar (Zeng et al., 1997), and they both display crust-mantle mixing characteristics; the REE distribution patterns (Fig. 1) in iron ores are similar to monzodiorite rocks, which are also characterized by LREE enrichment and HREE depletion, suggesting that they may have some relationship to the monzodiorite rocks in petrogenesis. In addition, the monzodiorite rocks have the highest iron content in the Taershan-Erfengshan alkaline complex (the average content of TFe_2O_3 in monzodiorite rocks is 3.26%), which is helpful for the mineralization. It can be speculated that the metallogenic material of the Skarn iron deposits in this area may come from the monzodiorite magma of the Taershan-Erfengshan alkaline complex.

Acknowledgements

Thanks Professor Zhang Jin for his reviews. This work was financially supported by the Natural Science Foundation of China (Grants 40773041, 41073047).

References

Hua, R.M., and Mao, J.W., 1999. A preliminary discussion on the Mesozoic metallogenic explosion in East China. *Mineral Deposits*, 18(4): 300–307 (in Chinese with English abstract).

Mao, J.W., Xie, G.Q., Zhang, Z.H., Li, X.F., Wang, Y.T., Zhang, C.Q., and Li, Y.F., 2005. Mesozoic large-scale metallogenic pulses in North China and corresponding geodynamic setting. *Acta Petrologica Sinica*, 21(1): 169–188(in Chinese with English abstract).

Zeng, J.N., You, D.H., and Ma, X., 1997. The Evolution of Yanshanian Magma and its Control Function to Metallic Mineralization in Taershan District, Shanxi Province. *Jour Geol & Min Res North China*, 12(1): 33–43 (in Chinese with English abstract).

Zhai, M.G., 2010. Tectonic evolution and metallogenesis of North China Craton. *Mineral Deposits*, 29(1): 24–36 (in Chinese with English abstract).

Zhai, M.G., Meng, Q.R., Liu, J.M., Hou, Q.L., Hu, S.B., Li, Z., Zhang, H.F., Liu, W., Shao, J.A., and Zhu, R.X., 2004. *Geologocal features of Mesozoic tectonic regime inversion in Eastern North China and implication for geodynamics*,11(3): 285–297 (in Chinese with English abstract).