

LI Chao, Ren Tao, HUANG Jianguo, HAN Runsheng, ZHOU Hongyang and FENG Zhihong, 2017. Geochemical Characteristics of the Tayuan Volcanic Rocks in the northern Daxinganling Metallogenic Belt. *Acta Geologica Sinica* (English Edition), 91(supp. 1): 68-69.

## Geochemical Characteristics of the Tayuan Volcanic Rocks in the Daxinganling Metallogenic Belt

LI Chao<sup>1</sup>, Ren Tao<sup>1,\*</sup>, HUANG Jianguo<sup>1</sup>, HAN Runsheng<sup>1</sup>, ZHOU Hongyang<sup>2</sup> and FENG Zhihong<sup>3</sup>

1 Kunming University of Science and Technology, Kunming 650093, China

2 Yunnan Chihong Zinc & Germanium Limited Liability Company, Kunming 650000, China

3 Daxinganling Yunye Mining Development Limited Liability Company, Jiagedaqi 165021, China

### 1 Introduction

Daxinganling region is one of the most important nonferrous metal metallogenetic province (Wu et al., 2011; Li et al., 2014). The northern Daxinganling was a geological blank area in China formerly (Li et al., 2017). However, the region has a huge resource potential. Forty metal deposits have been found in the area recently, with many skarn deposits. The study of geochemical characteristics of the Tayuan volcanic rocks are the window for understanding the petrogenesis and tectonic setting. Therefore, this paper first analyzes the geochemical characteristics of the Tayuan volcanic rocks, especially reports the characteristics of major and trace elements which can provides inspiration and ideas for study of petrogenesis and tectonic setting.

### 2 Geochemical characteristics of volcanic rocks

#### 2.1 Major elements characteristics

The SiO<sub>2</sub> content of all volcanic rocks changes from 53.55% to 77.46% and K<sub>2</sub>O+Na<sub>2</sub>O is from 4.3% to 9.72% (Fig. 1a). The data of major elements show that the volcanic rocks in Tayuan are classified intermediate-acidic magmatic rock. As shown in K<sub>2</sub>O+Na<sub>2</sub>O-SiO<sub>2</sub> figure, the jurassic volcanics are mainly basaltic andesite, basaltic trachy andesite, trachy dacite, dacite and rhyolite (Fig. 1a). Al<sub>2</sub>O<sub>3</sub> content of all volcanic rocks vary from 13.88% to 18.88%. And in the figure of ANK-ANCK, all of samples plot in the area of peraluminous field (Fig. 1b) and mostly fall from medium K to super high K field in K<sub>2</sub>O-SiO<sub>2</sub> figure (Fig. 1c).

#### 2.2 Trace elements characteristics

Chondrite-normalized REE patterns are plotted in Fig.2a. The Tayuan volcanic rocks contain a high total REE content with 151 to 267 ppm. They are moderately fractionated ((La/Yb)<sub>N</sub>=10.71~30.59) with light REEs (LREEs) enrichment and heavy REEs (HREEs) depletion. There is an intense fractionation in LREEs ((La/Sm)<sub>N</sub> 3.40~6.86) and a weak fractionation in HREEs ((Gd/Yb)<sub>N</sub>=1.84~2.84). These rocks display negative Eu anomalies (the δEu=0.48~0.89) and have no prominent Ce anomalies (δCe=0.94~1.01) according to the chondrite-normalized diagram (Fig.2b). As shown in the primitive mantle-normalized trace element spider diagram (Fig.2), all of the samples are enriched in large ion lithophile elements (LILE) such as Rb, Ba, K, Pb and are clearly depleted in Nb, Ta, Sm, Ti.

#### 2.3 Discussion

The shape of trace element spider diagram usually developed on the margin of the paleo-continent, and formed in a rifting period of the paleo-continent. It formed in the Proterozoic in China.

In the Y vs. Sr/Y and (La/Yb)<sub>N</sub> vs. Yb<sub>N</sub> diagram, the analysis data of volcanic rocks fall in the field of island arc volcanic rocks suggest that the paleo-Pacific Plate have subduction to Eurasia influences Mesozoic magmatic activities in the Great Xing'an Range. Due to the subduction, the continental crust became shorten and thicken gradually during Jurassic Period (Maruyama et al., 1997; Sagong et al., 2005. Zhang et al., 2010). Soon afterwards, the subduction direction was turning (Liu et al., 2013). The subduction recurvature make a conversion of tectonic regimes from the extrusion to extension in Northeast China. Subsequently it led to delamination of continental crust and

\* Corresponding author. E-mail: rtao1982@126.com

uplift of asthenosphere (Liu et al., 2013). In this process, the thinning of lithosphere and the uplift of asthenosphere led to the intense crust-mantle interaction, the underplating of mantle-derived magma and directly heating on crust of asthenosphere make materials overlying lower crust partial melting and then form Tayuan intermediate-acidic magmas.

### Acknowledgements

This study was supported by the Natural Science Foundation of China(No.41203039). Great thanks to Daxinganling Yunye Mining Development Limited Liability Company for assistance in the field.

### References

Li, C., Ren, T., Huang, J. G., Han, R. S., Yin, H. J., & Zhou, H. Y., et al. (2017). Skarn mineralogy and its geological significance for the tayuan (cu–mo)–pb–zn deposit, northern daxinganling metallogenic belt. *Acta Geochimica*, 1-13.  
 Li ZZ, Qin KZ, Li GM, Shunso Ishihara, Jin LY (2014) Formation of giant Chalukou Porphy Mo deposit in northern

great Xing'an Range, NE China: Partial melting of the juvenile lower crust in intra-plate extensional environment. *Lithos* 202-203:138-141.  
 Liu, J., Mao, J.W., Wu, G., Luo, D.F., Wang, F., Zhou, Z.H., Hu, Y.Q., 2013. Zircon U-Pb dating for the magmatic rocks in the chalukou porphyry Mo deposit in the northern great Xing'an range, China, and its geological significance. *Acta Geologica Sinica* 87(2):209-219.  
 Maruyama, S., Isozaki, Y., Kimura, G., Terabayashi, M., 1997. Paleogeographic maps of the Japanese Islands: plate tectonic synthesis from 750 Ma to the present. *The Island Arc* 6:121-142.  
 Sagong, H., Kwon, S.T., Ree, J.H., 2005. Mesozoic episodic magmatism in south Korea and its tectonic implication. *Tectonics* 10:1029-20042005;  
 Wu, F.Y., Sun, D.Y., Ge, W.C., Zhang, Y.B., Grant, M.L., Wilde SA, Jahn BM (2011) Geochronology of Phanerozoic granitoids in northeastern China. *Journal of Asian Earth Sciences* 41(1):1-30.  
 Zhang Jiheng., Gao Shan., Ge Wenchun., Wu Fuyuan., Yang Jinhui., Wilde, S.A., Yang Liming., 2010. Geochronology of Mesozoic volcanic rocks in the Great Xing'an Range, Northeastern China: Implications for subduction induced delamination. *Chemical Geology*,276:144-16.

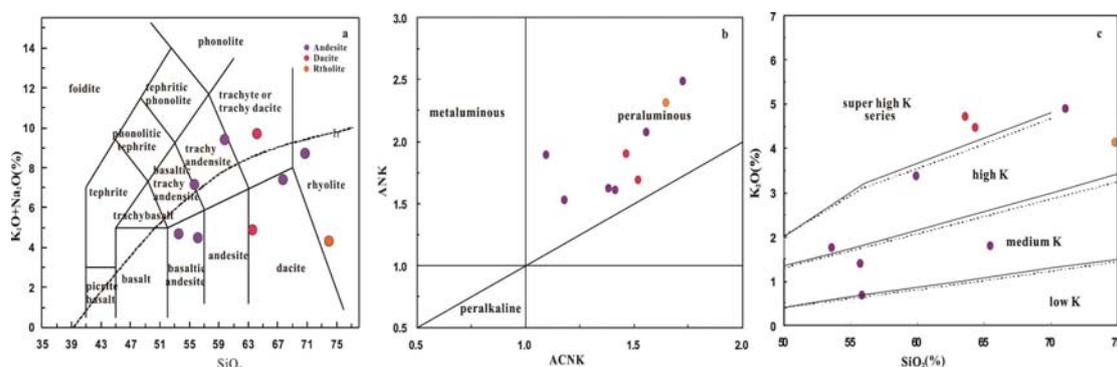


Fig. 1. (a) Tas classification of the Tayuan volcanic rocks; (b) alumina saturation of the Tayuan volcanic rocks; (c) plot of K<sub>2</sub>O vs SiO<sub>2</sub> of the Tayuan volcanic rocks.

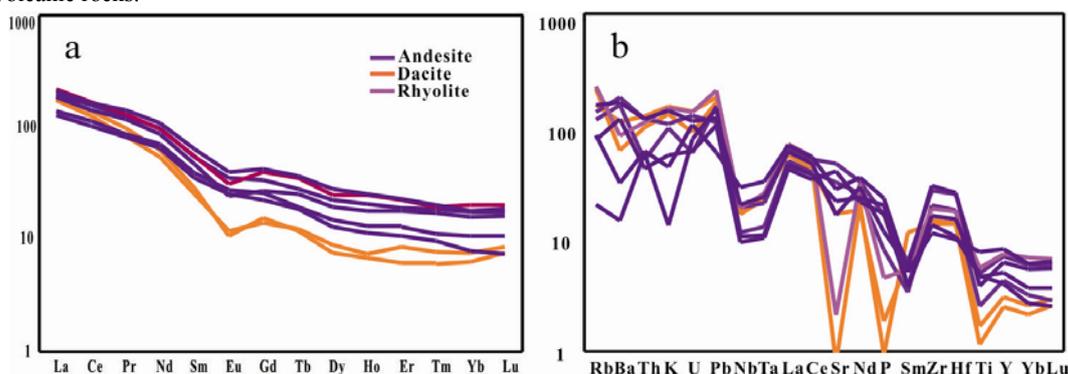


Fig.2 (a) Chondrite-normalized REE patterns (b) Primitive mantle-normalized spider diagram for the Tayuan volcanic rocks. The normalizing values of chondrite are from Boynton (1984) and the normalizing values of primitive mantle are from Sun and McDonough (1989).