CHEN Xuefeng, LIU Xijun, GUO Lin, SHI Yu, HUANG Wenlong and LIAO Shuai, 2014. The Gold Mineralization Background of Napo Permian Mafic Magmatism in Western Guangxi Province: Evidence for Emeishan Mantle Plume and Paleotethyan Subduction Interaction. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 697-699.

The Gold Mineralization Background of Napo Permian Mafic Magmatism in Western Guangxi Province: Evidence for Emeishan Mantle Plume and Paleotethyan Subduction Interaction

CHEN Xuefeng, LIU Xijun*, GUO Lin, SHI Yu, HUANG Wenlong and LIAO Shuai

Guangxi Key Laboratory of Hidden Metallic Ore Deposits Exploration，Guilin University of Technology, Guilin, 541004, China

Permian mafic rocks are well preserved in the Napo area, Western Guangxi Province, Which are composed of pillow basalts and layered sub-volcanic diabases. According to the concentration of TiO_2=2.8% and Ti/Y=500, Napo mafic rocks can be divide into high-Ti group and low-Ti group.

Rocks of the high-Ti group have lower SiO_2 (average 49.52 wt%), MgO (average 5.75 wt%), higher FeO_t (average 12.09 wt%), TiO_2 (average 3.01 wt%) and P_2O_5 (0.12~0.25 wt%) than the low-Ti group(53.23 wt%, 6.58 wt%, 10.97 wt%, 1.17 wt% and 0.04~0.08 wt% respectively). In Nb/Y-Zr/TiO_2 diagram, except for the sample NP-12-24, other high-Ti samples plot into the fields of alkaline basalt; Low-Ti group plot into the fields of sub-alkaline basalt, and the high-Ti sample NP-12-24 plot into the fields of sub-alkaline basalt between the two groups above. And in FeO_t/MgO-FeO_t diagram, all low-Ti samples plot into the fields of tholeiite.

In chrondrite-normalized REE patterns(Fig. 1a), two groups have different patterns. The high-Ti group shows LREE enrichment, patterns in a narrow distribution range. They have (La/Yb)cn ratios between 5.0~6.3 and positive Eu anomalies. The patterns distribute in the fields of the Emeishan high-Ti basalts, and sub-parallel to them. Whereas low-Ti group has (La/Yb)cn ratios between 1.2~1.7, has relatively flat chondrite-normalized REE patterns, similar to E-MORB, and exhibits positive Eu anomalies. The sample NP-12-24 has the same REE patterns as the low-Ti mafic rock, but its REE contents are more higher.

As shown in the primitive mantle-normalized spidergrams(Fig. 1b), two groups also have different patterns. The high-Ti group is enriched in LILE (Rb, Ba, Th, U, etc) and HFSE(Nb, Ta, Zr, Hf, Ti). The patterns close to OIB and sub-parallel to it, distributing in the fields of the Emeishan high-Ti basalts. Unlike the high-Ti group, the low-Ti rocks are enriched in LILE (Rb, Th, U, Sr), Pb. Ba showing positive to negative anomalies. The rocks have pronounced negative Nb, Ta anomalies, the patterns sub-parallel to the island-arc basalts and distribute

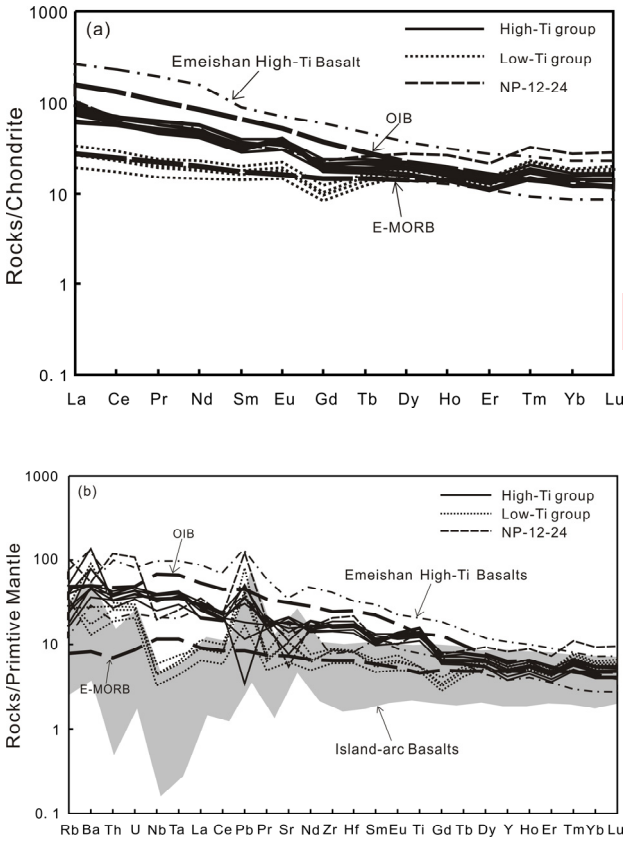

Fig. 1. Chondrite-normalized REE patterns(a) and primitive mantle-normalized trace element patterns(b) for the Permian mafic rocks in Napo.

* Corresponding author. E-mail: xijunliu@gmail.com

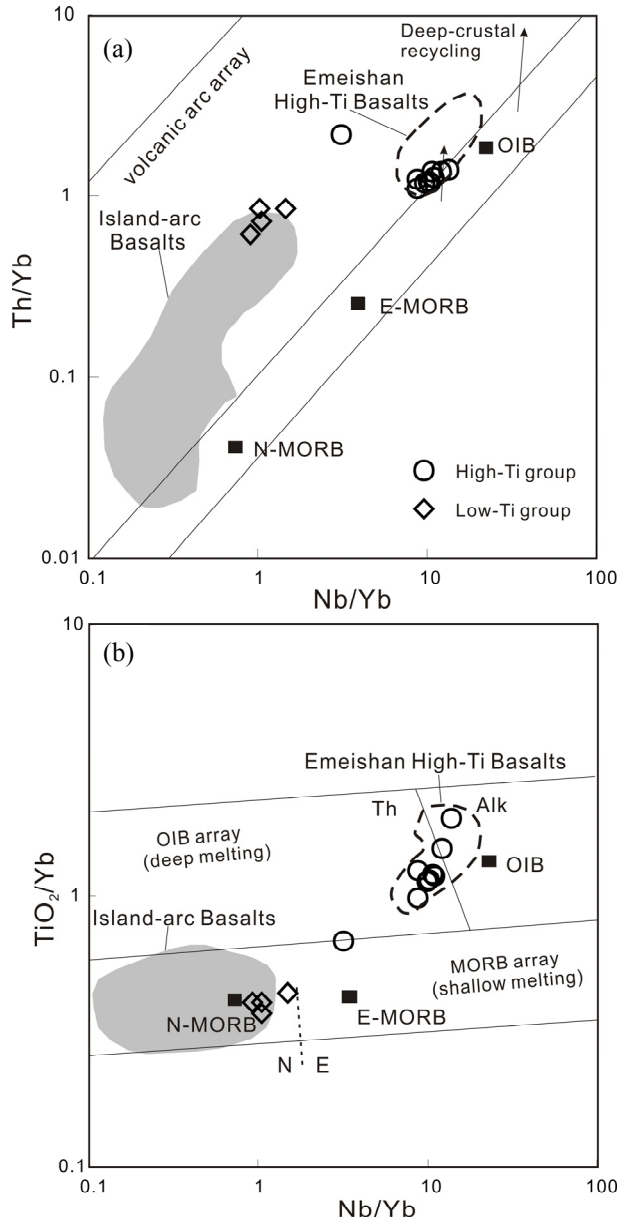

Fig. 2. Nb/Yb-Th/Yb(a) and Nb/Yb-TiO_2/Yb(b) diagrams for the Permian mafic rocks in Napo

in their fields. Similarly, the high-Ti sample NP-12-24 has the similar patterns as the low-Ti mafic rock, but more enrich. Implying they have similar evolution of magma, sample NP-12-24 likely suffered later enrichment.

The samples are fresh, they have LOI of 1.65~4.09 wt%, average 2.45%, indicating the rocks have not experience obvious alteration. The generally positive correlations between MgO and Ni, Cr, Sc/Y, CaO/Al_2O_3 indicate fractionation of Ol and Cpx. For the low-Ti rocks, positive correlations between MgO and Al_2O_3, Sr/La, and positive Eu and Sr anomalies are probably due to accumulation of Pl. As is well-known, there are low contents of Nb, Ta and high contents of Th in crust, Napo mafic rocks have positive correlations between Th and Nb, Ta, indicate crustal contamination is non-significant. Zhou et al. (2006) have reported the Funing mafic rocks that also can be divide into high-Ti group and low-Ti group. Funing low-Ti mafic rocks have high $(^{87}Sr/^{86}Sr)_i$(initial) ratios ranging from 0.710 to 0.715 and low initial εNd values ranging from -9.6 to -4.0, indicating the rocks undergone a significant degree of crustal contamination. But Napo low-Ti mafic rocks have lower $(^{87}Sr/^{86}Sr)_i$ (initial) ratios(0.706~0.708) and higher initial εNd values (-2.0~ -2.2) than Funing low-Ti group, such signatures not support the characteristics of island arc of Napo low-Ti mafic rocks are caused by crustal contamination.

In Nb/Yb-Th/Yb(Fig. 2a) and Nb/Yb-TiO_2/Yb(Fig. 2b) diagrams, high-Ti rocks plot in the Emeishan High-Ti basalts region(except for the sample NP-12-24). low-Ti group plots in the edge of island-arc basalts region and tends to Emeishan High-Ti basalts region. Furthermore, sample NP-12-24 plot between two groups, implying magma mixing of two groups.

Napo area locates in outer zone of the Emeishan LIP, and geochemical signatures of the high-Ti mafic rocks are comparable to the Emeishan high-Ti basalts. Some scholars have reported the Permian high-Ti mafic rocks near Napo area(Funing, Longlin-Xilin, Yangxu, Longchuan, Yufeng, Bama area) (Fan et al., 2008; Lai et al., 2012; Zhou et al., 2006), these rocks were identified as parts of Emeishan LIP. So we consider that the Permian high-Ti mafic rocks in Napo are products of the Emeishan mantle plume and parts of Emeishan LIP.

Western Guangxi Province is geologically a part of the South China, it nears the boundary of South China and Indochina. By studying in sedimentary rock, paleontology and paleomagnetism, former scholars considered that Western Guangxi Province was a wide ocean basin and east branch of Paleotethys(Wu, 1999). Integrating geochemical signatures of island arc and regional geological background, we consider that the Permian Low-Ti mafic rocks in Napo were derived from subduction of Paleotethys.

In conclusion, late Permian magmatism of Emeishan mantle plume and subduction of Paleotethys coexists in Napo area, and existing magma mixing of them. This study furnish new information about the tectono-magmatic evolution and gold mineralization in the late Paleozoic.

Acknowledgement

This work is supported by NSFC funds (No. 41302041),

Guangxi NSF (No. 2012GXNSFCA053007), China Postdoctoral Science Foundation Grant (2013M530440), research grants of GUT, 2013 Bagui Scholar Innovation Project of Guangxi Province (to Xu JF).

References

Fan W M, Zhang C H, Wang Y J, Guo F and Peng T P. 2008. Geochronology and geochemistry of permian basalts in western guangxi province, southwest china: Evidence for plume-lithosphere interaction. Lithos, 102(1): 218-236.

Lai S C, Qin J F, Li Y F, Li S Z and Santosh M. 2012. Permian high ti/y basalts from the eastern part of the emeishan large igneous province, southwestern china: Petrogenesis and tectonic implications. Journal of Asian Earth Sciences, 47(0): 216-230.

Wu H R. 1999. Implications of radiolarian chert for the palaeogeography of south china. Journal of Palaeogeography, 1(2): 28-35.

Zhou M F, Zhao J H and Qi L. 2006. Zircon u-pb geochronology and elemental and sr–nd isotope geochemistry of permian mafic rocks in the funing area, sw china. Contributions to Mineralogy and Petrology, 151(1): 1-19.