YUAN Yajuan, HUANG Huilin, XU Chi, LU Ye and XIA Bin, 2018. Geochemical Characteristics and Geochronology Research of Diopside Syenite and Diopside Granite of Zankangou, Taxkorgan. *Acta Geologica Sinica* (English Edition), 92(supp.2):124-125.

Geochemical Characteristics and Geochronology Research of Diopside Syenite and Diopside Granite of Zankangou, Taxkorgan

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1 Introduction

Pamir syntax is one of the strongly tectonic compression areas in Tibetan Plateau and a typical area of crustal shortening and thickening during continental collision(Burtman, 2000; Ducea et al., 2003; Robinson et al.,2004, 2007). The Taxkorgan alkalic complex is mainly distributed in the mid-east region of Pamir syntax and is the largest Cenozoic intrusive rock in the region.Therefore, the origin and time of Taxkorgan alkalic complex is particularly important for the lithosphere shortening and thickening, crust-mantle interaction as well as the uplift process of the plateau(Luo et al.,2003; Ke et al., 2006, 2008; Xu et al., 2017).Here, we present a new study of SHRIMP U-Pb and $^{40}Ar/^{39}Ar$ geochronology, whole-rock major and trace elements of the Zankangou diopside syenites in Taxkorgan area, in order to constrain the petrogenesis and source region of these rocks.

2 Results and Conclusions

Zankangou rock mass is located in the southeast of the Taxkorganarae, about 22km to Kalaqigu in the west.The Zankangou diopside syenite is light gray and equigranular texture, and mainly composed of alkali feldspar (85%–90%) and diopside (5%–8%).The accessory mineral is composed of garnet, titanite, apatite and zircon.The clinopyroxene have low TiO_2 and Al_2O_3, but high FeO_T and CaO contents (TiO_2 =0.20–0.41 wt.%, Al_2O_3 =0.85–2.17 wt.%, FeO_T =9.7–15.82 wt.%, CaO= 21.78–22.70 wt.%), and thus are classified as Quad pyroxenes and diopside (Morimoto et al., 1989).

Zankangou diopside syenites are rich in alkali (Na_2O+K_2O=11.64–13.7 wt.%) and potassium (K_2O/Na_2O=2.2–3.7)). And the large-ion lithophile elements (LILE, Rb, Ba, Th, U and Sr) and Pb are also enriched while the high field strength elements (HFSE, Nb, Ta, Zr, Hf and Ti) are deficient. Rare earth elements (REE) content ranges from 409.43 to 1121.18 ppm. These rocks have weak negative anomaly of Eu (Eu/ Eu*=0.81~0.86), and rich in LREE with $(La/Yb)_N$ ranging from 31 to 109. $^{40}Ar/^{39}Ar$ dating of K-feldspar and SHRIMP U-Pb dating of zircon indicates ages of diopside syenite are 11.58±0.76 Ma and 11.65±0.32Ma, respectively,which is consistent with the Kuzigan alkaline syenites and Karibasheng subalkaline granitoids zircons U-Pb ages from Taxkorgan area(Ke et al.,2006).

We suggest that Zankangou diopside syenite derived from the partial melting of the eclogitic thickened lower crust, for the following three reasons: 1) the samples exhibit a steep trend in the La vs. La/Sm and Th vs. Th/Hf diagram, suggesting that the effects of partial melting were more important than fractional crystallization; 2)The high Sr ratios of 1845 to 2810 ppt and no obvious negative Eu anomaly showed that there was no plagioclase in the residual phase; 3)The characteristics of high Sr/Y, low Y and Yb, negative Nb–Ta–Ti anomalies, as well as a negative P anomaly indicate that the existence of garnet, rutile and apatite as residual phase in the source regions; 4)The published Sr–Nd–Hf isotopic data of the Miocene High-K alkaline rocks in Tashkorgan region also support this viewpoint(Ke et al., 2006; Xu et al., 2017).

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Acknowledgements

The work was financially supported by the National Natural Science Foundation of China (41776056) and Natural Science Foundation of Guangdong Province (2017A030310395).

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