1 Geological Background

The Late Triassic volcanic rocks mainly distribute in Xiaobangda, Yanjing, Xilu, Jiangbo village area and extend in NNE-SSW direction constraining by the structure. TBGM recognize this set of volcanics as Xiaodingxi Group which is angular unconformity with the late Triassic Bolila Group and disconformity with early Permian Jiaoga Group. In this paper, all the samples were mainly collected from the Yanjing area in where the thickness of the rock layer is about 520m and mainly consisted of trachyandesite, sandstone and purple-red colored conglomerate. The trachyandesite has porphyritic structure with 5% pyroxene phenocrysts and 30% plagioclase phenocrysts. The matrix is composed of irregular arranged grained plagioclase which is filled with minor alkali feldspar, pyroxene, biotite and magnetite grains.

2 Geochemical Characteristics

All the samples show small compositional variation with their SiO$_2$ range from 51.36 to 58.04 wt.% and TiO$_2$ range from 0.61 to 0.97 wt.%. The MgO contents of most samples are larger than 3 wt.%, with Mg# value (38.79 ~ 49.68), implying the existence of extensive magmatic fractional crystallization. What's more, the K$_2$O/Na$_2$O ratio of these rocks range from 1.8 to 2.47. However, lead isotopic ratios of these rocks are relatively uniform, ($^{208}$Pb/$^{204}$Pb)~35.060~39.423, ($^{207}$Pb/$^{204}$Pb)~15.471~15.706, ($^{206}$Pb/$^{204}$Pb)~14.367~38.842. The Sr-Nd isotope data show similar characteristics with EMII end member, indicated that some "enriched components" may involve in their source region.

3 Petrogenesis and Tectonic Significances

There are three mechanisms which could be considered for the petrogenesis of the late Triassic ultrapotassic rocks in Changdu microcontinent: 1, the mantle-derived magmas intensely contaminated by crustal material or mixing with crustal-derived magmas during the process of rising; 2, directly formed by the partial melting of the ancient crust;
3, originated from low degree partial melting of the metasomatic lithospheric mantle.

Generally, the K-rich magma, enriched in volatile, is rarely contaminated by crustal material due to the high-speed during the process of rising. The Nb/La of these rocks is slightly low (average values 0.38) and is obviously lower than the average values of crust (Nb/ La=0.5) (Rudnick and Gao, 2003). Such low Nb/La values cannot be purely caused by the crustal contamination. The Sr-Nd-Pb isotopic data are relatively uniform and aren't shown clear linear relationship with SiO₂, which is further confirmed that the "enriched components" in source region are not caused by crustal contamination. The previous studies consider that the Mg# values of the rocks formed by the partial melting of lower crust is usually less than 40 (Atherton and Petford, 1993). In this research, the Mg# average values of the rocks is 51. On the other hand, the second-stage model age of volcanics in Changdu microcontinent is less than the relative values of lower crust, which is also proved that possibility of the magma formed by the partial melting of the ancient crust can be excluded. While, there is also no evidence to prove the existence of magma mixing. Voluminous of evidences described above shows that the late Triassic volcanics is originated from low degree partial melting of the metasomatic lithospheric mantle. This petrogenesis model is also the most appropriate interpretation to the geochemical characteristics, such as enrich in LILE and light REE, depleted in Nb, Ta and Ti and EMII type isotopic characteristics. So the aforementioned "enriched components" in source region should be associated with the ancient subduction fluids/melt.

As an important part of the Paleo-tethys, Jinshajiang started subduction to the Changdu terrane at Mid-Permian, then closed at Mid-Triassic. The regional angular unconformity between Mid-Triassic sediment and underlying formation observed in Changdu microcontinent and the collisional-type volcanic rocks from Malasongduo Group of Jiangda-Weixi volcanic belt are all the products formed during Arc-continent collision stage (Mo et al., 1993; Liu et al., 1993; Pan et al., 2004). After the "Sanjiang amalgamative terrenes" formed in Late-Triassic, the Changdu continent enters post-collisional stage (Zhong, 2001; Kou et al., 2009). In west side of Jiangda-Weixi volcanic belt, several Late-Triassic volcanic rocks which have the similar geochemical characteristics with the rocks in this research were reported that they all formed in post-collisional setting (Wang et al., 2002a, 2002b). Based on the evidence above, we consider the Late-Triassic volcanic rocks in Changdu microcontinent are originated in post-collisional extension setting, which is also proved by the plot of TiO₂/10-La-Hf=10 and Zr×3-Nb×50-Ce/P₂O₅ tectonic setting discrimination diagram (Müller et al., 1992).

In summary, the source region of the ultrapotassic rocks in Changdu microcontinent is a metasomatic lithospheric mantle which is modified by the fluids/melt during the subduction of Jinshajian oceanic basin. With the post-collisional extension setting and obvious arc-type geochemical fingerprint, these rocks are more like the lagged arc volcanic rocks proposed by Mo (2001).

Keywords: Changdu microcontinent; Late Triassic; ultrapotassic rocks; Trachyte; Paleo-Tethyan

References