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Geochemical characteristics and geological significance of picritic rocks in Permian Tiaohu Formation from Santanghu Basin, Xinjiang, NW China

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1 Introduction

Santanghu Basin is located between the Armantai and Karamaili suture zone, at the junction of the Siberia, Kazakhstan and Tarim plates (Chen and Jahn, 2004; Xiao et al., 2008). As an important part of the Central Asian Orogenic Belt, large-scale magmatic rocks of Later Carboniferous-Permian are well developed in Santanghu Basin. Thick volcanic rocks appear in Permian Tiaohu Formation of Santanghu Basin, included basalts and a small amount of picritic rocks and andesites. Picritic rocks are ultramafic lava, which usually occurs in large igneous provinces (Zhang et al., 2006). Evidences of large igneous province in Permian have found in Tarim Basin, Tianshan region, NW China, and some scholars believe the dynamic setting is related with the mantle plume (Xia et al., 2006; Zhang et al., 2010a,b). Does mantle plume also results in intensive magmatic activity of Permian in Santanghu Basin? We focus on the petrology, mineralogy and geochemistry of picritic rocks, which is found from drilling cores in the middle of Malang Depression.

2 Petrology and Mineralogy

The picritic rocks are celadon in hand specimen and exhibits massive texture with varying degrees of spheroidal weathering. Under optical microscope, the picritic rocks are holocrystalline and dominated by olivine (up to 65%), clinopyroxene (10%) and plagioclase (25%). The subhedral to anhedral clinopyroxenes and plagioclase occurring between olivine. Olivine is belong to chrysolite for Fo between 72.78 and 77.12, with a mean of 74.73. Clinopyroxene is mainly augite with restricted compositions of $Wo_{39.3-43.97}En_{45.07-47.43}Fs_{10.13-14.4}$. Plagioclase is composed of labradorite with $Ab_{35.1–52.6}An_{45.4-54.2}Or_{0.94-1.98}$.

3 Whole-rock Geochemistry

SiO_2 of picritic rocks is between 40.50-45.59 wt% (average 43.89 wt%), with MgO and K_2O+Na_2O contents ranging from 12.18-21.0 wt% (average 16.0 wt%) and 1.39-3.61 wt% (average 2.62 wt%), respectively. The picritic rocks display LREE-enriched patterns on chondrite normalized REE diagrams, and enriched in large ion lithophile elements (LILEs) of Ba, Pb and Sr, and relatively depleted high field strength elements (HFSE) of Nb, Ta and Ti on primitive mantle normalized trace element diagram, which shows characteristics of island arc basalts. The picritic rocks plotted in the within-plate field on Zr/Y-Zr diagram, combined with voluminous postcollisional granitoids and Armantai and Karamaili suture zone formation age around Santanghu basin, it should be continental intraplate setting. The picritic rocks with lower Nb/La ratios and falling into continental contamination area on Zr/Y vs.Nb/Y diagram, which suggest the magmas forming picritic rocks were contaminated by continental crust (Xia, 2014). Magmatic process of picritic rocks may be associated with a mantle plume.

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