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Geochemistry and Geochronology of Saga Alkaline Basalt in Southern Tibet

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The Yarlung Zangbo Suture Zone (YZSZ) to the west of Saga is divided into two sub-belts, namely the south sub-belt and the north sub-belt. The Saga ophiolite is mainly composed of peridotites, gabbro, diabase and lava. In this paper, we report a suite of alkaline basalt to the south of the Saga ophiolite, which extends NWW along an outcrop 1–3 km in width. This suite of basaltic lava has a vesicular/amygdaloid structure and a porphyritic texture with phenocrysts of plagioclase (15–20 modal%) and clinopyroxene (~5 modal%). The plagioclase is albitic and the clinopyroxene is titaniferous diopside ($\text{TiO}_2=1.46$ wt%). Based on the composition and TAS diagram, the lava classifies as alkaline basalt. The SiO_2 contents of the lava vary from 44.06–53.06 wt%, the Al_2O_3 contents vary from 14.68–18.44 wt%, the MgO contents vary from 4.96–7.95 wt%, and the TiO_2 contents vary from 2.62–3.47 wt%. In all, the lava shows the characteristics of low SiO_2 and high TiO_2 and Al_2O_3 , as well as enrichment in large ion lithophile elements (LILE: Rb, Ba, Th) and high field strength elements (HFSE: Zr, Hf, Nb, Ta). The rare earth element (REE) content of the basalt is higher ($\Sigma\text{REE}=266.93$ ppm), with a strong fractionation between LREE and HREE [$(\text{Ce}/\text{Yb})_N=7.30\text{--}14.18$], similar to typical OIB. This study shows that garnets exist as residual minerals in the source of Saga alkaline basalt. In

addition, the early stage of magmatism is marked by fractional crystallization of olivine, clinopyroxene and other mafic minerals. Based on incompatible element ratios and tectonic discrimination diagrams, the Saga alkaline basalts plot as oceanic intraplate. U-Pb dating of zircons by LA-ICP-MS yields a wide range of ages. The minimum average age is 54.2 ± 1.4 Ma, which can provide some important information about the evolution of the Tibetan plateau.

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