

Fractional Crystallization of High Nb/Ta Alkaline magma in Southeast (SE) China

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Petrogenesis of alkaline A-type granite is hotly debated. Here, we present a comprehensive petrological, *in situ* zircon U-Pb age, and whole rock major, trace elements and Sr-Nd-Pb isotopic data for Miaoxia pluton in western Zhejiang Province, Southeast China, with the aim of constraining the petrogenesis of alkaline A-type granite and the geodynamic processes of SE China during the late Yanshanian. Zircon U-Pb dating yields crystallization ages of 111.28 ± 0.71 Ma and 114.8 ± 1.3 Ma for the Miaoxia quartz monzonites and granite respectively, indicating their coeval formation during the late Early Cretaceous. Miaoxia pluton are metaluminous to peraluminous with intermediate-acidic signature ($\text{SiO}_2 = 59.45$ to 75.90 wt.%), and be classified to alkaline A-type granitoids. Moreover, the low $(^{87}\text{Sr}/^{86}\text{Sr})_i$ value (0.705 to 0.706) and high $\epsilon\text{Nd}(t)$ value (-2.6 to -2.0) are similar to the coeval and nearby enriched lithospheric mantle-derived mafic rocks, indicating that the Miaoxia alkaline rocks were likely derived from partial melting of the enriched mantle sources. The low Mg# and low Ti-in-Zr temperatures ($\sim 650^\circ\text{C}$) may indicated a hybridized magma sources in low pressure. Their high Nb/Ta ratios (ave. 21.88) and variable low Nb/U ratios (as low as 3.48) indicate that the metasomatically enriched mantle components were involved, which was attributed to the modification of slab-derived fluid and melt by the subduction of the paleo-Pacific Plate. We propose that this high Nb/Ta, low Mg# (<30) alkaline the magmatic intrusions may derived a hydrous alkaline basaltic melt, maybe formed by partial melting of an amphibole-phlogopite-bearing peridotite of the subduction-modified subcontinental lithospheric mantle, and experienced strongly fractional crystallization process. The parental magma was slightly contaminated by ancient crust materials during the magma ascending. The Yanshanian alkaline rocks in southeastern China are related to continental arc rifting setting by paleo-Pacific slab rollback subduction.

Key words: SE China, Yanshanian, Alkaline A-type granite; hybridized; Paleo-Pacific plate; Depress melting

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