Late Cretaceous highly fractionated I−type granites from Qiangtang block, central Tibet: Petrogenesis and tectonic implications

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The tectonic evolution of Lhasa and Qiangtang collision zone is poorly understood due to lack of pivotal magmatic records and complex geology in central Tibet. We present zircon U−Pb ages, whole-rock major and trace elements, and Sr−Nd−Pb isotopic data for the newly discovered Chuburi granites in the southern Qiangtang subterrane. Zircon U−Pb data reveal that the Chuburi granites were emplaced during the Late Cretaceous Santonian−Maastrichtian (ca. 75 Ma). Bulk-rock analyses show that this intrusion is characterized by high SiO_2, Na_2O and K_2O, but low MgO, CaO and P_2O_5. They are enriched in large-ion lithophile elements and light rare earth elements, with marked Eu anomalies, and depleted in heavy rare earth elements and high field strength elements. These geochemical features indicate that the Chuburi granite is highly fractionated I−type granite. The nine granites samples show high $(^{87}Sr/^{86}Sr)_i$ ratios (0.70644 to 0.70886), negative εNd(t) values (−1.94 to −5.59) and Nd isotopic model ages ranging from 0.76 to 0.97 Ga. The initial Pb isotopic ratios of the Chuburi granites are uniform: $(^{206}Pb/^{204}Pb)_t$ = 18.774–18.884; $(^{207}Pb/^{204}Pb)_t$ = 15.695–15.713; $(^{208}Pb/^{204}Pb)_t$ = 39.362–39.613. These geochemical features indicate that the Chuburi granites were derived through various degrees of mixing between mantle-derived components and lower crustal materials. Considering the coeval volcanic rocks in the southern Qiangtang subterrane, we contend that the Chuburi intrusion formed in post-collision environment related to the upwelling of asthenospheric mantle induced by lithospheric delamination. The petrogenesis of Chuburi granites provides evidence for the lithospheric thicking, delamination and uplifting of central Tibet duing Late Cretaceous prior to India-Asia collision.