TRANSITION OF MELTING REACTION IN TSONA LEUCOGRANITE: AN INDICATOR TO THE MOTION OF THE EAST-WEST EXTENSION IN EASTERN HIMALAYA

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Abstract

The Himalayan orogen is created by the northward continent-continent collision between India and Asia starting at about 55 Ma. It has been an ideal place to study the geologic processes related to collisional orogenesis because of its youthfulness and spectacular exposure. Widely spread leucogranites provide records of the crustal conditions, and maybe a useful proxy indicator to reveal the evolution of Himalayan-Tibetan orogen after the collision. Here we present a study of geochemistry, zircon U-Pb chronology and Hf isotopes on the Yamarong leucogranites from Tsona area, Eastern Himalaya, to explore the petrogenesis of the rocks, and to further expain related problems of continental crustal anatexis. The zircon U-Pb dating displayed two ages of magmatism, 14.4 Ma and 17 Ma respectively. Combined with the published data, the time of anatexis in Tsona had a duration of 5 Ma at least. We found that the Yamarong leucogranites have high SiO_2 (71.85% ~ 72.91%), Al_2O_3 (15.3% ~ 15.67%), but low TFe_2O_3 (0.58% ~ 0.9%), CaO (0.72% ~ 1.05%), and the A/CNK ratios range from 1.08 to 1.22. Calculation through zircon titanium thermometry demonstrates that the 17 Ma leucogranites have a higher melt temperature (690 ~ 740 ℃, mean = 721 ℃) than the 14.4 Ma samples (600 ~ 700 ℃, mean = 661 ℃). Moreover, the 17 Ma samples display higher $\varepsilon_{Hf}(t)$ values and Rb/Sr ratios, lower Ba contents compared with the 14 Ma leucogranites. The differences of zircon titanium thermometry, $\varepsilon_{Hf}(t)$ value and the covariant relation of Rb/Sr and Ba among the two stages of magmatism show that Tsona leucogranties originated from more than one melting reactions, they had experienced the change from dehydration melting to fluid fluxed melting, and the reason respond to this transformation may be the start of the E-W extension in Southern Tibet.