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Effects of Dehydration Melting on Tibetan Crustal Evolution: Evidences from Interdiscipline Studies

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Here we present (1) the results of the dehydration melting experiments on the gneiss from Higher Himalayan Crystallines (HHC) at 770 – 1028 °C and 1.0 – 1.4 GPa; and (2) the results of chemical features of migmatites and K-Ar and Ar-Ar ages of the leucosomes in HHC. On the base of these data we discuss the relationship between anatexis and formation of Himalayan leucogranites and lower crust. The experiments produce both granitic melt and the residual phase assemblage (Pl+Qz+Gat+Bio+Opx±Cpx+Ilm/Rut±Kfs) that is similar to those of granulites observed at eastern and western Himalayan syntaxises. The compositions of Type-I leucosome are identical with those of melt produced by the melting experiments but different from those of type-II leucosome which compositions are similar to High Himalayan Leucogranite (HHL). Prime partial melting occurred at 22.7-24.7 Ma based on the date of type-I leucosome. Very young age of 6.2-8.3 Ma of type-II leucosome provides a new time constraint on magma activity in Higher Himalayas. We infer that (1) the formations of the granulites and leucogranites in Himalayas are interrelated as the results of crustal Anatexis; (2) the top part of lower crust beneath southern Tibet is probably made up of garnet-bearing intermediate granulites formed during dehydration melting of metasedimentary rocks; (3) the age of about 24 Ma (the beginning of anatexis) does not support the view that anatexis was derived from MCT movement, on the contrary, but rather, the anatexis may have played an important role on the outset of MCT and STDS movement; (4) Decompression melting associated with crust uplifting contributed greatly to the increase of melt fraction and consequently formation of massive leucogranites, and then the extensive melting provides a strong positive feedback on crust extension and uplift further; (5) anatexis and magma activity, and consequently the “positive feedback” mechanism at least lasted to Pliocene Epoch in the central segment of Higher Himalayas.