

Geochemistry and U-Pb zircon geochronology of Higher Himalayan leucogranites and gneiss from Sikkim-Darjeeling Himalayas, India

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In Sikkim, the Higher Himalayan Sequences (HHS) comprise leucogranites, migmatites, and gneisses which are separated from Lesser Himalaya Sequences (LHS) by the Main Central Thrust. This study aims to understand the evolution of the Higher Himalayan Leucogranites from North Sikkim on the basis of their geochemical and geochronological characteristics. The leucogranites are mainly found intruding the high-grade metamorphic rocks of the HHS. Petrographically, two varieties of leucogranites are observed; tourmaline leucogranites (Tg) and two-mica leucogranites (2mg). The Alumina Saturation Index >1.0 and normative corundum suggest the S-type peraluminous nature of the leucogranites. Based on major and trace element geochemical results it is suggested that 2mg were sourced mostly from clay-poor sources whilst the Tg were derived from clay-rich sources. The Ti-in-zircon thermometer suggests an average temperature of zircon crystallization of < 720°C. Zircon U-Pb dating of the 2mg yields ages ranging from ~15-2462 Ma, whilst the sillimanite-bearing gneiss from Mirik, Darjeeling yields an age range from ~14.4 to 2190 Ma. We interpret the Miocene (15-19 Ma) ages from the leucogranite to indicate crystallization of the granite magma whereas pre-Tertiary ages (145-2462 Ma) record inheritance from the HHS and possibly LHS rocks.