Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.14449

Whole-rock geochemical, zircon U-Pb, Hf and O isotope constraints on the evolution of Chhota Shigri granitoids, Himachal Himalaya, India

WAIKHOM NONGDON[1], BIDYANANDA MAIBAM[1], ELENA BELOUSOVA[2,3], PANKAJ KUMAR[4], DEEKSHA KHANDELWAL[4] AND ATUL KUMAR SINGH[4]

[1]Manipur University
[2]Macquarie University
[3]Geological Survey of Queensland
[4]Inter-University Accelerator Centre (IUAC)

Presenting Author: nongdonwaikhom88@gmail.com

Pre-Himalayan granitoids are exposed in the Chhota Shigri area of Himachal Himalaya, northwest India. We present the whole-rock geochemical composition of the granitoids and zircon U-Pb, Hf and O isotopic data to understand the pre-Himalayan crustal evolution of the area and its contribution to the evolution of the western Himalayas. The studied granitoids are strongly peraluminous (A/CNK > 1.1) with crustal-derived magma source, inferred from the enrichment in LILE (Cs, Rb, K) and depletion in HFSE (Nb, Hf, Ti, Y), Ba and Sr. Trace element tectonic discrimination diagrams show syn-collisional and volcanic arc tectonic settings. Zircon U-Pb data set from this study define two major age peaks: Neoproterozoic (987 to 675 Ma), represented by the zircon cores, and Cambro-Ordovician (533 to 444 Ma), demonstrated by both the rims and individual grains. Neoproterozoic zircons have εHf values ranging between –0.78 to +9.1, with single-stage Hf modal age of 1.04–1.45 Ga, indicating the source from mixed components (recycled and juvenile). $\delta^{18}O$ values ranging from 5.75 to 9.93 (‰) also suggest the source from evolved juvenile crust with the incorporation of supracrustal materials. Cambro-Ordovician zircons show negative εHf values (–26.7 to –4.0), single-stage Hf modal age of 1.24–2.16 Ga, and $\delta^{18}O$ values of 8.05 to 11.35 (‰), indicating the source derived from voluminous remelting of older crustal components. Older Hf modal ages of the Cambro-Ordovician rims and individual grains show a different source from the Neoproterozoic cores.

The study suggests that the Chhota Shigri granitoids evolved from two major magmatic events that occurred along the northern margin of the Indian continental plate. The first magmatic cycle can be correlated with the assembly and breakup of the Rodinia supercontinent generating the juvenile Neoproterozoic crust. The second event is associated with the late Pan-African orogeny, which led to the voluminous remelting of older crustal components and Neoproterozoic crust.