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Geochemical, petrological and field evidences Unravelling the origin of Nakora Granites: Insights into A-type magmatism and crustal dynamics in Western Rajasthan, India

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The Nakora Ring Complex (NRC), dated at 732 million years, is a constituent of the Malani Igneous Suite (MIS) in Western Rajasthan, India, exhibiting a tripartite structure comprising volcanic, plutonic, and dyke phases. Geochemically, Nakora granites manifest peralkaline, metaluminous, and slightly peraluminous compositions, typifying A-type granites with discernible trends correlating with silica content. Peralkaline granites reveal elevated concentrations of SiO2, total alkalies, TiO_2, MgO, Ni, Rb, Sr, Y, Zr, Th, U, La, Ce, Nd, Eu, and Yb, juxtaposed against lower levels of Al_2O_3, total iron, Cu, and Zn compared to their metaluminous counterparts. The Al content indicates AI values ≥1 for peralkaline granites and <1 for peraluminous and metaluminous granites. Nakora peralkaline granites, positioned between 4 to 7 kb in pressure, are emplaced at greater depths (16–28 km and 480–840°C) than metaluminous granites, signifying elevated fluorine content. Primitive mantle normalized multi-element profiles indicate low La, Sr, and Eu, with relatively less minima of Ba, Nb, and Ti, pointing towards a crustal origin for Nakora magma. Classified as A-type granites, Nakora granites align with the "Within Plate Granite" field, with geochemical, field, and petrological evidence suggesting their origin through partial melting of rocks akin to the Banded Gneiss from the Kolar Schist Belt of India.