

Igneous stage of chromian spinels from albite porphyroblast-bearing greenschists in Shyok suture zone, Ladakh Himalaya,

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The Shyok suture zone in Ladakh Himalaya, NW India acts as a terrane boundary separating the Asian plate in the north from the Kohistan-Ladakh island arc to the south, and is composed of mafic-ultramafic rocks, sedimentary rocks and metamorphic rocks. The metamorphic rocks in the Shyok-Nubra river confluence are composed mainly of greenschists. The albite porphyroblast-bearing greenschist layers were observed within the widely distributed greenschist zone. They consist of amphibole, albite, epidote, quartz and phengite. Chromian (Cr²⁺) spinels occur as subhedral to euhedral grains in the albite porphyroblast-bearing greenschists. Although the rims have suffered post-magmatic alteration, we delineated the igneous domains on majority part of the grains on the basis of back scattered electron images and elemental mapping (Cr, Al, Fe, Mn and Mg).

The Cr-spinels are characterized by high Cr# (0.78-0.85), Mg# (0.54-0.66), and low TiO₂ (0.014-0.202 wt.%) and Al₂O₃ contents (6.93-10.93 wt.%). The chemical data on representative igneous stages are plotted within the field of boninites in a series of petrological discrimination diagrams, indicating their derivation from a boninitic parental magma. Al₂O₃ contents and FeO/MgO ratio of the parental melts estimated from the primary Cr-spinel chemistry also suggest a Ca-boninite source. All data cluster around an overlapped area of island arc and supra-subduction zone peridotite fields in tectonic discrimination diagrams.

Boninitic magmas were usually generated in a supra-subduction zone by hydrous mantle melting. It follows that the Cr-spinels were derived from an arc region above a supra-subduction environment. The present data including the calc-alkaline magmatism exposed in the northern suture suggests a northward dipping subduction.

Albite from the sample is dated by K-Ar method and yields an age of 104.4±5.6Ma. This age may represent early exhumation of the greenschists formed during the subduction stage. This in turn suggests that the time of generation of boninite-type magma was older than 104 Ma and the correlated subduction took place before 104.4 Ma.

Keywords: Ladakh Himalaya, Shyok suture zone, green schists, Chromian spinel, Chemistry, K-Ar age