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Geochemistry of Adakite-NEBA-ADR magmatic association: Implications on matured Island Arc from Babina-Mauranipur Greenstone Belt, Bundelkhand Craton, India

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We present field geology, petrography and geochemistry of the Adakite-Nb enriched basalt-andesite (NEBA) and Andesite-Dacite-Rhyolite (ADR) series association from Babina-Mauranipur Greenstone Belt of the Bundelkhand Craton, India, providing insights into arc maturation in the Craton.

The adakites are High Silica Adakites (SiO_2 = 71.04 -71.95 wt%) with low Sr concentration (Sr = 51.77-102.25 ppm). They are highly fractionated {$(La/Yb)_N$ = (9.67-22.23) and $(Gd/Yb)_N$ = (1.17-1.27)} and are depleted in Y and Yb. Continental signature for the adakites is evident from Na_2O/K_2O (0.69-0.90) and Ca_2O/Al_2O_3 (0.01-0.06) ratios. SiO_2 vs Mg# and MgO diagrams [1,2] indicate that the adakites are derived from partial melting of a thickened lower crust. Low MgO (< .5 wt%), Mg # (13-16), Ni (4.1-5.3 ppm) and Cr (13.4-65.4 ppm) point to its formation from a basaltic source with little to no interaction with a peridotitic mantle wedge.

The NEBAs have Nb of (11.77-13.25) ppm, variable Mg# (38.64-60.63), Ni and Cr concentrations (Ni = 16.28-42.70 ppm, Cr = 16.54-123.98 ppm) which is pointing to its formation from an evolved source. They have an enriched REE pattern {$(La/Yb)_N$ =16.22-21.33} and $(Gd/Yb)_N$ ranges between 1.72 and 2.28, which is less than that of Ocean Island Basalts {OIB, $(Gd/Yb)_N$ = 3}, thus negating the influence of OIB in its generation. Based on close field proximity and geochemical coherence with the adakites, the NEBAs are likely formed by partial melting of adakites, which have been metasomatized by slab-derived fluids.

The ADR series has significantly fractionated REE {$(La/Yb)_N$ =13.19-22.99, $(Gd/Yb)_N$ =1.33-2.33} and has low MgO (0.31-2.58 wt%), Mg# (14.09-37.38), Ni (0.82-65.94 ppm) and Cr (1.99-57.90 ppm). The rhyolites/dacites fall in the category of FI rhyolite [3] and reflect an active continental margin environment.

Field setting, high K-calc-alkaline to shoshonitic signatures, evidence of crustal thickening and overall geochemistry of the rock association indicate that the island arc complex has progressed into a mature system and has migrated towards a continental margin environment.

[1] Wang et al. (2004), *Precambrian Research* 131, 323–343

[2] Hart et al. (2004), *Economic Geology* 99,1003–1013

[3] Karsli et al. (2011), *Lithos* 127, 354–372.