

# Petrological and Geochemical characterization of Archean-basement litho units from the koyna-warna region, Western India

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## Abstract

Samples from deep boreholes of the Koya-Warna seismic zone, located in the southwestern part of the Deccan Volcanic Province (DVP), offer a unique opportunity to study the Archean basement rocks. These basement rocks are situated beneath the thick magma pile of DVP with a thickness ranging from 1 to 2 kilometers. We present petrographic and geochemical insights into the basement rocks, utilizing drill core samples from KBH-4A in Nayari and KBH-7 in Panchgani. Samples from both drill-core sites consist of Tonalite, granodiorite, qtz-rich granitoid, monzo- granite and amphibolites. The petrographic analysis from both sections indicates the presence of quartz, plagioclase, and K-feldspar as major mineral phases. Minor amounts of chlorite, biotite, muscovite, hornblende, magnetite, and zircon were additionally observed. Perthitic and myrmekitic igneous textures are commonly observed within these sections. Additionally, K-feldspar grains exhibit deformation and growth along the boundaries of crystals, suggesting recrystallization. The basement rocks, especially belonging to KBH-4A sections show alteration of feldspar into secondary minerals e.g., sericite. The formation of chlorites within these sections can be attributed to secondary alteration of mafic minerals. The geochemical studies of the basement rocks indicate an affinity towards calcic to calc-alkaline composition. The ASI (Alumina Saturation Index) ranges between 1.3-2.4, indicative of peraluminous nature of these basement rocks. The REE fractionation indicates enrichment of LREE, moderate to depleted HREE and prominent Eu/Eu\* negative anomaly in these rocks. Primitive mantle normalized exhibit distinct, Ba, Nb, Ti negative anomalies. Tectonic discrimination plots predominantly exhibit volcanic arc and syn-collisional affinities. The Archean basement rocks are lithologically heterogeneous and are genetically related by processes e.g., partial melting and fractional crystallization. These are characterized by calc-alkaline magmatic rock of

modern subduction zone.

1. Bhaskar Rao, Y.J., 2017. Evidence for Neoproterozoic basement for the Deccan volcanic flows around Koyana-Warna region, western India: Zircon U-Pb age and Hf-isotopic results. *Journal of the Geological Society of India*, 90(6), pp.752-760.

2. Misra, S., 2017. Granite-gneiss basement below Deccan Traps in the Koyana region, western India: Outcome from scientific drilling. *Journal of the Geological Society of India*, 90, pp.776-782.