Paper Number: 3350

Geochemical characterisation, Sm-Nd and U-Pb zircon chronology of the Tirodi Gneissic Complex (TGC), Central Indian Tectonic Zone (CITZ): constraints on Proterozoic crustal evolution

Alam, M[1,2*], Mishra, M.K[2], Kaulina, T.V[3], Ahmad, T[1,2]

[1] Department of Geology, University of Delhi, Delhi-110007, India
[2] Department of Geography, Jamia Millia Islamia, Jamia Nagar, New Delhi-110025, India
[3]Geological Institute of the Kola Science Centre, Russian Academy of Sciences, Apatity, Russia
[*]All correspondence-merajdu@gmail.com

The Tirodi Gneissic Complex (TGC) is a major Proterozoic basement entity in the central Indian Precambrian Shield. The TGC contains an assemblage of pink and grey granitoids, migmatitic and banded gneisses, with a calc-alkaline/trondjhemite affinity. The petrographic study reveals that the TGC rocks are divided into three groups. Group-I show biotite-rich granitic gneisses and Group-II show hornblende-rich, whereas Group-III shows muscovite/biotite rich granite gneisses. The rock contains an assemblage of plagioclase, quartz, k-feldspar and ± biotite ± muscovite ± hornblende. However, Sphene and opaque minerals are present as accessory minerals. The inversely correlation of major oxides, specially CaO, Fe_2O_3, TiO_2, Al_2O_3 and MgO against SiO_2 suggest a magmatic differentiation of the parental melt. Whereas, alkalies K_2O and P_2O_5 shows scattered trend against SiO_2, probably suggesting the mobile nature of potash may be due to post-crystallization processes / fluid activity in the area.

The chondrite normalized Rare Earth Elements (REE) patterns are also characterized by three groups. Group-I show enriched LREE and depleted HREE pattern with a large positive europium anomaly while the Group-II shows highly fractionated at LREE and distinct concave upward HREE pattern and no Eu anomaly. However, the Group-III exhibits the highly fractionated LREE and nearly flat HREE and distinctive negative Eu anomaly. Spidergrams show similar peaks for all the groups in which Nb negative Pb positive and Ti negative anomalies are observed. All these trace elements characteristics indicate feldspars, titano-magnetite and apatite fractionation and influence of some crustal component in these studied rocks.

The Sm-Nd and precise U-Pb zircon dating indicate that the TGC were generated at ca. ~1500 Ma due to thermal perturbations related to granulite grade metamorphism of their mafic protoliths that were extracted from the mantle at ca. 2500 Ma. The significant negative values of epsilon Nd (ranging from -14.81 to -31.74) which suggests that these protoliths have had experienced long crustal residence time and owing to Proterozoic crustal evolution.