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Late-Archaean Potassic Granite from the Bundelkhand Craton, Central India

Saheli Sarkar (1), Lopamudra Saha (1), Pritam Nasipuri (2), Jayanta Kumar Pati (3), and Vishal Patole (2)

(1) Indian Institute of Technology Roorkee, India (saha.lopamudra@gmail.com), (2) Indian Institute of Science Education and Research Bhopal, India, (3) Allahabad University, India

Late-Archaean granitoids, show wide range of compositional variation: (i) TTG like granitoids with strongly fractionated REE patterns, which can be both Na-rich and K-Mg-rich (Sanukitoids) (ii) K-rich, Mg-poor biotite granites with less fractionated REE patterns and showing negative Eu-anomalies (type area, the Closepet Granite, Eastern Dharwar Craton, India). Amongst them Late-Archaean Sanukitoid or K-rich Closepet-type granitoids are most widely reported from the Archaean Cratons world-wide: Superior Province, Canada, Pilbara Craton, Yilgarn Craton, Antarctica, Limpopo Belt, Dharwar Craton.

Several models proposed so far for the origin of these granitoids mostly include partial melting of hydrated basalts, reaction of slab melts with mantle wedge peridotites, re-melting of an enriched mantle and then mixing of the resulting melt with the anatectic melt generated during the melting of continental crust in subduction zone settings. The Closepet-type potassic biotite-rich granites were mostly produced by re-melting of TTG-like continental basements most likely in a subduction zone setting. Most of the proposed models suggest such partial melting to have taken place in garnet-stability field and some in orthopyroxene-stability field.

In this study we report late-Archaean ($\sim$2.61-2.5 Ga) potassic granite from the Bundelkhand Craton in central India. The Late-Archaean granitoids recorded from the craton are intrusive into the high-grade supracrustal rocks of the craton. They are classified as coarse grained grey, pink porphyritic granite, medium granied pink granite, granite porphyry and fine-grained pink granite. The supracrustal rocks of the craton have been metamorphosed at $\sim$2.78 Ga under high-pressure conditions ($\sim$17-18 kbar)- medium temperature (600ºC) in a subduction zone setting. The intrusions of the granitoids at $\sim$2.6-2.5 Ga mark the stability of the craton.

The pink-porphyritic granite studied here preserves plagioclase-potash feldspar-orthopyroxene-muscovite-biotite-quartz. Plagioclase megacrysts mostly contain orthopyroxene inclusions and are rimmed by anti-perthite and potash feldspar. Biotite and muscovite mostly occur along the potash feldspar grain boundaries or along the grain fractures. The textural observations hence indicate that these granitic rocks are formed in two stages: (i) initial TTG-like melts formed by partial melting of pre-existing mafic supracrustal rocks in the orthopyroxene-stability field, as evidenced by orthopyroxene inclusions in the plagioclase megacrysts, followed by (ii) fractionation of plagioclase crystals, thus making the melt progressively enriched in potassium that led to rimming of the plagioclase megacrysts by anti-perthite or potash feldspar. Biotite and muscovite were formed during later retrogression due to fluid ingression. Whether such magma-forming processes were related to the $\sim$2.78 Ga tectonics recorded from the craton or may be related to a short phase of collision tectonics post to that, needs further investigation.