In Situ Trace Element Chemistry of Apatite, Titanite and Zircon using LA-ICPMS from Archean Granitoids, Bundelkhand Craton, Central India

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Accessory minerals have increasingly become valuable petrogenetic tools to shed lights on many geological problems, including the nature and age of the early crust and the timing and nature of crustal growth. The most crucial quality of these accessory minerals is their capacity to survive multiple stages of their host-rock evolution while preserving a robust and accessible record of magma evolution. Because of the high partition coefficients of the REE and other critical trace elements into accessory phases these minerals play an important role in defining the crystallization history of granitoids.

In this contribution, we have used differences in accessory mineral (apatite, titanite and zircon) chemistry in combination with bulk rock chemistry from geochemically diverse Archean granitoid types (~9 samples) to understand their evolution from the Bundelkhand craton, Central India. These granitoids represent the "granite proliferation" near the end of Archean and range from sodic tonalite-trondhjemite-granodiorite (~3.5 Ga and 3.3 Ga) to calc-alkaline high-K granitoids (2.5 Ga; intracrustal granites) and sanukitoids (~2.5Ga; reworked crust mixed with magma from mantle source). This study reveals that there is a contrast in absolute rare-earth element (REE) abundances, REE distribution patterns, and elemental abundances (Eu, Sr, Y) between accessory phases from different Archean granitoid types with titanites and apatites having maximum variations in terms of LREE/HREE enrichment and Eu anomaly in chondrite normalised REE patterns. These elemental variations will be related to geochemical signatures of the host magma for providing better understanding of petrogenetic history of host rock and evolution of continental crust.