

U-Pb baddeleyite and zircon ages from Kambam Carbonatite, south India and implications on regional tectonics

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Carbonatites reported from off-craton, orogenic, or collision sutures are of petrological significance as their formation in such tectonic settings are restricted to back-arc regimes or orogenic collapse. The Precambrian Southern Granulite Terrane (SGT) of south India is known for sporadic occurrences of carbonatitic rocks exposed along a linear belt parallel to a major shear zone, known as the Suruli shear zone. These plutons are interpreted to be the product of mid-Neoproterozoic extensional rifting in south India during Rodinia break-up or represents a deformed alkaline rocks and carbonatites suite (DARCS) marking the location of a major collisional zone. Among these, the Kambam carbonatite (KC) reported from the central part of SGT known as the Madurai block is important due to its close spatial association with high to ultra-high temperature rocks occurring within a narrow belt along the Suruli shear zone.

In the present study, we report new LA-ICPMS U-Pb baddeleyite and zircon ages from KC constraining its emplacement at ~520 Ma, contradicting the earlier reported ages at ~750 Ma and ~2.5 Ga. Apatite-calcite trace element modelling of KC suggests that the whole rock composition of KC does not represent the parental liquid composition, rather represent early formed cumulate grains that crystallized from different batches of melt formed in a complex magmatic environment. Our new age data on the timing of carbonatite emplacement post-dates the proposed timing of Neoproterozoic collision reported in the Madurai block along the Suruli shear zone during the Gondwana supercontinent assembly. These results with the available geochemical data offer a better understanding on carbonatitic magmatism in south India. The study also adds significance to Suruli shear zone that can be considered as a major terrane boundary in SGT, and calls for a revisit to the presently proposed models for the crustal architecture of SGT.