American Mineralogist, Volume 93, pages 1230–1244, 2008

Monazite ages from carbonatites and high-grade assemblages along the Kambam Fault (Southern Granulite Terrane, South India)

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Abstract

Monazite ages from carbonatites and high-grade assemblages exposed along a significant lineament within the Southern Granulite Terrane of India termed the Kambam fault were obtained in thin section (in situ) using an ion microprobe. X-ray maps for Ce and Th were acquired in larger monazites to decipher the significance of the ages of individual spots within grains. The Kambam carbonatite contains large (millimeter-sized) apatite rimmed by ~10 μm thick bands of monazite. Monazite commonly appears as a lower-Th, late-stage mineral in carbonatites, and bands surrounding apatite are interpreted as products of metasomatism, rather than exsolution. The age of a Kambam carbonatite monazite band is 715 ± 42 Ma (Th-Pb, $\pm 1\sigma$), but monazite filling cracks within the apatite is ~300 m.y. younger (405 ± 5 Ma). The younger monazite grains are in contact with quartz, a mineral thought to be an indicator of subsolidus alteration in carbonatites. The age of the monazite rim is similar to ages of several carbonatites located 50–400 km further north, and chemical analyses show that this sample displays chemical trends similar to the other complexes (e.g., Y/Ho, Ce/Pb, REE, and HFSE patterns). The mid-Neoproterozoic event is recorded in garnet-bearing assemblages ~20 km west of the Kambam fault (733 ± 15 Ma) and garnet-bearing enclaves within Southern Granulite Terrane charnockites (701 ± 26 Ma; 786 ± 84 Ma). The results show that monazite can crystallize during metasomatism and be useful in deciphering fluid processes occurring at deeper crustal levels. The Kambam fault, which records over 300 million years of monazite growth, should be considered a major boundary in reconstructions of Gondwana.

Keywords: Carbonatite, geochronology, ion microprobe, monazite, Southern Granulite Terrane