Hafnium isotope systematics of carbonatites and alkaline silicate rocks from South and West India

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The preliminary Hf isotope data for two Neoproterozoic carbonatites (Sevattur and Samalpatti in Tamil Nadu, S India) and the Cretaceous Amba Dongar carbonatite (Gujarat, W India) are presented. The former carbonatites have been shown to originate from an enriched mantle source (Sevattur) with massive hydrothermal post-emplacement modifications recognized in a subset of carbonatites from Samalpatti on the basis of a uniquely ^{13}C–^{18}O-enriched signature [1]. A wide range of εHf_{800} values for Sevattur–Samalpatti alkaline silicate rocks (−12.3 to +15.7) broadly negatively correlates with εNd_{800} which indicates their derivation from a heterogeneous source with a predominance of enriched (crustal) component.

On the contrary, bulk S India carbonatites and Mg-Cr-rich silicocarbonatites consistently show extremely variable, but collectively highly radiogenic εHf_{800} values up to ~740. This provides strong evidence for disequilibrium behavior of the Lu–Hf system in magmatic carbonates [see 2], also apparent in distinctive Lu/Hf which vary widely for carbonate (1–15) versus non-carbonate (mostly <0.15; [1]). Such elemental fractionation coupled with an ancient age of S India suite (~800 Ma; [3]) would develop $^{176}Hf/^{177}Hf$ ratios outside any known terrestrial reservoir [2].

Analyses of carbonatites from Amba Dongar as well as carbonate and non-carbonate fractions from selected bulk carbonatites from S India and Amba Dongar are pending. Whether Hf isotopes could disentangle between the possible influence of a hotspot, suggested to be involved in producing Deccan trap basalts and parental carbonatite melts for Amba Dongar [4], and the lack of such a signature for S India suite remains to be evaluated.

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[1] Ackerman et al. (2017) Lithos, in press. [2] Bizimis et al. (2003) CMP 145, 281-300. [3] Kumar et al. (1998) GCA 62, 515-523. [4] Simonetti et al. (1995) ChG 122, 185-198.