Hafnium-Osmium Systematics of Cretaceous Group II Kimberlites from India

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Abstract

Hafnium and Os isotopes of orangeites (Group II kimberlites) may prove to be a useful tool in deciphering mantle sources and petrogenetic histories. According to recent interpretations, orangeite parent magmas are derived from a source with high Os concentrations, ocean island basalt-like gamma Os values (i.e. chondritic to slightly suprachondritic), and low time-integrated Lu/Hf relative to Sm/Nd (Pearson et al., 8th IKC, 2003; Nowell et al., J. Petrol., 2004). Thus, in Hf-Nd isotope space, data for orangeites generally plot below the terrestrial array, as defined by oceanic basalts and continental crust. Osmium isotope compositions may reflect a source for orangeite parent magmas in the convecting mantle, and subsequent interactions between these magmas and an Os-poor, radiogenic source. In order to evaluate this petrogenetic model, we studied a suite of mid-Cretaceous orangeites from eastern India, rocks that have been linked in space and time to the Kerguelen hot spot. High-precision Lu-Hf and Re-Os isotope data were obtained by MC-ICPMS and N-TIMS, respectively. The Indian orangeites have Hf isotopic compositions ranging from chondritic to moderately subchondritic. In Hf-Nd isotope space, data for these samples plot within the terrestrial array, on the very low end of the ocean basalt range. Osmium concentrations are high and Os isotopic values fall mostly within the range of present-day ocean island basalts. In detail, our preliminary Os isotopic data appear to reflect mixing between an Os-rich, chondritic mantle source and an Os-poor, suprachrondritic contaminant. The Os isotopes are not obviously correlated with Hf, Nd, Sr or Pb isotopes in the Indian orangeites; this might imply that their parent magmas interacted with continental crust on the way to the surface. Alternatively, the radiogenic, Os-poor component could also be the cause of the lithophile isotope ratios.

Poster Main References

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