

Hf isotope as a tracer of subduction processes and mantle recycling

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It has been expected that Hf isotope, in conjunction with Pb-Sr-Nd isotopes, will provide strong constraints on the formation, differentiation and recycling processes of the mantle components. This is tested by comparing the Hf-Pb-Sr-Nd isotopic data of arc magmas and ocean island basalts. The arc magmas are generally enriched in Pb and Sr owing to slab dehydration and element transport of such fluid mobile elements from subducted slab to the mantle wedge. HIMU, which is considered to be ancient subducted oceanic crust, has the isotopic signature which is consistent with Pb-Sr depletion. In contrast, relatively low Sm/Nd, Lu/Hf, Hf/Nd of HIMU as shown by Nd-Hf isotopic systematics cannot be explained by extraction of fluids during subduction. As Nd and Hf are less fluid-mobile elements, these isotopic systematics may be controlled by melting process during formation of the ancient oceanic crust.