

# Origin of geochemical variations of primary boninite magmas of the Ogasawara (Bonin) Archipelago

KANAYAMA, KYOKO<sup>1</sup>, KITAMURA, KEITARO<sup>2</sup>,  
UMINO, SUSUMU<sup>1</sup>, TAMURA, AKIHIRO<sup>1</sup>,  
ISHIZUKA, OSAMU<sup>3</sup> AND ARAI, SHOJI<sup>1</sup>

<sup>1</sup>College of Science and Engineering, Kanazawa University

<sup>2</sup>Guraduate School of Natural Science and Technology,

Kanazawa University

<sup>3</sup>Geological Survey of Japan/AIST

Stratigraphy and ages of volcanic rocks of the Ogasawara Archipelago indicate secular variations of magmas generated during the early Izu-Ogasawara-Marina Arc with the progress of subduction of the Pacific Plate. Here, we discuss the origin of the geochemical variations of primary boninite magmas on the basis of melt inclusions in chrome spinel from the Ogasawara Archipelago.

We have modeled the geochemical variations of primary boninite magmas, which are assumed to be the highest MgO melt inclusions of each geochemical type, by using the Arc Basalt Simulator (Kimura et al, 2010). 48-46-Ma ultra-depleted boninite magmas were generated by partial melting of residue of 10% to 20% fractional melting of DMM, with the introduction of fluid liberated from eclogitic slab. LILEs/La variations of the ultra-depleted melts could be explained by the varying degrees of dehydration of the mantle just above the subducting slab, depending on the thermal status of the mantle wedge. The 45-Ma less-depleted boninite magma requires less depleted source mantle which experienced 4 to 8% fractional melt from DMM with relatively high contribution of sediment fluid.

Major and trace element variations of boninitic melt inclusions can be explained by the mixing of primitive boninite magmas with felsic melts during ascent in the upper mantle. Mixed magmas entered into the stability field of chrome spinel, resulted in rapid crystallization of chrome spinel which trapped melt with a broad compositional range (Arai and Yurimoto, 1994).

Different compositional variations of the bulk boninites from the melt inclusions were formed by crystallization of spinel, olivine and pyroxenes from primitive magmas enhanced by degassing at shallow depths, combined with mixing with evolved magmas.