# Petrogenetical relationships among some primitive volcanic rocks from Bonin (Ogasawara) archipelago

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Petrological and geochemical characteristics of the Tertiary primitive volcanic rocks from Chichijima were compared with these from Hahajima, Bonin (Ogasawara) archipelago in order to consider the petrogenetical relationships and propose the model for unmature subduction magmatism. The primitive volcanics are high-Ca (HCB) and low-Ca boninites (LCB) from Chichijima, primitive tholeiites (TH-P) and primitive calc-alkaline volcanics (CA-P) from Hahajima.

The beginning ages of magmatism on these islands are thought to be similar (about 40 Ma) by the radio active ages and fossil ages. Near the Bonin archipelago waters, extremely high free air anomaly is observed and this observation implies that the crust of the region is very thin (7-8 km). The volcanics from Bonin archipelago would be formed on an oceanic-oceanic crust subduction zone at similar age.

Chichijima has been known as type locality of boninite, which originate from mantle, while, Hahajima is mainly composed of tholeiitic basalts and calc-alkaline andesites.

A comparison among the some types of magmas which extruded at similar age as the early subduction stage may give constraints on a model for magma genesis.

HCB, LCB TH-P and CA-P are thought to be primitive composition which could coexist with mantle peridotite judging from their olivines showing near Mg#=90, extremely high values of pyroxene's Mg# and Cr-spinel's Cr#, and high MgO, Cr, Ni contents of bulk rock chemistries.

Judging from modelings of REE and compositional frequency distribution of Cr-spinels in olivines, the degree of depletion for the parental mantle which yielded each primitive magmas thought to be increased in the following order of TH-P, CA-P, HCB and LCB. The knowledges from petrological experiments and the modelings of incompatible elements imply that the material induced from subducting slab is aqueous fluid which dissolved a large quantity of LILE. A supply of aqueous fluid thought to increase in the following order of TH-P, CA-P, HCB and LCB.

Zr/Hf ratios for these rocks are nearly the same. Zr and Hf would be considered to have similar chemical feature and these elements would not distribute to aqueous fluid during dehydration process of slab subduction. Furthermore, this ratio could not be changed on the partial melting process. An idea of the genesis for high-Mg andesites, that is interaction between peridotite and silicic melt produced by slab melting, is proposed. If the volcanics from Bonin archipelago were produced by this idea, the Zr/Hf ratios would be systematically changed. But, these feature are not observed. Therefore, the idea of interaction between peridotite and silicic melt could not explain successfully the geochemical feature of these volcanics.

A model to explain the above features might be that a slab subduction occurs on young oceanic crust. At incipient stage of subduction, the geothermal gradient might be higher than the recent subduction zone. A slab began to subduct into the mantle which varies from shallow refractory to deep fertile mantle owing to extraction of MORB. At the shallow region, an aqueous fluid is supplied much more, and high-SiO2, LILE-rich and HFSE-poor magma like LCB is produced. Degree of mantle depletion and the amounts of supplied aqueous fluid decrease with depth, and HCB, CA-P and TH-P are subsequently produced in the mantle with various degree of the depletion and with various amounts of aqueous fluid. The reasons why boninites do not appear on the matured arcs are, because of long period of subduction, the geothermal gradient of wedge mantle decreased. Therefore, a parental mantle of the volcanics goes down where is not depleted. Then, aqueous fluid from slab may become more little because slab have experienced dehydration reaction at sallower depth already.