Petrology of felsic rocks dredged from the Myojin Seamount and the Myojin Rift in the north Izu-Bonin arc - Contribution of intra-oceanic subduction system to making continental middle crust -

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The Myojin Seamount, located in the volcanic front of the north Izu-Bonin arc, is a submarine composite volcano with a large caldera. The Myojin Rift, western back arc side of the Myojin Seamount, exhibits graben structure rifting at present. The volcanic rocks from the Myojin Seamount are comprised of basalt, andesite, dacite and rhyolite, whereas the Myojin Rift is characterized by basalt and rhyolite assemblage. The felsic rocks from the Myojin Seamount and Rift consist mostly of pumices with variable vesicularity and lesser amount of massive lava and plutonic rocks, which are divided into three suites on the basis of incompatible element and isotopic characteristics: type 1 rocks with low Na, Zr, LREE, and high Ba, $^{87}Sr/^{86}Sr$, type 2 rocks with low K, Rb, Ba, and high $^{87}Sr/^{86}Sr$, type 3 rocks with high Na, K, Rb, Zr, Nb, LREE, and low Ba, $^{87}Sr/^{86}Sr$.

The type 1 felsic rocks occur in the Myojin Seamount of the volcanic front, the type 3 felsic rocks in the Myojin Rift side, and the type 2 felsic rocks overall from volcanic front to back arc. Isotopic compositions of basalts from the volcanic front are similar to the type 1 and 2 felsic rocks, whereas those of basalts from the Myojin Rift are similar to the type 3 felsic rocks. Geochemical signatures and occurrences of the felsic and basaltic rocks suggest that the type 1 felsic magma may be derived from the basaltic sources beneath the volcanic front, and the type 3 felsic magma from the basaltic sources beneath the back arc. Isotopic compositions of the type 2 felsic rocks are similar to the type 1 felsic rocks, however, the differences of major and trace elements between the type 1 and the type 2 felsic rocks can not be explained by different conditions from the common basaltic sources, such as variable fO_2 (e. g. Sission et al., 2005; Tatsumi and Suzuki, 2009). An alternative model of the type 2 felsic rocks is partial melting of another source material, such as pre-rifting stage basaltic crust (e.g. the Oligocene middle crust of Tamura et al., 2009). The dispersed distribution of the type 2 felsic rocks from the volcanic front to the back arc is consistent with the old pre-rifting stage lower crust model.

The Calc-alkaline andesite and dacite from the Myojin Seamount at the volcanic front have magma mixing evidences, such as mixing trend of bulk chemistry, mingling texture under thin sections, and sieve texture of plagioclase phenocrysts. This suggests that the intermediate composition volcanic rocks may be originated by mixing of the basaltic magma and the type 1 felsic magma beneath the volcanic front at the Myojin Seamount, which process contributes to make intermediate composition continental crust in the Izu-Bonin oceanic arc.