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Magma genesis of Quaternary volcanic rocks from Futagoyama volcano, Kunisaki Peninsular, northeast Kyushu, Japan

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It is well known that the slab melting is one of the important mechanisms transporting the materials from subducting slab to the mantle wedge, in addition to the dehydration of the slab (e.g. Defant & Drummond, 1990). It is believed that the origin of the magma produced adakite is generated by the slab melting. However, the detailed genesis of adakite is still under the issue (e.g. Castillo, 2006). Thus, the accumulation of the study for adakite is considered to be important. From the Southwestern Japan arc where Philippine Sea plate is subducting, many Quaternary adakitic magmas are observed. Futagoyama volcano is situated at Kunisaki Peninsular, Kyushu Island, Japan, and belongs to the Southwestern Japan arc, and the volcanic activity was occurred at 1.5 to 1.1 Ma (e.g. kamata, 1998). We determined the major and trace element and Sr, Nd and Pb isotopic compositions of six (biotite) +hornblend dacites from Futagoyama volcano. Range of SiO₂ content was 63 - 66 wt%. From the MORB normalized trace element pattern, depletion of Nb and enrichment of LIL are observed, which indicate the geochemical characteristics of island arc magma. Most of the Sr/Y ratios are >40, and the concentrations of Y are < 17ppm indicating the signature of adakite. ⁸⁷Sr/⁸⁶Sr, ¹⁴³Nd/¹⁴⁴Nd, ²⁰⁶Pb/²⁰⁴Pb, ²⁰⁷Pb/²⁰⁴Pb and ²⁰⁸Pb/²⁰⁴Pb ratios are 0.7036 - 0.7041, 0.5126 - 0.5129, 18.1 - 18.3, 15.5 - 15.6 and 38.1 - 38.5, respectively. MgO concentrations and Sr/Y and ¹⁴³Nd/¹⁴⁴Nd ratios increase, and ratios of ⁸⁷Sr/⁸⁶Sr decrease with increasing the SiO₂ concentrations. This may indicates that the magma with higher SiO₂ keeps characteristics of primary magma of Futagoyama volcano. The Sr-Nd-Pb isotopic compositions are plotted on the tow component mixing curve in between the fields of Shikoku Basin basalts (Hickey-Vargas, 1991) and terreginous sediments on Philippine Sea plate (Shimoda et al., 1998). Shikoku Basin basalt is considered to be a constituent of oceanic crust of the Philippine Sae plate. Therefore, the origin of adakitic magma from Futagoyama volcano can be explained by the slab melting of the Philippine Sea plate together with the tereginious sediments on the plate. The enriched Sr, Nd and Pb isotopic compositions of the samples with relatively low SiO₂ compared to those with high SiO₂ may suggest the involvement of mafic crustal materials.

Keywords: slab melting, Philippine Sea plate, kyushu, trace elements, Sr-Nd-Pb isotopic compositions