The contribution of crust to the genesis of rhyolitic magma from the Hime-shima volcanic group

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The genesis of rhyolite magma is important to elucidate, e.g., the continental crust formation, althoug it is still under debated [1]. Hime-shima volcanic group (HVG), northeast Kyushu, South West Japan arc, is composed of dacites and rhyolites. A possibility of involvement of crustal materials to the magmas of HVG is suggested from the occurrence of crustal xenoliths in the dacite and of residual material of crustal melt in the rhyolite [2]. We determined trace element compositions of volcanics and crustal xenoliths of HVG to discuss the contributions of crustal materials to the genesis of rhyolite magma.

The primitive mantle normalized multi element pattern of rhyolites from HVG show negative anomalies of Th, Sr, Zr and Eu and positive anomalies of U, Nd and Sm. These geochemical features differ from those of the dacites and other silicic magmas from North Kyushu. In contrast, intra plate type rhyolites from Northeastern New Brunswick [3] show similar trace element compositions to that of HVG. Genesis of the felsic magma is interpreted as a product of of supracrustal rocks, associate with heat advection from intruding continental back-arc mafic magma. Although HVG and Northeastern New Brunswick have different tectonic settings, geochemical features of rhyolites of the both areas show similar characteristics. We, thus, examined the specific contribution of crustal materials to HVG rhyolite. Petrography of crustal xenoliths in HVG is similar to that of basement rocks of Ryoke metamorphic and granitic rocks from northeast Kyushu. Geochemical compositions of the Ryoke granites [4, 5] have low Sr/Y ratios (10 - 20), wide compositional range of Y and Zr contents (12 – 35, and 50 - 250 ppm, respectively), high Nb concentrations (10 - 20 ppm). These chemical characteristics are similar to the rhyolites from HVG. Therefore, it can be interpreted that the rhyolites from HVG was derived from partial melting of crustal materials, of which compositions is similar to the Ryoke granites.

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