Geochemical Feature and K-Ar Age of Oshima-Kojima Volcano, Southwestern Hokkaido, Japan

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Oshima-Kojima volcano, a small island of 1.5 x 1 km in size, locates at the eastern margin of the Japan Sea. The previous research about this volcano is restricted to Yoshii (1965) in which geology, rock description and a few chemical analyses were done. In this study, the field investigation, rock sampling and the analyses of whole-rock composition and K-Ar dating were done. Based on these results, we revealed formation age and process of Oshima-Kojima volcano and defined petrologocal and geochemical features of the rocks.

Based on the field investigation of whole area, Yoshii (1965) mainly divided volcanisms of Oshima-Kojima volcano into two stages, late Neogene dacite accompanied with dike intrusion and Quaternary andesite. We clarify that the occurrences of these rocks are hyaroclastite and lava, respectively. Hyaroclastite shows the bedding structure. The oxidation and cross lamination are recognized in upper part of hyaroclastite. Lava flows show the flow structure and several flow units. In this investigation area, there is no structure indicating long dormancy between hyaloclastite and lava. We obtain K-Ar ages of ca. 0.15Ma for both hyaloclastite and lava. Oshima-Kojima volcano has started its activity under shallow subaqueous condition. With constructing its volcanic edifice, the activity has continued in subaerial.

Most of the rocks contain plagioclase, amphibole, biotite, apatite and magnetite phenocrysts. Some samples also contain quartz, olivine, orthopyroxene and clinopyroxene. Lava flows are divided into three units (L1, L2 and L3) by their phenocryst assemblage and mode composition. The rock facies of Lava L1, which directly covers hyaloclastite, is similar to that of hyaloclastite. Mafic inclusions, with various size (cm-mm) and color, can be recognized in hyaloclastite and lava. The phenocryst assemblages of mafic inclusions are identical to or different from those of their host rocks. Host rocks are andesite˜dacite, ranging from 56 to 64 SiO_2 wt.%. Mafic inclusions are basalt˜basaltic andesite, ranging from 48 to 55 SiO_2 wt.%. The rocks are classified into calk-alkali series on $FeO*/MgO$-SiO_2 diagram, and are plotted along the boundary between high-K and medium-K fields in SiO_2-K_2O diagram. $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ ratios of representative samples show the relatively broad variation (0.7030-0.7033 and 0.51285-0.51292, respectively).

1) The plagioclases of all units show the zonal structure and dusty zone. 2) The disequilibrium phenocryst assemblages in some rocks 3) Hyaloclastite shows the mixing texture of groundmass. 4) Rocks apart from the dike contain mafic inclusions. These observations indicate that the magma mixing process is dominant. However, the different trends of three lava-units and compositional scattering of mafic inclusions on some elements vs. SiO_2 diagrams indicate that Oshima-Kojima magmatism cannot be explained by simple 2-components magma mixing. Also, the correlation between SiO_2 composition and $^{87}Sr/^{86}Sr$ indicates the crustal assimilation possibility. Rare earth element composition supports the complex magma system of Oshima-Kojima valcano.

The rocks of Oshima-Kojima volcano show the negative anomalies of HFSE (Ta, Nb, Zr and Hf) and positive anomalies of LILE (Ba, K and Sr), that is the character of arc magma. In comparison with other NE-Japan volcanoes , the rocks of Oshima-Kojima show higher contents of incompatible elements than Iwate volcano of volcanic frontal side. Rocks of Oshima-Kojima volcano have same HFSE contents as those of Oshima-Oshima volcano. On the total alkali-SiO_2diagram, the rocks of Oshima-Kojima volcano are classified into the high-almina basaltic series and lower contents than those of Oshima-Oshima and Rishiri. On the $^{87}Sr/^{86}Sr$-$^{143}Nd/^{144}Nd$ diagram, the rocks of Oshima-Kojima are plotted in rear-arc volcanoes field and show highest $^{87}Sr/^{86}Sr$ and lowest $^{143}Nd/^{144}Nd$ among these volcanoes.