

Petrological study of volcanic products from Ojodake and Nakadake in central cones of Aso volcano, southwestern Japan

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In order to constrain the magma-plumbing system of the post-caldera basaltic magmatism in Aso volcano, we investigated the petrological characteristics of volcanic products from Ojodake and Nakadake in central cones, and discussed the genetic relationship of magmas from these volcanoes.

Recent seismic study showed that the magma chamber of Nakadake exists beneath the Kusanenri-ga-hama crater at about 5km depth (Sudo et al.,2006). The eruption age (-ka) and location of Ojodake are similar to those of Nakadake (from Xka to present). These seismic and geological observations may indicate that the magma chamber located beneath Kusanenri-ga-hama supplied magmas to both Ojodake and Nakadake.

Volcanic products from Ojodake and Nakadake include the following phenocrysts: plagioclase (20-30 vol.%), clinopyroxene (5-15 vol.%), orthopyroxene (-4vol.%), olivine (-5vol.%) and opaque minerals (-2vol.%). Whole-rock chemical compositions of lava and agglutinate from Ojodake indicate the distinct trend in the Harker diagrams between 50.5 and 52.5 wt.% of SiO₂. On the other hand, volcanic products from Nakadake show the wide range in composition (50.1-58.3 wt. %) and compositional trend in the Harker diagrams. The whole-rock chemical compositions of Ojodake volcanic products partly overlap with those of Nakadake volcanic products.

Genetic relationship between Ojodake and Nakadake magmas are examined by fractional crystallization model calculations. Major and trace elements were used for mass balance equation and Rayleigh fractionation modeling, respectively.

Results of mass balance calculations indicate that the compositional trends observed in the Harker diagrams of both Ojodake and Nakadake volcanic products are explained by the fractionation of phenocrysts from the most primitive basalt samples. However, the results of trace element model calculations do not support that. These results of model calculations probably indicate the Ojodake magma was from the different source from Nakadake.