

Petrological characteristics of the Kumanodake agglutinate in the Zao volcano, NE Japan

Yoshinori Takebe^{1*}, Masao Ban¹

¹Environmental Sci., Yamagata Univ.

The Zao volcano is an active volcano (< 1Ma), located in central part of Quaternary volcanic front of NE Japan. The volcanic activity has been classified into four stages. One of the products formed in the early part of the youngest stage is the Kumanodake agglutinate. The volcanic successions of this unit are well exposed around Mt. Kumanodake. In this study we clarified petrologic characteristics of successively sampled juvenile materials and examined the evolution of the magma feeding system of this unit.

This unit is composed of piles of pyroclastic layers. While, the lower part of the unit is composed of agglutinate layers with relatively large scoria fragments in ash matrix, the upper part is composed of reddish scoriaceous tuff layers with planer stratification and cross laminae. Weakly vesiculated andesitic fragments can be observed sparsely. Reverse and normal grading of several meter intervals, recognized by the variation of size of the fragments, is repeatedly observed. Rocks are olv-cpx-opx basaltic-andesite and belong to medium-K, calc-alkaline series. The range of the SiO₂ and K₂O contents are ca. 55.2-56.2 % and ca. 0.82-0.85 %. The systematic temporal variation in whole rock compositions of juvenile materials was observed. The amounts of SiO₂ decrease, while amounts of MgO increase toward upwards.

Based on textural and chemical compositional features, phenocrysts can be divided into following two groups. Group A includes An-poorer plagioclase (An = ca. 58-72), orthopyroxene (Mg# = ca. 63-67) and clinopyroxene (Mg# = ca. 66-71). The plagioclase phenocrysts usually have patchy textured core, oscillatory zoned mantle with or without dusty zone, and thin clear rim. Some plagioclase phenocrysts show honeycomb texture instead of patchy one in core. The anorthite content of honeycomb core is slightly higher than those of patchy one. Pyroxene phenocrysts show homogeneous core and have Mg-rich zone (Mg#, up to 78) inner part of rim. Group B includes clear type plagioclase (An = ca. 88-92) and olivine (Fo = ca. 79-83). Group B phenocrysts show homogeneous core. The anorthite and forsterite contents decrease steeply in rim. Judging from chemical and textural features of these phenocrysts, the cores of group A and B crystals were derived from felsic and mafic end-member magmas respectively. The estimated magma temperature of felsic and mafic end-member magmas are ca. 940-970 degrees C and ca. 1150 degrees C. The mixing ratio of the mafic / felsic magmas increased gradually, which would be caused by successive injection of mafic magmas from depth to the shallow felsic magma chamber.

Keywords: Zao, agglutinate, magma mixing, magma chamber