

A suggestion of the magma mixing model of the Yakedake Volcano, Norikura Volcanic Belt, Chubu District, Japan

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Mt. Yakedake, which belongs to Norikura volcanic belt is located on the border of Gifu and Nagano prefectures. The lava of Mt. Yakedake is composed of andesite, which contains coarse-grained plagioclase and hornblende. Some phenocryst plagioclase in the lava has a dusty ring near the rim. While many dark enclaves are composed of the coarse-grained plagioclase (most of them having dusty rings), hornblende of phenocryst and fine-grained plagioclase and hornblende of groundmass. In this study, those minerals and glass were analyzed by EPMA. According to the chemical compositions, it is considered that the phenocryst are transformed between the mafic and felsic magma during the magma mixing and it is presumed that the heterogeneousness of groundmass suggest the mingling under the liquidus.

Mt. Yakedake, which belongs to Norikura volcanic belt is located on the border of Kamitakara village in Gifu prefecture and Minamiazumi village in Nagano prefecture. The basement rock the area around Mt. Yakedake was surveyed by Harayama (1990). The volcanic body of Quaternary was subdivided into the upper Pleistocene composed of the debris-avalanche, the pyroclastic flow and three lava and Holocene composed of lava domes, which are distributed around the summit of Mt. Yakedake, and pyroclastic flows provided from the domes (Harayama, 1990). The Holocene lava domes are composed of at least seven robes (Fugono, 1991) The youngest one located at the summit showed similarity to that of Mt. Unzen-Fugendake and Myake et al. (1995) suggested the possibility of magma mixing. In this study, I carried out a more detailed petrological and mineralogical study and tried the modeling for the mechanism of mixing and mingling.

The lava of Mt. Yakedake is composed of andesite and dacite, the color of which is dark gray to light gray, contains phenocryst of coarse-grained plagioclase and hornblende. The phenocryst plagioclase in the lava is divided into two glass groups; having dusty zone near the rim and normal plagioclase. Most of the normal plagioclases have a honeycomb structure. Some hornblendes are slightly round shaped and it is considered to be melting. The glass of the groundmass is composed of two types glasses; clear and dark gray. The lava dome is divided into three types based on the glass type; mainly occupied by the clear one, only occupied by the dark gray one and coexist both type heterogeneously. On the other hand, many dark enclave that are contained in the lava are composed of the coarse-grained plagioclase and hornblende of phenocryst and fine grained plagioclase and hornblende of groundmass. Most of the phenocryst plagioclase have dusty ring while most of phenocryst hornblende rim is dehydrously decomposed into pyroxene or opaque mineral.

In this study, the chemical composition of these minerals and glasses are analyzed by EPMA. The An content of the core of phenocryst plagioclase having dusty ring is around 55% and similar to normal phenocryst plagioclase. The An content of the dusty zone and rim is about 70 to 80% and the rim of normal plagioclase, however An content of the rim for normal plagioclase is almost the same as the core or have normal zoning weakly, but some grains have weak reverse zoning. Fine grained plagioclase are also contained in the groundmass of the lava, whose An content indicate 70 to 80. The content of fine-grained plagioclase is similar to that of the rim and the dusty zone of phenocryst plagioclase, which also have dusty ring. On the other hand, the chemical feature of the phenocryst dusty plagioclase is similar to that of dusty plagioclase of country rock and the chemical composition of fine grained plagioclase in the enclave is also similar to that of country rocks. The chemical composition of phenocryst hornblende in the enclave is also similar to that of country rocks, but is different from the fine grained groundmass hornblende in the enclave. In some groundmass, clear glass and dark glass coexist heterogeneously under the thin section and the chemical composition is also heterogeneous.

According to these chemical compositions and features, the phenocryst are transformed between the mafic magma (nearly presented by the dark enclave) and felsic magma (nearly presented clear groundmass lava) during the magma mixing and it could be considered that the heterogeneousness of groundmass suggest the mingling of the liquidus.