

Petrological study of the Miocene adakitic andesite in the Tateyama area, eastern part of Toyama prefecture.

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The Oligocene ~ Miocene volcanic rocks are widely distributed in Hokuriku Green Tuff Province. Some previous studies discussed that magma generation and evolution process in the Hokuriku district at Oligocene ~ Miocene (e.g. Uematsu et al., 1995; Takahashi and Shuto, 1999; Ishiwatari and Ohhama, 1997). However, tectonic setting in Hokuriku district at Miocene remains obscure in detail.

The Iwaine formation (Early ~ Middle Miocene) and the Fukuhira formation (Middle Miocene) consist of mainly andesitic pyroclastic rocks and lavas.

The Miocene volcanic rocks in this study area can be divided into four groups by petrographic and chemical features (Group-1; tholeiitic low-K basalt, Group-2: tholeiitic andesite, Group-3; calc alkaline amphibole andesite, Group-4; calc-alkaline two-pyroxene andesite). The Iwaine formation consist of calc-alkaline rocks (group-3, group-4) and tholeiitic rocks (group-1, group2). Fukuhira formation consist of tholeiitic rocks (group-3, group-4).

Especially, calc-alkaline amphibole andesite (Group-3) is characterized by relatively higher Sr/Y ratio contents than common andesite in island-arc. These chemical features of Group-3 is similar to adakite that is generated by partial melting of subducted oceanic plate (e.g. Defant and Durmmond, 1990). This study aimed to discussion of the magma generation and evolution process of Group-3 andesite and unravels the Miocene magmatism in the Hokuriku district.

Phenocryst assemblage of group-3 is amphibole + plagioclase + clinopyroxene + orthopyroxene. Almost phenocrystic plagioclases have dusty zone and honeycomb texture. Phenocrystic clinopyroxene and orthopyroxene in the Group-3 andesite can be divided into three types by petrographic features (Type-1; monocrystal pyroxene, Type-2; glomeroporphyritic texture with amphibole, Type-3; glomeroporphyritic texture with pyroxene). Type-1 pyroxene has narrow range Mg# (0.77~0.80), Type-2 pyroxene has wide range Mg# (0.70~0.86), Type-3 pyroxene has wide range Mg# (0.68~0.80).

Group-3 is plotted in calc-alkaline field on the FeO*/MgO -SiO₂ diagram (Miyashiro, 1974), and low-K andesite field on the SiO₂-K₂O diagram (Gill, 1981). In term of Y-Sr/Y diagram (Defant and Durmmond, 1990), group-3 plotted in overlap field between adakite and island arc-ADRs. However, Group-3 is characterized by higher MgO, Cr and Ni content than the typical adakite.

Petrographical and chemical compositions of phenocrystic minerals in Group-3 andesite exhibit dis-equilibrium texture and compositions such as dusty zoned plagioclase and coexistence of high Mg# pyroxene and low Mg# pyroxene. Thus, these petrographical and petrological features suggest that magma evolution process of Group-3 andesite involves magma mixing.

High Mg# (Mg# 0.85~0.86) pyroxene shows Type-2 texture, and is equilibrium with high-magnesian andesite melt such as Oligocene high-magnesian andesite in Noto peninsula (Uematsu et al., 1995). Middle Mg# (Mg# 0.77~0.83) pyroxene shows Typ-1, Type-2, Type3 texture, and is equilibrium with whole rock composition of group-3. Low Mg# (Mg# 0.68~74) pyroxene show Type1, Type-2 texture, and is equilibrium with dacitic ~ rhyolitic melt such as primitive slab melt (Zamora, 2000).

Mg# of phenocrystic pyroxene indicate that Group-3 magma is generated by magma mixing between mafic end member magma (HMA or bronzite-andesite) and felsic end member magma. Whole rock composition of Group-3 andesite indicates possibility of felsic end member is adakite magma. Therefore, it is though that Group-3 andesite generated by magma mixing between high-magnesian andesite magma and dacitic ~ rhyolitic magma. Additionally, the chemical composition of felsic

end-member magma needs high Sr/Y ratio such as adakite magma. It is thought that these results give limitation to discuss about the tectonic setting model of Miocene magmatism in the Hokuriku green tuff province.

Keywords: Miocene , Hokuriku district, adakite