Miocene adakitic volcanism in Toyama prefecture in the Hokuriku region, northern end of the SW Japan arc

*Watanabe Syun[1], Raiki Yamada[1], Toshiro Takahashi[1]

1. Niigata university

Miocene volcanic rocks widely distributed from Toyama prefecture to Fukui prefecture in Hokuriku region, northern end of the SW Japan arc. These volcanic rocks are broadly classified into andesitic rocks and rhyolitic rocks. Miocene andesitic rocks in Toyama prefecture is divide into tholeiitic series (TH) and calc-alkaline series (CA) by the petrographical and petrological features, and some CA andesite have adakite like geochemical features such as relatively high Sr/Y ratio. These adakitic andesites are founded in Kamiichi area (eastern part of Toyama prefect.), Yatsuo area (southern part) and Nozumi area (western part). In previous studies, adakitic andesites in Yatsuo area are inferred that attributed to partial melting of subducted oceanic crust result from hot asthenosphere injection (Takahashi and Shuto, 1999; Sato *et al.*, 2013). In this report, we discuss the magma generation and evolution process of the Miocene adakitic andesites in Toyama prefecture.

Phenocrystic mineral assemblages of these adakitic andesites are Hbl+Cpx+Opx±Pl. Plagioclase phenocrysts in Kamiichi adakitic andesite have dusty zone and honeycomb structure, whereas Yatsuo and Nozumi adakitic andesite are plagioclase free or very rare. Clinopyroxene phenocrysts have relatively high Mg# for andesitic composition (Whole rock SiO_2 =59.08 to 66.35 wt%). Clinopyroxene phenocrysts in Kamiichi and Nozumi adakitic andesite shows wide or bimodal compositional range of Mg# (0.71 to 0.88), whereas that of Yatsuo adakitic andesite shows monomodal distribution (0.78 to 0.88). High-Mg# clinopyroxene in Kamiichi adakitic andesite has high Sr and low Y content, and the estimated equilibrium melt compositions from high-Mg# clinopyroxene indicate adakitic (bajaitic) signatures. On the other hand, low-Mg# clinopyroxene in Kamiichi adakitic andesite has different composition from high-Mg# clinopyroxene.

Chemical composition of these adakitic andesites are characterized by higher MgO, Cr, Ni and Sr content than the coexist other andesites. Furthermore, each adakitic andesites in Kamiichi, Yatsuo and Nozumi area have different geochemical characteristics, for example, Kamiichi adakitic andesite has lower LILEs (K_2O, Rb) composition and Sr/Y ratio than the other area adakitic andesites.

Sr and Nd isotopic compositions of these adakitic andesites are plotted around the bulk earth compositions with small variation in $^{143}Nd/^{144}Nd$ (0.5123 to 0.5127) and constant $^{87}Sr/^{86}Sr$ (0.7041 to 0.7049). These isotopic compositions are more isotopically enrichment than the common adakite attributed to partial melting of subducted oceanic crust which have isotopically depleted signature reflecting the MORB. This enrichment might be affected by sediment melt derived from subducted slab (Castillo, 2012; Sato *et al.*, 2013).

These petrological features indicate that the Miocene adakitic andesites in Toyama prefecture are formed by differ magmatism from coexist other andesites, and isotopic signature indicate that it cannot be explained by the only previous adakite magma generation model attributed to partial melting of subducted oceanic crust (Castillo, 2012; Sato et al., 2013). Petrological signature suggesting involvement several composition magmas including adakitic (bajaitic) magma indicates that the Miocene adakitic andesites in Toyama prefecture have some possibility of being affected by more complex magma

evolution process than the common adakite magma genesis.

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