K037-P004 Time: May 29 17:15-18:45

Origin of zonal structure and crystallization history of adakitic plutons in the southern Kitakami Mountains, Japan

Nobutaka Tsuchiya[1], Hideko Mukaigawara[2]

[1] Dept. Geology, Iwate Univ., [2] Faculty of Education, Iwate Univ.

Large amounts of Cretaceous to Paleogene felsic igneous rocks, related to the westward subduction along the eastern margin of the East Asian continent, are distributed in Northeast and Southwest Japan. Among them, Early Cretaceous plutonic rocks in the Kitakami Mountains attract special interest because of the coexistence of adakitic granites and normal subduction-related rocks. Adakitic granites occur in central part of zoned plutonic bodies surrounding by calc-alkaline granites in marginal part. These plutons are distributed in eastern margin of the Kitakami Mountains (Hashikami, Tanohata, Miyako, and Kinkasan plutons) and inner part of the South Kitakami belt (Tono and Senmaya plutons). Distribution of the former plutons corresponds to that of the positive magnetic anomaly belt along the eastern margin of the Kitakami Mountains (Ishikari-Kitakami positive magnetic belt: Makino et al., 1992; Finn, 1994). Among them, the Tono pluton shows relatively wide range of petrochemistry. The purpose of this paper is to clarify the petrochemical characteristics of the Tono pluton and to discuss the origin of zoned pluton consisting of adakitic and calc-alkaline rocks.

The Tono pluton is exposed as zoned plutonic body (22 km wide and 37 km long) becomes progressively more felsic inward. Kano et al. (1978) described that the Tono pluton is a symmetric ``drop-like'' form from the gravimetric investigation. The Tono pluton is divided into next six types on the basis of petrochemistry; central facies A1 (biotite granodiorite to biotite leucotonalite), central facies A2 (biotite hornblende granodiorite to leucotonalite), central facies B1 (biotite hornblende granodiorite to leucotonalite), central facies B2 (biotite hornblende granodiorite to leucocratic quartz monzodiorite), marginal facies (biotite hornblende granodiorite to tonalite), and granodiorite porphyry (biotite hornblende granodiorite porphyry). Central facies rocks are characterized by homogeneous leucocratic rocks, while marginal facies rocks by the heterogeneous melanocratic rocks with dark-colored inclusions.

In the case of the variation diagram of bulk rock chemistry, the trends of each rock type can be explained by fractional crystallization of early formed minerals. On the other hand, variation trend of central to marginal facies rocks is discordant with those of each rock type. Petrochemical evidence indicates that the typical adakitic rocks (central facies A1, A2, and granodiorite porphyry) can be derived by direct partial melting of subducted oceanic crust leaving garnet, clinopyroxene, and minor amounts of rutile. These adakitic granites show similar characteristics to those of Archean TTG compiled by Martin (1995) and of experimental slab melts (e.g., Rapp et al., 1991; Winther and Newton, 1991; Sen and Dunn, 1994). The adakitic rocks of central facies B1 and B2 are characterized by slightly lower in Sr contents and slightly higher MgO, Cr, Ni and Y contents and mg-values (= Mg/(Mg+Fe*)) than those in tipical adakitic rocks. In addition, the adakitic rocks from central facies B1 and B2 are slightly but clearly higher in MgO contents and mg-values than those of experimentary slab melts. The calc-alkaline marginal facies rocks are characterized by lower Sr and higher Y contents than the adakites, but the Sr/Y ratios are rather higher than the typical calc-alkaline rocks. Therefore, the adakitic characterisitics decrease from the central facies to marginal facies.

From this, the adakitic to calc-alkaline rocks from the central facies B1 and B2 and marginal facies rocks may be interacted with mantle peridotite and lower crustal amphibolite during their ascent, while those in the typical adakitic rocks of central facies may not. Such difference in the degrees of mantle contamination in the adakitic granites is analogous to the case of the difference in Cenozoic adakites and Archean TTG.