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Partial melting origin of Neoarchean migmatites in Daeijak Island, South Korea: A preliminary study

Yuyoung Lee* and Moonsup Cho
Scohool of Earth and Environmental Sciences, Seoul National University, Seoul 151-742, South Korea
(yuyoung2@snu.ac.kr)

The Precambrian basements in South Korea are known to have formed as early as Neoarchean, primarily based on depleted-mantle Nd model ages. We have recently found a migmatite complex of Neoarchean (ca. 2.51 Ga) age in Daeijak Island, situated in western Gyeonggi Massif. The lithology of Daeijak Island consists mainly of mafic-intermediate (45-58 wt% SiO_2) blocks or layers, migmatites and granites. Mafic blocks of gabbros and garnet-free amphibolites occur in close association with tonalites and migmatites. Leucosomes of migmatites are tonalitic. Migmatites are divided into four types: (1) diktyonitic, (2) stromatitic, (3) patchy and (4) agmatitic migmatites. Dictyonitic migmatites are characterized by mesosomes extensively dissected by veins of leucosomes. Leucosomes in stromatitic migmatites are 0.5-2 cm in thickness, and contain phenocrysts of hornblende and biotite. On the other hand, mesosomes consist of calcic amphibole, oligoclase (An_{19-23}), quartz and biotite together with small amounts of apatite, allanite, zircon and titanite. Mesosomes in stromatitic migmatites are locally boudinized. Leucosomes in patchy migmatites are coarse-grained, and contain subhedral to euhedral hornblende up to 0.7 cm. Agmatitic migmatites consist mainly of mafic blocks and granitic-tonalitic leucosomes. Migmatites and amphibolites are strongly deformed and subsequently intruded by granitic dykes. Some mafic blocks have plagioclase laths, 1-2 cm long, aligned to define the mineral lineation.

Mineral assemblages and textures of stromatitic migmatites suggest that partial melting is governed by the reatcion, biotite + oligoclase + quartz + fluid = calcic amphibole + tonalitic melt. Some portions of stromatitic and patchy migmatites contain resolved calcic amphibole and relict pyroxene, suggesting a high-temperature melting. Major and trace element discrimination diagrams suggest an island-arc setting for mafic rocks. The rare-earth element (REE) patterns of mafic blocks are characterised by two distinct groups showing either strong or weak LREE enrichment. This apparent discrepancy could be attributed to the difference in the degree of partial melting or the composition of source rock. Weak Eu anomaly indicates insignificant fractionation of plagioclase. Tonalites also show slight LREE enrichment, but further analyses are necessary to model their petrogenetic relationship with mafic rocks. Taken together, petrological and geochemical data of tonalites and migmatites suggest that both units are the product of partial melting of Archean mafic rocks.