Sr-Nd-Pb-Mg isotope geochemistry of Late Cenozoic basalts from Central Vietnam: Implications for a mixed pyroxenite-peridotite source

HOANG THI HONG ANH[1], SUNG-HI CHOI[1,2*], YONGJAE YU[1,2], PHAM TRUNG HIEU[3]

[1]Department of Astronomy, Space Science and Geology, Chungnam National University, Daejeon 34134, S. Korea (*Corresponding author: chois@cnu.ac.kr)

[2]Department of Geology and Earth Environmental Sciences, Chunganm National University, Daejeon 34134, S. Korea

[3]Department of Geology, Ho Chi Minh City University of Science, Vietnam

We determined geochemical compositions, including Sr, Nd, Pb and Mg isotopes for Late Cenozoic intraplate basaltic rocks from central Vietnam. The samples are compositionally trachybasalts, basalts and basaltic andesites. They exhibit typical oceanic island basalt-like LILE enrichment without significant depletion in HFSE. However, they show weak but remarkable positive Eu (average Eu/Eu* = 1.06) and Sr anomalies (average Sr/Sr* = 1.11) together with a frationated Ba/Th ratio, indicating important role of plagioclase in the genesis. The Sr-Nd-Pb isotopic compositions display a good linear array between depleted mid-ocean-ridge basalt (MORB) mantle and enriched mantle type 2 (EM2). They are characterized by high Fe/Mn ratios (60–72), FeO/CaO–3MgO/SiO_2 values (0.54–0.95) and low CaO contents (7.6–9.7 wt%) at a given MgO. Olivine phenocrysts also have higher Ni and Fe/Mn and lower Ca relative to those from peridotite melts, implying their derivation from pyroxenite/eclogite-bearing sources. Estimated primary magma compositions plot within the experimental fields defined by partial melting of garnet pyroxenite and garnet peridotite. The Mg isotopic compositions (δ^{26}Mg = -0.38 ± 0.06‰) are lower than normal mantle (δ^{26}Mg = -0.25 ± 0.07‰). In addition, the δ^{26}Mg values decrease with decreasing Hf/Hf* and increasing of CaO/Al_2O_3 ratios, indicating carbonates possibily in the source. We thus propose a hybridized peridotite/recycled carbonate-bearing gabbroic oceanic crust for the central Vietnamese basalts. Observation of systematic variations in geochemical compositions of Late Cenozoic basalts from southern to central Vietnam suggests spatial gradient in the amount and type (i.e., basalt, gabbro, sediment) of the recycled oceanic crust in the mantle source.