Metasomatism of the upper mantle beneath the Jeju Island, South Korea: evidence from secondary orthopyroxene and rare phlogopite in peridotite xenoliths

KYOUNGHEE YANG, GEUNYEONG PARK, EUNJU KIM

Dept. of Geological Sciences, Pusan National University, South Korea yangkyhe@pusan.ac.kr

Spinel peridotite xenoliths in Quaternary intraplate alkaline lavas from Jeju Island, South Korea, contain late-stage phlogopite and orthopyroxene replacing the previous minerals. The xenoliths are unique in having late-stage phlogopite and orthopyroxene as the metasomatic minerals and is considered as the most extremely metasomatized sample in the Jeju suite. Nevertheless, the constituent minerals are chemically homogeneous (olivine Mg# = 90, pyroxenes Mg# = 89-91, spinel Cr# = 13-18). Three different type of phlogopite are recognized: Type I phlogopite (Mg#s = 87-89) is observed in the xenolith selvage, occurring as thin elongated microveinlets crosscutting or filling olivine interstices, which are associated with secondary othopyroxene, or amoeboid spinel grains. Euhedral Type II phlogopite (Mg#s = 85-87) is observed at the contact between the host basalt and the xenoliths, being crosscut by the host basalt. Type III phlogopite (Mg#s = 80-84) is observed in the host basalt and crosscut by the host basalt. Except for Rb, Ba and Nb-Ta, clinopyroxenes from the xenoliths display a pronounced enrichment in La over Ce with similar concentration and patterns to each other. The geochemical differences depending on the paragenesis or textural difference of phlogopites are recognized. The phlogopites display progressive enrichment of trace elements from Type I to III, showing LREE-enriched patterns. It is reflected that the xenoliths have been affected by fractional partial melting (5-8%), followed by metasomatism. The metasomatic reactions from Type I phlogopites and the growing time of Type II phlogopites with respect to the velocity of ascent of the host magmas, have to have occurred at mantle depths some time before the xenoliths were entrapped. These rocks are of great importance for understanding complex modification of the region that accompany the migration of small-volume of high-K_2O and SiO_2 silicic fluids/melts, implying that the upper mantle lithosphere of the region was enriched to the variable extents by the contribution of subduction flavors.