Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SCG62-P05 Room:Convention Hall Time:May 22 17:15-18:15

Modification of continental lithosphere by the Miocene alkali basaltic activity recorded in gabbroic xenoliths in Shingu

NOGUCHI, Wataru[1*], MIZUKAMI, Tomoyuki[1], ARAI, Shoji[1], TAMURA, Akihiro[2]

[1]Graduate School of Natural Science and Technology, Kanazawa University, [2]Frontier Science Organization, Kanazawa University

Miocene alkali basaltic dikes in the Shingu area, Ehime Prefecture, brought up abundant crustal and mantle fragments. They bear the information of the petrological structure beneath the region at the beginning of subduction of the Philippine Sea plate. We provide results of petrological examinations on the xenoliths and discuss the chemical diversities in magmas at the east Eurasian continental margin.

The gabbroic xenoliths in the Shingu can be classified into three groups: Amph-bearing gabbro (A type), brown Cpx-bearing gabbro-pyroxenite (B type) and gabbronorite (C type). The microtextures of the A-type gabbro are almost granoblastic with local subhedral Pl. The Hbl-Pl thermometry indicates the lowest equilibration temperature among the Shingu mafic and ultramafic xenoliths. Therefore, they probably formed a part of the lower crust beneath the Shingu. The B type gabbro-clinopyroxenite has petrographical features similar to the Group2 xenoliths that are considered as cumulates from an alkali basaltic magma. The C type gabbronorite contains granular Cpx with abundant exsolutions of Opx and brownish interstitial Cpx with no exsolution. High temperature crystallization (1250oC) and re-equilibration (1050-1100oC) are estimated for the gabbronorite, indicating that they were located at a mantle depth. Mineral chemistry of exsolution-rich Cpx in gabbronorite (C type) is richer in Cr and Mg and has a lower abundance of REE than Cpx in groundmass of the host alkaline basalt and the B-type gabbros whereas Pl is richer in alkaline elements. The major and trace element mineral chemistry of the interstitial Cpx is similar to the B type Cpx. These textural and chemical features indicate that the C type gabbronorite were modally metasomatised by an alkaline magma that have crystallized the B-type cumulates.

In order to explain the silica-saturated and Cr-rich but highly alkaline nature of the magma for the C type gabbronorite, we consider assimilation of Opx in lithospheric mantle by ascending alkali basaltic magma. Model calculation including Opx assimilation and subsequent fractionation of Cpx largely reproduces the chemical signatures of Cpx in gabbronorite. The significantly HFSE-enriched geochemical character implies a separation of carbonatite melt in the magmatic evolution. Considering the highly potassic nature of the C type, the original alkaline magma was formed by a low degree of partial melting of mantle probably at the earliest stage of the alkaline magma activity in the SW Japan. Such a silica-undersaturated magma modified the lithospheric structure beneath SW Japan by removing Opx from peridotite in mantle and by crystallizing gabbronorite at around the Moho.