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一ノ目潟マールにおける下部地殻捕獲岩の熱史
Thermal history of lower crustal xenoliths from Ichinomegata Maar, NE Japan

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Xenoliths derived by maar eruptions are important source of information on the deep earth. In this study, we carried out petrographical study of crustal xenoliths from Ichinomegata Maar, NE Japan to constrain their origin and ascent processes. Among the xenoliths correction of Tohoku University, we selected seven hornblende (Hb) gabbro samples having cumulate texture. These samples include small amount (<~10 vol. %) of fine-grained crystals of plagioclase, olivine, clinopyroxene and magnetite with or without trace amount of intergranular glass. The Hb-gabbro xenoliths were divided into two types on the basis of modal composition and Hb mineral chemistry, one with abundant (ca. 50?65 vol.%) aluminous pargasite-tschermakite (Type-2) and the other less abundant (15?35 vol.%) and less aluminous (Type-1). The amphibole geothermo-barometer yielded equilibrium P-T conditions for the core compositions as follows: 400?650 MPa and 930?980oC for Type-1, and 500?1000 MPa and 900?1020oC for Type-2. These temperatures are higher than hydrous basaltic solidus, showing that the Hb-gabbro xenoliths were derived from cumulate zones of magma reservoirs in the lower and middle crust. The anorthite content (An#) of plagioclase cores are 85?95 mol%, which is consistent with the estimated temperatures. In order to constrain xenoliths capturing and ascent processes of host magma, we examined rim compositions and fine-grained crystals in the melt. In Type-1 xenoliths, Hb grains have relatively wide rim with relatively AlIV and alkali-rich, high Mg# (Mg/(Mg+Fetotal) in mol.%) compositions compared to the core. The plagioclase grains have a rim with Na-rich compositions (An# ~50?70) that overlap with the range of fine-grained plagioclase composition. These mineralogical characteristics show that rim compositions of Hb and Pl record heating event and magma ascent process, respectively. In Type-2 xenoliths, by contrast, Hb crystals have very thin, if any, rim and fine grained crystals are much less than Type-1. This indicates that Type-2 xenoliths have a shorter heating duration than Type-1, i.e., Type-2 were derived from the lower crust immediately after they were captured by the basaltic magma. The preheating event of Type-1 may correspond to the injection of hot basaltic magma into the lower crust.
Keywords: Ichinomegata, xenolith, hornblende Gabbro