

Geochemical and mineralogical evidences for evolved alkaline magmatism from pyroxene-hosted melt inclusions

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Dokdo and Ulleung Islands in South Korea are a place of intraplate multi-stage volcanism and have complicated geologic setting. Geochemical study for volcanic rocks has been widely studied in terms of magma composition, eruption age and volumes, but the deep magmatic system of Dokdo and Ulleung Islands are still highly arguable.

Melt inclusions provide opportunity to depict the the physico-chemical evolution of magmatic systems, mantle composition, trapping temperature, cooling rate, and volatile contents. Hence, we report the first results of mineral chemistry of daughter minerals preserved in melt inclusions within clinopyroxene phenocrysts in trachybasalt, trachyandesite, and trachyte using in situ Raman spectroscopy, SEM, and EPMA technique. To summarized the results, the pyroxene-hosted melt inclusions are commonly composed of amphibole (hornblende ± grunerite) ± vesicles ± Ti-rich magnetite. Especially, the magnetite contains relatively high TiO₂ (average of 8.04 wt.%) concentrations, which indicative of potential evidences of exsistence of Fe-Ti melts under oxidized condition. In addition, the euhedral magnetite might have been associated with high post-entrapment temperature (approximately 1150 °C) of melt inclusions in Dokdo and Ulleung Islands. Therefore, we concluded that Dokdo and Ulleung Islands volcanoes were originated by Fe-Ti rich magma under high temperature and oxidized conditions.