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オマーンオフィオライト・サラヒマントルセクション超苦鉄質複合岩体における単斜輝石の REE 組成とボニナイト質メルトの形成過程
Evidence for the formation of boninitic melt in the ultramafic complex from the Salahi mantle section,the Oman ophiolite

野本 有希 [1*], 高澤 栄一 [2]
Yuki Nomoto[1*], Eiichi TAKAZAWA[2]

[1] 新潟大学大学院自然科学研究科, [2] 新潟大学理学部地質科学科
[1]Grad School Sci and Tech, Niigata Univ, [2]Dept Geol, Facul Sci, Niigata University

An ultramafic complex in a scale of 8 km x 5.5 km is distributed in the southwestern part of the Salahi mantle section in the northern Oman ophiolite. Based on the study by Nomoto and Takazawa (2013) the complex consists mainly of massive dunite associated with minor amounts of harzburgite, pyroxenites and wehrlite. The spinels in the dunites from the complex have Cr# (=Cr/(Cr+Al) atomic ratio) greater than 0.7 indicating highly refractory signature. The range of spinel Cr# is similar to those of spinels in boninites reported worldwide (Umino, 1986; van der Laan et al., 1992; Sobolev and Danyushevsky, 1994; Ishikawa et al., 2002). The complex might be a section of dunite channel that formed by flux melting of harzburgites as a result of infiltration of a voluminous fluid from the basal thrust. We determined the abundances of rare earth elements (REE) in the peridotite clinopyroxenes (cpxs) by LA-ICP-MS to estimate the compositions of the melts in equilibrium with these clinopyroxenes.

The chondrite-normalized patterns for clinopyroxenes in the dunites are characterized by enrichments in light REE (LREE) relative to those of the harzburgite clinopyroxenes. The chondrite-normalized REE patterns for the calculated melts in equilibrium with clinopyroxenes in the dunites do not resemble to the pattern of N-MORB (Sun and McDonought, 1989) but fit very well to the patterns of the boninites (Cameron et al., 1983; Cameron, 1985; Taylor et al., 1994; Ishikawa et al., 2005). In the diagram of clinopyroxene REE contents versus spinel Cr#, with increasing the spinel Cr# from harzburgite to dunite, the Yb content of clinopyroxenes decreases whereas the Ce content increases. Chondrite-normalized REE patterns of clinopyroxenes in dunites indicate that the dunites are not a residue of closed system melting but a product of open system melting with addition of a LREE-enriched fluid. Our results supports a hypothesis that the dunites formed as residue after flux melting of harzburgite accompanied with LREE-enriched fluid infiltrated from the base of the ophiolite.
Keywords: boninite, dunite, flux melting, REE, open system melting, fluid