

Reexamination of genetic relationship between mantle peridotite and volcanic rocks in the Oman ophiolite

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The volcanic sequence in the Oman ophiolite consists of MORB, island arc tholeiite and boninite from the bottom to the top (Ishikawa et al., 2002; Yamazaki, 2012, Kusano et al., 2012, 2014). These evidences support the change in tectonic setting for the Oman ophiolite from spreading ridge to incipient subduction zone (Umino et al., 1990; Arai et al., 2006). The boninitic dikes and lavas in the Oman ophiolite are high-Ca boninite and require melting of cpx-bearing peridotite such as lherzolite (Kusano et al, 2014). However, boninite occupies only about 13 % of the lavas in the V2 unit (Kusano et al, 2014). It's left as an unsolved problem what and where the residue after extraction of island arc tholeiite is. Harzburgite with spinel Cr# (=Cr/(Cr+Al) atomic ratio) lower than 0.65 is widely distributed inside of the mantle section. We speculate that these harzburgites may be the residues after extraction of arc tholeiitic melt produced by flux melting of lherzolite during intra-oceanic thrusting. Clinopyroxenes in such harzburgite are highly depleted in LREE relative to HREE in the C1 chondrite-normalized REE patterns. Before flux melting the mantle section may have consisted of moderately depleted lherzolite which composition is similar to the basal lherzolites in the northern Oman ophiolite (Takazawa et al., 2003; Khedr et al., 2013, 2014). Highly refractory harzburgites and dunites locally occur in the lower part of the mantle section above basal thrust and have spinel Cr# greater than 0.7. Emplacement of hot young oceanic lithospheric mantle caused thermal metamorphism and dehydration of subducting oceanic crust (Hacker and Mosenfelder, 1996; Ishikawa et al., 2005). Both fluid and sediment-derived melt may have infiltrated into the mantle section caused flux melting of harzburgite and produced boninitic melt together with highly refractory dunite (Arai et al., 2006; Nomoto and Takazawa, 2013; Kanke and Takazawa, 2014).

Keywords: Oman ophiolite, mantle section, peridotite, island arc tholeiite, boninite, flux melting