Arc-related mantle in the northern Oman ophiolite; a preliminary report of orthopyroxenite-dunite-harzburgite suite

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The Oman ophiolite is one of the best examples to understand not only magmatic processes beneath mid-ocean rigde but also the history of the oceanic lithosphere (e.g. Nicolas, 1989). The origin of the Oman ophiolite has been still controversial and the transformation of the tectonic setting can not be ignored (e.g. Alabaster et al., 1982; Lippard et al., 1986). The arc-related signature has been discovered from crustal sections, for example, boninite (Ishikawa et al., 2002) and late-intrusives (e.g. Uesugi et al., 2003). In the mantle section, the discordant dunite is favorable to be the arc-related product (e.g. Kadoshima et al., 1999). Pyroxenite veins or layers are common features in the mantle section. Kadoshima and Arai (2000) reported the spinel-rich orthopyroxenite layer replaced by dunite within deformed harzburgite in the Oman ophiolite. The origin was considered to be high-pressure cumulate or residue of garnet-rich rock formed at the mid-ocean ridge setting rather than arc setting (Kadoshima and Arai, 2000). On the other hand, as the arc-related material, pyroxenite dykes within depleted peridotite, i.e. mantle-hosted pyroxenite dykes, have reported from the Bay of Islands ophiolite (e.g. Edwards, 1995; Varfalvy et al., 1997).

We examined orhtopyroxenite-dunite-harzburgite suites from wadi Kitnah (Buraymi area) in the northern Oman ophiolite. Many orthopyroxenite layers or dykes occur within host harzburgite. The dunite is usually interlayered between orthopyroxenite and host harzburgite. The thickness of orthopyroxenite and dunite layers is 10-30 cm. The orthopyroxenite is composed of orthopyroxene (95~ vol%), cpx (~5 vol%) and trace spinel (~1 vol%), and is free from olivine. The pyroxenite does not exhibit deformation texture whereas the host harzburgite has the porphyroclastic texture. The mineral chemistries scarcely indicate systematic relationships between orthopyroxenite, dunite and host harzburgite. All rock types, however, can be characterized by high Cr# (=Cr/(Cr+Al) atomic ratio) of spinel (Cr# 0.65-0.76). In harzburgite and dunite, the Fo content of olivine is relatively low (Fo89.9-91.1). The host harzburgite is depleted mantle possibly corresponding to the trend 2 harzburgite categorized by Matsukage et al. (2001). The trend 2 harzburgite should be an arc-related product formed by influx re-melting of MORB released mantle (Matsukage et al., 2001). Their samples were floating rocks corrected from wadis in the mantle section of the Oman ophiolite, therefore it was still unclear in field occurrence. In our study, we would like to discuss the origin of the host harzburgite on the basis of the formation of the suites, and its significance.