Variabilities in mineral and bulk rock compositions along the paleo ridge-segmentation inferred from the northern Oman ophiolite

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Recently, a center and an end of a paleo ridge segment in the Fizh block were inferred (Miyashita et al., 2003; Le Mee et al., 2004; Monnier et al., 2006). Moreover, Kanke and Takazawa (2006) reported a NW-SE trending highly refractory harzburgite zone in the northern part of Fith block.

We studied the mantle section of the Fizh Block in the northern Oman ophiolite to investigate a relation of mineral compositions with segment structure of plaeo-ridge and to identify highly refractory harzburgite zone associated with high temperature shear zones in the southern part of the Fizh block.

In this study we analyzed mineral compositions for 171 harzburgites and whole rock composition for 101 harzburgites. We considered compositional variation of depth and along paleo-ridge. We only used harzburgite sampled within 10km from paleo-Moho.

With increasing depth from paleo Moho to the basal thrust, spinel Cr# (=Cr$*$100/(Cr+Al)) decrease from 60 to 47.Furthermore, the spinel Cr# over 60 and olivine Fo greater than 91.5 always occur along shear zone. Because spinel Cr# increase as partial melting proceed (Arai, 1987), the degree of partial melting increase upward in the paleo-oceanic lithosphere. The range of spinel Cr# is limited in a range from 55.6 to 63.2 in the south Fizh block. On the other hand, in the Wadi Rajmi area a of the northern Fizh block, spinel Cr# ranges from 40 to 70. These results indicate that the range of spinel Cr# becomes greater from the south where segment center of a paleo ridge was located toward the north where segment end was located (Kanke and Takazawa, 2006; Murakami and Takazawa, 2007).

Whole rock compositions are uniform from base to the Moho. Similar to spinel compositions, range of whole rock compositions becomes greater toward northern part of Fizh block and more limited in the southern part of Fizh block. As a result, the variations of mineral and whole rock compositions consistent with the ridge-segmentation system discussed by Miyashita et al. (2003), Le Mee et al. (2004), and Monnier et al. (2006).

On the basis of the result, we propose next model. Because the temperature beneath the ridge segment center was relatively high, a homogeneous residual harzburgite was formed. Intensive fluid influx in the segment end during oceanic thrusting caused in the segment end more than in the centre resulted in larger variation of the degree of melting in the area. On the other hand, as the temperature below the segment boundary was relatively low, partial melting didn't advance resulted in relatively homogeneous harzburgite. The influx of flux during oceanic thrusting was not significant in the center of ridge segment and was limited near the shear zones.