

Spatial distributions of chemical compositions and microstructure in the Fizh block of the Oman Ophiolite

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The Oman ophiolite was a remnant of Neo-Tethys mid-oceanic ridge of Upper Cretaceous age that has been obducted on the east edge of Arabian Peninsula according to the collision of Eurasia plate in the Latest Cretaceous to the Arabia-Africa continent. The mantle research group of Niigata University has investigated the structural and compositional variability in the mantle section of the Fizh block located in the northern Oman ophiolite to understand the evolution of an ocean lithosphere; i.e., the formation at mid-oceanic ridge, oceanic detachment and obduction. As a result, the mantle section that had been thought to be composed of harzburgite of a homogeneous composition associated with dunite have structure and chemical composition significantly change in relation to a depth from the Moho, ridge segment structure, and to a shear zone.

In the Fizh block the ridge segment center has been inferred in the southern part and the ridge segment boundary is in the northern part (Miyashita et al., 2003; Le Mee et al., 2004; Monnier et al., 2006). Recently, a highly-refractory zone has been reported from the northern Fizh block. It distributes linearly with a NW-SE direction parallel to a high temperature shear zone indicating a trace of the remelting of oceanic lithospheric mantle (Kanke and Takazawa, 2006). The range of Cr# of spinel in the harzburgites expands from the southern part of the Fizh block toward the northern part. That is, in the southern part where the center part of a ridge segment has been inferred, the partial melting progressed thoroughly so that the degree of partial melting was relatively uniform. On the other hand, the degree of partial melting was much lower in the northern part where the ridge segment boundary has been inferred (Murakami and Takazawa, 2007). Afterwards, the remelting of lithospheric mantle initiated in the northern part probably due to a fluid flux supplied from the basal thrust along the segment boundary in the stage of oceanic thrusting forming the highly refractory zone in the northern of the Fizh block (Kanke and Takazawa, 2006).

The shear sense were estimated for harzburgites in the Fizh block on the basis of extinction angle of olivine in the oriented thin sections under a microscope. In the coarse granular domain that distributes beneath the Moho the hanging side flowed to the south between Wadi Rajmi and Wadi Zabin. The flow changed the direction to the west between Wadi Zabin and Wadi Fizh. Finally it heads for the south again in the southern part of the Fizh block. Clockwise rotation of the ocean lithosphere placed between overlapping ridge system where a ridge axis advances toward the south in the west side while another ridge axis advances toward the north in the east side. In the porphyroclastic domain that distributes below the coarse granular domain the dominant flow sense of hanging side is in a direction from south to north.

NW-SE shear zones with sinistral echelon arrangement crosscut both coarse granular and porphyroclastic domains in the Fizh block. Development of the shear zones should be after the clockwise rotation of the coarse granular domain. It may be related to a sinistral shear of the entire Fizh block probably during the oceanic thrusting. It is thought that the highly refractory zone is in parallel to the shear zone because the remelting of lithospheric mantle was coincided to the sinistral shear during the oceanic thrusting (Kanke and Takazawa, 2006).