

Volcanic stratigraphy and Magmatic process of the oceanic crust in the northern Oman ophiolite

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Oman ophiolite is one of the best fields to study magmatic processes beneath ocean ridges. In this ophiolite, upper mantle to extrusive section and pelagic sediments are exposed without serious tectonic disturbance. Extrusive section is divided into 3 volcanic units: V1/Geotimes (MORB-like) section, V2/Alley (arc volcanism) and V3/Salahi (within plate basalt). We have studied detailed volcanic stratigraphy of V1. Based on the lithostratigraphy obtained from Wadi Fizh area located at the segment boundary, magmatic process at the segment margin is discussed.

In Wadi Fizh area (segment boundary), 650 m height column of V1 is obtained from the basal part to the second upper horizons. This 650 m succession is divided into two sequences by the occurrence of thin upper about 40 cm thick at 415 m height from the basal part. 36 units (a unit is defined from a bottom of the sheet flow or pillow lava to the next sheet flow or pillow lava) are defined in this area. Lower 415 m of sequence consists of 16 lithological units. While upper 235 m height of succession made up of 20 units. Pillow lava with 1-1.5 m in diameter predominates, attaining 62 % in the lower and 72 % in the upper sequences. It is noted that because of superior of pillow lava, estimated total units number is the lowest. Thin jasper layer about several cm thick occurs at 280 m height in the lower V1 sequence. The appearance of the first upper and jasper layer at the lower V1 sequence in Wadi Fizh area indicates that some time gap exists within the V1 magmatism.

Geochemical signatures of the lower and upper V1 section are significantly different each other. Upper V1 sequence shows more depleted composition and higher Zr/Nb ratio than that of lower V1 sequence. Across the jasper horizon, Zr/Nb ratio does not change markedly but incompatible trace element concentration is slightly increased.

At East Pacific Rise, recent exploration for high-resolution bathymetry showed that numerous small seamounts are concentrated at the segment boundaries of second to third order. In these OSC (=overlapping spreading center), many of small seamounts are found (White et al., 2006). Spiegelman and Reynolds (1999) suggested that off-axis lava shows more depleted composition in incompatible elements than ridge volcanism in fast-spreading ridge.

Therefore, geochemical features of the lower and upper V1 sequence are in good agreement with that of EPR. Thus, the upper section of V1 in Wadi Fizh is may be generated by off-axis seamount volcanism, and this fact supports the idea that Wadi Fizh area is a second to third order segment margin (Adachi and Miyashita, 2003).