The role of melt lens beneath ocean ridges: Preriminary results from upper gabbro unit of the Oman ophiolite

Yutaka Nogawa[1]; Yoshiko Adachi[2]; Sumio Miyashita[3]

[1] Geology, Niigata Univ.; [2] none; [3] Dep. Geol., Fac. Sci., Niigata Univ.

It is generally regarded that long-lived magma chamber is present beneath fast-spreading ridges. A huge magma chamber models had been envisaged until 1980s. However, geophysical data along fast-spreading ridges showed absence of such large magma chamber, instead exhibited a thin melt lens with about hundreds m height and a few km wide. The melt lens is underlain by thick crystal mush zone. Subsequently, various magma chamber models beneath ocean ridges have been proposed so far. Most important problem is how to form the thick layered gabbro unit up to 4 to 5 km from such thin melt lens. There are two extreme end-member models, gabbro glacier model and sheeted sill model.

This study showed detailed vertical variations of mineral and bulk rock compositions, and lithology from the upper gabbros exposed in the Hilti block in the northern Oman ophiolite. The upper gabbros in the Oman ophiolite are formed by in situ crystallization and fractionation in the melt lens rather than by accumulation that is predominated process in the layered gabbro unit. We found that the varitextured gabbros occurring at -200˜-300m height below the base of the sheeted dyke complex are most evolved horizon within the upper gabbro units which span about 400 to 500 m thickness between foliated gabbro and sheeted dike complex. Therefore, we conclude that the varitextured gabbro were probably sandwich horizon. Although the most evolved rocks occur at the middle part of the upper gabbro unit (= sandwich horizon), it is noted that the mineral and bulk rock compositions evolve roughly upward in the upper gabbro unit. Zoning patterns of plagioclase are also varied from layered gabbro to upper gabbro through foliated gabbro, indicating that the mode of crystallization and solidification is significantly changed depending to their stratigraphic position. There lines of evidence suggest that sheeted sill models are more likely for magma chamber models beneath ocean ridges.