

Mylonitization of gabbroic rocks in the presence of fluids within the Mado Megamullion, Shikoku Basin, Philippine Sea

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Back-arc basins in the Philippine Sea Plate are characterized by the ubiquity of oceanic core complexes (OCCs). OCCs are domal bathymetric highs characterized by surface corrugations oriented parallel to the spreading direction and the exposure of serpentinized peridotites and gabbroic rocks by detachment faulting. Gabbroic rocks have common features in lithology and chemical composition among OCCs in both back-arc basins and slow-spreading ridges. Yet microstructural development to understand the rheological behavior of gabbroic rocks from the OCCs remains ambiguous. In this study, we focus on the deformed gabbroic rocks sampled along the transform fault area of the Mado Megamullion (site YK20-18S-6K-1569), located at the Shikoku Basin, Philippine Sea. These gabbroic rocks are classified into protomylonite, mylonite and ultramylonite, which are characterized by porphyroclastic textures consisting mainly of coarse plagioclase $\pm$ clinopyroxene $\pm$ amphibole grains with a fine-grained matrix. Microstructural and petrologic features within the mylonitic gabbros reveal the following deformation events including (i) plastic deformation synchronous with hydrothermal alteration with the retrograde metamorphic reaction: clinopyroxene + calcic plagioclase + fluid $\rightarrow$ brown amphibole + sodic plagioclase, and (ii) hydrothermal alteration after mylonitization for forming green amphibole. We compared the microstructural features of the mylonitic gabbros with those of typical OCCs around the world. As a result, mylonitic gabbros in the OCCs have commonly been deformed in the presence of the fluids. It suggests that the fluid infiltration could play a major role in weakening of the lower crust, resulting in the formation of the OCCs.

Keywords: oceanic core complex, gabbroic rock, mylonite, Shikoku Basin, Philippine Sea