Spatial variation of petrological and geochemical characteristics of mantle peridotites in Mado Megamullion, Shikoku Basin

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Oceanic core complex is one of the tectonic windows, where mantle peridotites are exposed directly to the ocean floor. The mantle peridotites can provide petrological and geochemical information of the inaccessible oceanic mantle. However, the mantle peridotites from the oceanic core complex bear a possibility that their petrological and geochemical characteristics were modified during exhumation to the ocean floor via detachment faulting. Thus, formation process of the oceanic core complex must be elucidated in order to better presume the pristine oceanic mantle materials therein. Here, we present petrological and geochemical characteristics of mantle peridotites collected from a newly termed backarc oceanic core complex, “Mado (window in Japanese)” Megamullion in the Shikoku Basin, Philippine Sea. The samples were collected through a series of scientific cruises, YK18-07 by R/V Yokosuka with DSV Shinkai 6500, and KH-18-2 by R/V Hakuho. A total of 16 samples is used here: 13 peridotites and 3 dunites. Vein-like oxide gabbros are included in some peridotite samples from a region close to the ridge axis (proximal region), whereas none of the peridotites showing such lithological characteristics were found from a region far from the ridge axis (distal region). In contrast, the dunite samples were found only from the distal region. Since dunites are commonly interpreted as fossil channels for primitive (silica-depleted) melts beneath mid-ocean ridges, they likely transported parental melts of mid-ocean ridge basalt (MORB) beneath paleo-ridge axis. With regards to the spatial variation of petrological and geochemical characteristics of the mantle peridotites, we delineate a scenario of Mado Megamullion formation, where the exhumed mantle materials were getting modified by evolved magmas with time proceeding, indicating magma stagnation due probably to time-dependent cooling of the ridge spreading system. Therefore, the mantle peridotites in the distal region might show relatively pristine geochemical compositions in comparison with those in the proximal region.

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