Petrology of the podiform chromitite from MAR 15°20’N, ODP Leg 209, Site 1271: a high-T metamorphism in an oceanic lithosphere

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Abyssal peridotites (dunite and harzburgite) and gabbroic materials, the rocks compose the moho transition zone, are recovered from 15 20 N FZ, the Mid-Atlantic Ridge (MAR) during (ODP) Leg 209 [1]. Several podiform chromitites were recovered at Site 1271, both Hole 1271A and B, south of 15 20 N FZ during the cruise [1]. The primary chromites in the chromitites have moderately high-Cr# (0.52 and 0.48 for Hole 1271A and 1272B, respectively) and chromian spinels in the surrounding chromitites have similar composition [2]. It is considered that podiform chromitite is formed by two kind of melt (melt-mantle interaction, therefore there should be plenty volume of melt in the mantle beneath this area. Abundant of gabbro and dunite were recovered from this area suggest that main volume of melt body were consumed in the upper mantle by melt-wallrock interaction.

On the other hand, chromite grains have thick rims of Cr-magnetite or completely replaced by magnetite without chromite core. Cr content elevation in the Cr-magnetite rim occurred with Fe-enrichment. These chemical modifications suggest that the chromitite from Site 1271 were metamorphosed at greenschist facies because significant Al-missing from chromite cores is taken place above 550 degree Celsius. This result implies that the podiform chromitite had been lodged in a high-temperature condition longer than most ophiolite chromitite. Harvy et al. [3] reported that the chromitite from the site has ca. 2 Ga by Re-Os dating. Recent discovery of ultrahigh pressure mineral inclusions with biogenic C-isotope ratio (-20 ~ -30 ‰) in chromitite from some ophiolites [4] implies that those chromitites are recycle mantle materials, which stayed in the lower mantle at some stages and circulated in the Earth Interior.

Keywords; chromitite, ODP, MAR 15°20’N FZ, abyssal peridotite, recycle mantle

References