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Chromitite pods within the Masirah Ophiolite-Batain Melange, Eastern Oman: Implications for its tectonic environment of formation

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Masirah Island is almost entirely composed of ophiolite, which is, however, completely unrelated to the nearby Semail Ophiolite of Oman. New studies show that ophiolites form most commonly in a subduction setting and that only few number ophiolites have formed at an ocean ridge. The Masirah ophiolite is one of the few true ocean ridge ophiolites that have been preserved (Moseley and Abbotts 1979; Dilek and Furnes, 2011; Rollinson, 2017) and lacks any indication that it formed in a subduction environment. The Masirah ophiolite is Jurassic in age and comprises two ophiolitic sheets and Mid Cretaceous ophiolitic mélange. The ophiolite is extremely well developed, and as well as the sheeted dykes, there are mantle serpentinites, several varieties of ultramafic to gabbroic cumulates, massive gabbros, pillow lavas, radiolarian chert, limestone and marl (Moseley and Abbotts 1979). The Masirah Ophiolite forms a straight NNESSW trending strip 40 km wide, extending 450 km from Ras Madrakah to the Batain coast. The Batain mélange is composed of several kilometres to a few metres blocks of all the rock types of the ophiolite. The predominant rock within the mélange is altered harzburgite, dunite pods, pyroxenite, with bastite pseudomorphs after orthopyroxene. Several chromitite deposits have been recently discovered in the ophiolite of the Batain mélange at Wadi Musawa, Eastern Oman. This is the first report of podiform chromitite from the Masirah ophiolite. These deposits have been extensively altered and deformed, with the host pyroxenite and dunite. The chromitites occur as separated small concordant, lenticular pods (3–10 m in thickness). The chromitites show mostly disseminated and massive textures. The spinel grains are reddish brown in thin section, and partly to completely altered to black chromite. Most primary silicate minerals are converted to secondary chlorite, serpentinite and pargasite. Olivine and clinopyroxene occurs as inclusions in the spinel grains. The forsterite content of olivine is between 90.0 and 92.0 in harzburgites and dunites. Discriminant geochemical diagrams based on the mineral chemistry of harzburgites indicate a Mid-Ocean-Ridge (MORB) origin. Orthopyroxene and clinopyroxene have moderate CaO, $Al2O_3$ and TiO_2 contents, resembling those of moderately depleted abyssal peridotites. Geochemical studies confirm that the Batain chromite is podiform type. Consequently, we propose that the Masirah ophiolite formed in a MORB setting. The chromitite deposits have similar cr# (0.54–0.59), mg# (0.6-0.64), $Al2O_3$ and TiO_2 contents to spinels found in MORB and has been interpreted as having formed in amid-ocean ridge setting. It appears that this chromite has been formed through reaction between a mid-ocean-ridge basalt- melt with depleted harzburgite in the uppermost mantle.

References

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