

Melt/fluid - rock reaction inferred from the Wadi Tayin mantle section in the southern Oman ophiolite

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We report the petrology and the mineral compositions of peridotites from the Wadi Tayin massif in the southern Oman ophiolite [1-3] to investigate the influence of arc related magmatism during oceanic thrusting of the ophiolite. Harzburgites, dunites and a small number of lherzolite were systematically corrected along wadis to cover the mantle section from the boundary between lower crust and uppermost mantle namely "Moho" to the basal thrust. Spinel Cr# [=Cr/(Cr+Al) atomic ratio] of harzburgite varies from 0.22 to 0.58 similar to the range in abyssal peridotites [4]. Moreover, it gradually increases from the basal part to the Moho indicating the compositional variation expected for the residual mantle column formed at a mid ocean ridge. On the other hand, the spinel Cr# of dunite often exceeds 0.6 in the NW-SE striking shear zone in the middle part of the study area. The chondrite-normalized rare earth element (REE) patterns of clinopyroxenes in peridotites from the shear zone show a linear pattern that monotonously decreases from heavy REE to light REE (LREE). Calculated melt compositions in equilibrium with these clinopyroxenes are equivalent with the V2 (Type2) lava reported in the northern Oman ophiolite [5-6].

The plots in Cr# of spinel versus Ce/Yb ratio of clinopyroxenes show a linear trend with a positive correlation. It indicates that the LREE enrichment of clinopyroxene is associated with an increase in the degree of melting. Clinopyroxenes in the dunite from the shear zone are most significantly enriched in LREE to middle REE and have REE abundances being in equilibrium with the V2 lava. We consider that harzburgites were suffered from a flux melting by infiltration of H₂O-rich fluid producing V2 lava. Comparing to the results from the northern massifs the linear trend in the diagram of Cr# of spinel versus Ce/Yb ratio of clinopyroxenes in the southern massif is obviously shifted toward lower in Cr#. It suggests that the infiltration of H₂O-rich fluid may have started at early stage of melting in the Wadi Tayin massif relative to the northern massifs.

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Keywords: Oman ophiolite, Mantle section, Peridotite, Melt/rock reaction