



Mineral chemistry and geochemistry of ophiolitic ultramafics from central Eastern Desert, Egypt: A case for contaminated mantle-derived magma

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The ophiolitic ultramafics are widely distributed in the Eastern Desert of Egypt. The present study is focused on two different localities of ophiolitic ultramafics in the central Eastern Desert (CED); Um Halham and Fawakhir. These ultramafic sections consist of serpentinites, serpentinitized peridotites together with talc- and quartz-carbonates. Chromite is the most common original magmatic phase recorded in these rocks then olivine and pyroxene. The chemistry of the Al-chromite indicates a temperature of $\sim 500\text{--}550$ °C consistent with lower amphibolite facies metamorphism. The high Cr# (> 60) of Al-chromites in the studied ultramafics resembles supra-subduction zone (SSZ) peridotites. Moreover, their higher Cr# suggests that they originated from the deeper portion of the mantle section with boninitic affinity. These mantle rocks equilibrated with boninitic melt have been generated by high melting degrees. The estimated melting degrees ($\sim 19\text{--}24$ %) of these mantle rocks lie within the range of SSZ peridotites. The Serpentinized peridotite and serpentinites have low $\text{Al}_2\text{O}_3/\text{SiO}_2$ ratios (mostly < 0.03) similar to fore-arc mantle wedge serpentinites and further indicate that their mantle protolith had experienced partial melting before serpentinization process. The LREE-enriched patterns of the ophiolitic ultramafics arose from crustal contamination of their mantle source but not from melt/rock reaction. A higher mantle contamination by crustal materials and/or subduction-related slab fluids of the CED ophiolites relative to that of the SED ophiolites is also proved.