Metasomatic signatures in Neoproterozoic ophiolitic serpentinites from Wadi Igla, South Eastern Desert of Egypt

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The ophiolitic serpentinites in the Wadi Igla area, south Eastern Desert of Egypt, represent a part of the widely distributed dismembered Neoproterozoic ophiolites of the Arabian-Nubian Shield (ANS) that formed in arc stage in different tectonic setting. Thus they might subject to exchange with the crustal material derived from recycling subducting oceanic lithosphere. This caused metasomatism enriching the rocks in incompatible elements and forming non-residual minerals. On the basis of mineral chemical and geochemical data, we present new evidences of metasomatic signatures in Wadi Igla serpentinites.

These rocks have harzburgite composition. Based on the Cr# and Mg# of the unaltered spinel cores, all rocks formed in oceanic mantle wedge in the fore-arc setting. These rocks are restites formed after partial melting between 23.06-24 %. Melt extraction occurred mainly under oxidizing conditions except a few samples under reducing conditions.

As all the studied rocks do not contain metasomatic phases, but the metasomatism is presented only in variable enrichment of the incompatible elements in composition of the forming minerals or whole-rock composition, thus it is concluded that the mantle reservoir rocks in the area of study underwent cryptic rather than modal metasomatism. In addition, the TiO2 spinel is positively correlated with the TiO2 whole-rock, proposing enrichment by the infiltration of Ti-rich melts.

The studied rocks are enriched LREE, FMEs and HFSEs. This took place mostly by different agents. As the H_2O-rich liquid, which seems to have been produced from the subducting oceanic slab percolating peridotites, gradually loses trace elements, the HFSEs are fractionated from LILEs and REEs. This could explain the high ratios of $(Nb/La)_N$ and $(Nb/Ba)_N$ of the studied rocks. All the studied serpentinites have subchonddritic ratios of Nb/Ta (0.30-10.28) and Zr/ Hf (3.37-27.65). It is suggested that Nb did not fractionate from Ta and Zr from Hf. There are might be silicate melts enriched the peridotites in Ta rather than Nb causing a much great decrease in the Nb/Ta ratio. This melt/fluid might have been derived from recycled subducted oceanic crust or from hot asthenosphere. Concentrations of U in all the studied samples are positively correlated with LILEs, Pb and Mo, indicating that the studied serpentinites were enriched in these elements from the same fluids, most probably derived from subducted oceanic lithosphere. Positive anomalies of Li, U, Mo and Pb are characteristics of hydrothermally altered ocean-floor peridotites. High Sr/Nd ratios may be typical of the hydrous metasomatism caused by hydrous melt/fluid.