Signatures of subduction related hydrous magmas from the geochemistry of the upper mantle rocks of the northern Semail ophiolite

S. ALAABED

Department of Geology,UAE University, P.O. Box: 11757, Al-Ain, UAE; (s.alaabed@uaeu.ac.ae)

Concentrations of the incompatible trace elements and REEs in the upper mantle rocks of the Northern Semail ophiolite are very low, as typical in the residua of partial melting and in the early products of a fractionating magma. However, their geochemical characteristics have shown indications of hydrous magmas that more likely related to a subduction environment.

Melt extraction can play a crucial role in the enrichment of incompatible trace elements. Upper mantle harzburgites are depleted relative to chondrite in all incompatible elements except Ba Th, Nd and Zr However, the geochemical distributions of incompatible trace elements in harzburgites do not support a solely melt extraction control. Therefore, the observed enrichment of such elements relative to other elements and to chondrites probably reflects metasomatism of the peridotite by hydrous magmas generated in a subduction zone environment.

The incompatible trace elements in dunites and chromitites show only a slight enrichment relative to harzburgites. In magmatic rocks, the magmatic signatures are usually controlled by the amount of trapped intercumulus liquid. In dunites and chromitites, the intercumulus melt is almost absent or highly difficult to identify as these rocks are probably very early crystal precipitates from rising magmas, and so their geochemical characteristics are very close to those of residues. However, a few important magmatic signatures can still be identified from their geochemistry. First, these rocks are characterized by a positive Ti anomaly. This is a very important indicator of the magmatic origin of these rocks, especially that this anomaly is not observed in harzburgite residues. Second, the enrichment in some LILE namely Ba is characteristic of hydrous magmas generated above subducted slabs. Third, Sr enrichment in dunites and chromitites with model clinopyroxene is greater than do those of least clinopyroxene.

REE concentrations in upper mantle peridotites from all areas are depleted relative to chondrite with slight enrichment in LREE relative to HREE which is probably inherited from the fertile parent rocks of the harzburgites. The REE contents of most dunite and chromitite samples are lower than those of chondrite, but the least altered massive chromitites and some dunites have higher LREE abundances than chondrites. This is another possible indication of involvement of a subduction related hydrous melt in the genesis of these rocks.