Geophysical Research Abstracts
Vol. 16, EGU2014-8385, 2014
EGU General Assembly 2014

Petrology and Geochemistry of ultramafic rocks from Wadi Alam, South Eastern Desert of Egypt: evidences for two Neoproterozoic mantle reservoirs?

Hamed Gamal El Dien, Mohamed Hamdy, Abdel Salam Abu El-Ela, and Adel Hassan
Geology Department, Faculty of Science, Tanta University, 31527 Tanta, Egypt (hgamaleldien@yahoo.com)

Ultramafic rocks of the Neoproterozoic age are common in the Eastern Desert of Egypt. These rocks are commonly considered as a part of the widely distributed dismembered ophiolite sequence. The studied ultramafic rocks from Wadi Alam are classified into two main domains: mantle slices and non-slice ultramafics with intrusive nature. The non-slice ultramafics are observed within the mantle slices. Petrological and geochemical studies of the Neoproterozoic ultramafic rocks from wadi Alam in the South Eastern Desert of Egypt provided new evidences for possibility of two Neoproterozoic mantle reservoirs.

The serpentinized ultramafic mantle slices have harzburgite composition. They underwent melting with 23.4 to 24% melt extraction. Following the melting, rocks suffered cryptic mantle metasomatism, including chemical enrichment of the incompatible elements (LILEs, HFSEs and LREE) relative to the primitive mantle compositions. Metasomatism in the mantle reservoir of the studied rocks took place mostly by hydrous fluids or silicate melts, which were derived from subducting oceanic lithosphere.

The non-slice ultramafics are classified as cumulates and their compositions range from the dunite, lherzolite to harzburgite. They initially were formed from MORB or Mg-rich tholeiitic melts. Their clinopyroxenes record formation temperature of 700 to 1192 ˚C and pressure of 10 to 12 kbar (i.e. 30-40 km depth). The enrichment characteristics of these rocks in the incompatible elements may reflect a metasomatized mantle source. The metasomatic signs of the proposed mantle source are related to melts derived from a subducting oceanic slab.

Based on the Cr# and Mg# of the unaltered spinel cores, the serpentinized mantle slices formed in oceanic mantle wedge in the fore-arc setting. On the other hand, formation of the non-slice ultramafics (melts-derived rocks) occurred in a nascent fore-arc setting, subsequent to the formation of the mantle slice peridotites. It is assumed that the mantle slice peridotites were the source for the parental melts of the non-slice ultramafics, where the melting occurred due to spreading in the MOR-arc transition setting. Also, the difference in the degree of serpentinization for the mantle slices with signs of higher degrees of metamorphism in one hand and the non-slice ultramafic bodies refers to different serpentinization events among these rocks.