Neoproterozoic Subarc Mantle of Southeast Sinai, Egypt: Mineral Chemistry, Geochemistry and Tectonic Implication

AYMAN E. MAURICE [1] AND MOKHLES K. AZER[2]

[1]Geology Department, Faculty of Science, Beni-Suef University, 62517 Beni-Suef, Egypt
Email: ayman.maurice@yahoo.com

[2]Geological Science Department, National Research Centre, 12622 Dokki-Cairo, Egypt
Email: mokhles72@yahoo.com

Two isolated small serpentinized ultramafic masses occur in the northeast part of the Wadi Kid area, southeast Sinai. These serpentinized ultramafic masses are tectonically emplaced into gneisses and metasediments. The rocks of these masses are variably serpentinized with fresh igneous relics of olivine, orthopyroxene, Cr-spinel and extremely rare clinopyroxene. The high Mg# (91.2-92.4) and low Al_2O_3/SiO_2 ratios (0.012-0.021) of these ultramafic rocks together with the high Cr# (>70) of their Cr-spinels and the high NiO contents of their olivines indicate that these rocks are similar to residual mantle rocks, which formerly experienced high degrees of partial melting. LREE-enriched chondrite-normalized REE patterns of the ultramafic rocks and the relatively low Fo content (mostly 87-88) of their olivines and Mg# (85-86) of their orthopyroxenes are consistent with melt/rock interaction. The estimated Al_2O_3 and TiO_2 contents (10-11 wt% and 0.36-0.47 wt%, respectively) of the reacted melts indicate that they probably were of boninitic composition. The calculated oxygen fugacity values of the serpentinized ultramafic rocks are high (between FMQ+1 and FMQ+2), reflecting their highly oxidized nature and development in upper mantle modified by subduction. The high Cr# (73-77) of Cr-spinels together with their low TiO_2 contents (0.10-0.19 wt%) suggest that these rocks probably developed in a subarc environment within a supra-subduction zone system.The present work proposes that the arc rocks of southeast Sinai may have been originated in a mature island arc rather than in an active continental margin setting. We interpret the serpentinized ultramafic masses of southeast Sinai as detached part of subarc mantle which tectonically juxtaposed subduction-related rocks through collision of a mature island arc with continental margin during closing of Mozambique Ocean and collision of East and West Gondwana.