Abu Hamamid Neoproterozoic Alaskan-type complex, south Eastern Desert, Egypt

Abstract
Abu Hamamid (AH) Neoproterozoic (Sm/Nd model age of ~770 ± 20 Ma) mafic–ultramafic intrusion lies along a NE–SW fracture zone in the Shadli Metavolcanic Belt, south Eastern Desert, Egypt. AH intrusion is concentrically zoned with cumulate clinopyroxene-bearing dunite core mantled by olivine clinopyroxenite, hornblende clinopyroxenite and hornblende gabbroic rim. The observed crystallization sequence is olivine (+spinel)-clinopyroxene–hornblende. Orthopyroxene is an extremely rare phase in the core rocks. Clinopyroxene is Ca-rich diopside and spinel shows wide range of Cr# (38–85) and Fe^{3+}# (22–95) ratios. Olivine ranges from Fo_{74} to Fo_{81}. The ferromagnesian minerals from the AH intrusion show a consistent decrease in the Mg# of olivine (81–74), clinopyroxene (89–81), and hornblende (87–66) from core to rim. The gradational contact between the different rock types of the AH mafic–ultramafic rocks, their cumulate nature, the recognition of small-scale layering together with the systematic modal and compositional variations of rock-forming minerals all point to generation by fractional crystallization from a common parental magma. Petrography and mineral compositional data suggest that the AH complex crystallized from fractionated hydrous tholeiitic magma with no significant crustal contamination.
AH intrusion shares many important field, petrographic and mineralogical features with Phanerozoic Alaskan-type intrusions formed above subduction zones, suggesting that the AH rocks formed in a similar tectonic environment. Clinopyroxene and spinel chemistry support the subduction-related (island-arc) tectonic environment of origin for the AH complex. This revives interests in models involving subduction-related (island-arc), and possibly plume-interaction origin for the Shadli Metavolcanic Belt.