Occurrence Of Rare Metals At Gabal Abu Khruq Area, South Eastern Desert, Egypt.

By

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بسم الله الرحمن الرحيم

وَعَلَّمْنَاهُ مِن لَّدُنَّا عِلْماً

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Abbreviations

W.	**=**	**Wadi**
ARC	**=**	**Abu Khruq ring complex**
G.	**=**	**Gabal**
F.N.S.	**=**	**Ferruginated nepheline syenites**
ESEM	**=**	**Environmental scanning electron microscope**
$Z^{\wedge}c$	**=**	**extinction angle**

Abstract

The present thesis deals with the geological, structural, petrographical, geochemical, minerlizations and radiometrical studies of the rock units especially ring complex of Abu Khruq area.

The study area is located in the southeastern Desert of Egypt between Long. 34º10´ and 34º23´E, Lat. 24º30´ and 34º45´N and wholly covered by the basement rock units.

The basement rock units in Abu Khruq area can be arranged toctonostratigraphy beginning with the oldest as follws: Ophiolite assemblage. (serpentinites and related rocks and mélange), arc assemblage {meta-andsites and their pyroclastics metasedimentary rocks, gneisses (hornblende gneisses and hornblende biotite gneisses) and gneissose granodiorite}, late to post Pan-African granitoids (alkali feldspar granites, perthitic syenogranites and muscovite syenogranites) and Phanerozoic alkaline phase {alkaline volcanics (trachytes and rhyolites and their pyroclastics), alkaline gabbros, syenitic rocks as well as associated dykes}.

The geochemical studies indicated that, Abu Khruq rock units originated from alkaline magma and emplaced a within-plate environment. The fresh rocks have the same values of trace elements of the similar rocks but the ferrigunated nepheline syenits have abnormal concentration of Zr (up to 7154 ppm), Nb (up to 1959 ppm), Zn (up to **300 ppm) eU (up to 620 ppm) and eTh (up to 1800 ppm) .**

The structural studies of G. Abu Khruq area, indicated the following points:

١- The first phase of shorting (D_1) is emphasized by symmetrical and asymmetrical anticlines with fold axis running in the NW-SE direction and maybe associated with syn-tectonic subduction of the in earlier times.

٢- The second phase of shorting (D_2) is emphasized by folding (F_2) with fold axis running in NNW-SSE direction and plunge toward NNW. The folding in this stage may be related to accretionary-transpressional stage of the Pan-African orogeny and associated with several strike-slip faults in several trends in this stage. This phase was followed by master joints running in NE-SW direction. These joints may be related to late Precambrian extension where granitic intrusions were probably formed by crustal remelting of the newly formed and thickened crust, possibly in extensional environments.

٣- The third phase of deformation (D_3) is proved by crenulation foliations (F_3) with fold axes running in WNW-ESE direction and plunge in ESE direction. These folds may be formed because of motion of African plate against Laurasian plate (late Jurassic-early Cretaceous), which effected in the southern of Egypt. Large number of dyke swarms proves the second phase of extension, which running in the ENE-WSW direction. This phase of extension is followed by another one which is proved by joints running in NNW- SSE (the third phase of extension) and may related to the opening of Red Sea. After this phase of extensions G. Abu Khruq area affected by a structural episode of strike-slip faults in several trends, which are the traced of old faults that rejuvenated during the opening of the Red Sea.

The mineralogical studies indicated that, Abu Khruq ring complex especially ferruginated zone which contains variety of minerals such as malachite, rosasite, franklinite, kasolite, thorite, ferrithorite, uraothorite, columbite, tantalite, pyrochlore, samarskite, ilmenorutile, mossite, primary and secondary origin zircon, granet, rutile, ilmenite, pyrite, pyrrhotite, monazite, orthite and fluorite (violet and colorless). LREEs occur within monazite, orthite, thorite, ferrithorite, uranothorite, columbite, tantalite, pyrochlore, samarskite, mossite and aegirine.

The radioactive studies proved the following:

١) The abnormal concentrations of radioactive elements are restricted to NE of ARC of nepheline syenites that are deformed, ferruginated and feldspathized.

٢) Pegmatoidal pockets in unaltered or altered nepheline syenites are usually higher concentration of radioactive elements than other varieties of nepheline syenites.

٣) Radioactivity and mineralization not related to ferruginated nepheline syenites, where the rhyolites, pyroclastics, spherulitic felsites and granophyre dykes show abnormal concentration of eU and eTh.

٤) Most of ferruginated parts of Abu Khruq ring are not-radioactive and contain background values of the eU and eTh.

٥) Uranium and thorium contents in unaltered plutonic and volcanic rocks of the ring complex are magmatic origin as well as basaltic andesite and syenite dykes, whereas the granophyre, alkaline diabase and tinguaite dykes as well as spherulitic felsites pyroclastic are magmatic and post magmatic origin.

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