Geological, Structural and Radiometric Studies of Abu Harba Area, North Eastern Desert, Egypt

A Thesis Submitted for Partial Fulfillment of the Requirements of the Master Degree in Science in Geology

By

Mohammed Abdel Rahman Ibrahim Soliman

(B.Sc. in Geology, Faculty of Science, Zagazig University, 2013)

Supervision Committee

Prof. Dr. Ali Farrag Osman
Prof. of Igneous and Metamorphic Rocks
Geology Dep., Fac., Sci., Ain Shams Univ.

Prof. Dr. Falham Oraby Mahmoud
Prof. of Geology
Nuclear Materials Authority

Dr. Hamed Mohamed Dowidar
Doctor of Structural Geology
Geology Dep., Fac., Sci., Ain Shams Univ.

To

Geology Department
Faculty of Science, Ain Shams University

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NOTE

The present thesis is submitted to the Geology Department, Faculty of Science, Ain Shams University in partial fulfillment of the requirements for the Master degree of Science in Geology. Beside the research work materialized in this thesis, the candidate ***Mohammed Abdel Rahman Ibrahim Soliman*** has attended five post-graduate courses for one year in the following topics:

1. Field Geology and Geostatistics
2. Advanced Lithostratigraphy and Biostratigraphy
3. Photogeology and Geomorphology
4. Sedimentary Rocks and Sedimentation
5. Advanced Structural Geology and Geotectonics

He has successfully passed the final exam in the above-mentioned courses, besides an English language course.

Prof. Dr. Ashraf Rushdi Mohamed Baghdady

Head of Geology Department
Faculty of Science
Ain Shams University

TO MY FAMILY

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ABSTRACT

Abu Harba area is located at northwest of Hurghada City, north Eastern Desert of Egypt, which covers about 280 km^2. The exposed rock suites in Abu Harba area are related to the Pan-African orogeny of the Neoproterozoic Arabian-Nubian Shield, which consists mainly of metavolcanics, metagabbro-diorite complex, Dokhan volcanics and younger granites. The post-granitic dykes and veins penetrate all the previous rock types and represent the last igneous manifestation in the study area.

The metavolcanics are ranging in composition from meta-basalts to meta-andesites, which commonly exhibit porphyritic textures indicating regional metamorphism within the range of greenschist facies conditions. The metagabbro-diorite complex appears as low hills with gentle slopes contacting with Dokhan volcanics which consists of vary-colored alternating successions of lava flows of andesites, dacites, rhyodacites and rhyolites interlayered with their pyroclastics.

The granites of Abu Harba area are categorized into syenogranites and alkali feldspar granites. Syenogranites are medium to coarse grained grayish pink color, holocrystalline and equigranular, while alkali feldspar granites are medium to very coarse grained grading into pegmatitic texture in some parts and ranging in color from pale pink, pink to reddish pink. They have been affected by hydrothermal solutions especially along fault zones that nearly responsible for the formation of secondary uranium mineralizations.

The investigated area has suffered many successive tectonic events of the Precambrian age. The detailed structural analysis of the joints indicates that the type of the stress is shear stress affecting NNE-SSW and NW-SE directions which represent nearly the direction of the Gulf of Aqaba and the Gulf of Suez respectively.

The fault trend analysis of Abu Harba area indicates two phases of deformation which are nearly perpendicular to each other and are responsible for the most of the direction of the lineaments in the area. These surface lineaments document multidirectional orientations with three main trends; ENE-WSW, NE-SW and E-W with the less dominant trend represented by WNW-ESE, and NW-SE directions.

The background of radioactivity in alkali feldspar granites is ranging from 11 to 24 ppm for the equivalent uranium. The radioactive anomalies are recorded in five occurrences for uranium mineralizations (uranophane, kasolite and betafite). Three of them with laboratory analysis reached more than 1250 ppm. The mineralizations of secondary uranium in Abu Harba area seem to be lithologically controlled, where the alkali feldspar granites contain high amounts of silica and alkalis where the gamma radioactivity depends on the degree of acidity in association with accessory minerals (zircon, sphene, fluorite, monazite and allanite) and iron oxides.

On the other hand, the ENE to NE extensional force in the study area allowed the hydrothermal solution that bearing uranium minerals to infiltrate upwardly parallel NW joint sets at the peripheral western part of G. Abu Harba alkali feldspar granites. The ENE to NE extension force represents major extension event related to Red Sea rifting affected Egypt. It is therefore believed that there is a strong relationship between the re-distribution and re-localization of the mineralization of G. Abu Harba alkali feldspar granites with the Red Sea rifting. So, mineralizations appear to be structurally controlled.

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