

**GEOCHEMISTRY AND EXTRACTION OF
URANIUM FROM THE URANIFEROUS
GRANITE OF UM ARA AREA ,SOUTH
EASTERN DESERT, EGYPT**

BY

MOHAMED EL SAYED IBRAHIM HASANIN SHETA
(B.Sc.)

TO

FACULTY OF SCIENCE
AIN SHAMS UNIVERSITY
GEOLOGY DEPARTMENT

FOR
PARTIAL FULFILMENT OF MASTER
DEGREE IN SCIENCE
(GEOLOGY)

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NOTE

The present thesis is submitted to Ain shams University in partial fulfilment of the requirements for the degree of Master of Science in Geology .

Beside the research work materialized thesis, the candidate Mohamed El Sayed Ibrahim Hasanin has attended ten post graduate courses for one year in the following topics

- 1- Mineralogy
- 2- Geochemistry
- 3- Igneous petrology
- 4- Metamorphic petrology
- 5- Sedimentary petrology
- 6- Sedimentation
- 7- Structural geology
- 8- Lithostratigraphy
- 9- Field geology and mapping
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- 11- English language

He has successfully passed the final exam in the above mentioned courses

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ABSTRACT

Um Ara area is situated in the extreme southern part of Egyptian Eastern Desert between latitudes $22^{\circ} 30'$ and $22^{\circ} 41'$ N & longitudes $33^{\circ} 46'$ and $33^{\circ} 54'$ E.

Um Ara area comprises different rock units, the concerned one is Um Ara granitic pluton, which is belonging to the younger granites of (El Ramly and Akaad, 1960), the late orogenic plutonites and associated quartz veins of (El shazly, 1964) and the younger granitoids of (El. Ramly, 1972). It forms a composite granitic mass emplaced at two successive cycles (Ibrahim, 1986). Um Ara granitic pluton comprises three rock varieties, porphyritic monzogranite, hypidomorphic monzogranite and perthitic leucogranite. Transolvus textures are the most commonly recognized in Um Ara granitic pluton. Growing of newly formed albite or albitization took place as a result of hydrothermal activity which is probably responsible for mineralization within the pluton. Mineralogical modal analysis was carried out to define the proper name of the analysed samples. Plotted samples are restricted into two fields; syenogranite and monzogranite.

Radioactive potentialities of Um Ara granitic pluton was determined by determination of uranium in all collected samples (68). The results show that uranium distribution is structurally controlled.

Mineralogical study of the uranium minerals was achieved after heavy liquid separation by using bromoform (sp. gr. 2.81), magnetic,

separation at 1.5 amper, by X-ray diffraction technique and infrared spectroscopic investigation. The determined minerals were secondary uranium minerals uranophane and beta-uranophane.

Geochemistry of Um Ara granitic pluton was studied by complete chemical analyses for major, minor and trace elements. A lot of studied diagrams show the geochemical characteristics of the analysed samples. These diagrams show that Um Ara granitic pluton tends to be sodic, calc alkaline in nature, with shoshonitic affinities and located in acidic differentiation fields on felsic - mafic indices diagram. By plotting of R1 and R2, It was concluded that, Um Ara granitic pluton has been formed at late orogenic movement.

Trace elements of the analysed samples were also used to determine environments of formation. Due to the complicated history of Um Ara granitic pluton, the defined environments were WPG and VAG. The tectonic environment of Um Ara granitic pluton could be explained by VAG and enrichment in some trace elements took place through more than one cycle of magmatic activity.

Leaching and extraction experiments for a selected sample were done to obtain the optimum conditions. Optimum leaching conditions were defined as, sulfuric acid concentration 20kg/t. ore, solid /liquid ratio 1/2, grain size- 70 mesh and pugging the ore for two days at room temperature. It is worth mentioning that, about 10% of uranium

content of this ore is found as inclusions in accessory minerals (e.g. zircon) which required severe leaching conditions. Finally the obtained leach liquor contains 500 ppm U at pH 1.76.

Uranium extraction by organic solvent technique was preferred in the present work. The used extractant was diethyl hexyl phosphoric acid (D2EHPA). The optimum conditions for uranium extraction from this ore were found to be o/a phase ratio 1/6, D2EHPA concentration 0.075M., shaking time 15 min. at room temperature. These conditions could transfer > 95% of the uranium present in the leach liquor. McCabe Thiele diagram was also constructed to define the required stages of countercurrent extraction as four stages. Uranium stripping is a process for re-extraction of uranium of the loaded solvent. Concentrated HCl was used for uranium stripping. The optimum conditions for this purpose have been defined as follows: conc. HCl, shaking time 15min., a/o phase ratio 1/2 at room temperature. McCabe Thiele diagram for uranium stripping shows three stages for this purpose. The obtained HCl solution contains 16g/L uranium.

Finally a proposed flow sheet for uranium extraction from the studied ore has been constructed.

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