شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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HANAA ALY

Geology Department

Facies, Geochemistry and Rare Elements Potentiality of Um Bogma Formation in the Area East of Wadi Baba, Southwestern Sinai, Egypt.

By

Amany Refaat Ahmed Sayed

Nuclear Materials Authority, Cairo, Egypt.
M. Sc. in Geology, Ain Shams University (2017)

B.Sc. in Geology and Chemistry, South Valley University (2007)

Supervised by

Prof. Dr./ Mohamed M. Abu-zeid
Emeritus Professor of Mineralogy and Sedimentary Petrology,
Ain Shams University

Prof. Dr./ Ahmed M. El-Kammar
Emeritus Professor of Geochemistry,
Cairo University
(Deceased)

Prof. Dr./ Ibrahim E. El-Aassy
Emeritus Professor of Uranium Geology, Nuclear Materials Authority.

Prof. Dr./ Yehia H. Dawood
Professor of Mineralogy and Geochemistry,
Ain Shams University.

Prof. Dr./ Ashraf R. Baghdady
Professor of Sedimentary Petrology,
Ain Shams University.

Prof. Dr./ Gehan A. Mohammed
Professor of Mineralogy,
Nuclear Materials Authority.

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Student Name/ Amany Refaat Ahmed Sayed

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Degree/ Geology Specialist in the Nuclear Materials Authority

Supervisory Authority/

Prof. Dr. Mohamed M. Abu-zeid	Ain Shams University
Prof. Dr. Ahmed M. El-Kammar (Deceased)	Cairo University
Prof. Dr. Ibrahim E. El Aassy	Nuclear Materials Authority
Prof. Dr. Yehia H. Dawood	Ain Shams University
Prof. Dr. Ashraf R. Bagdady	Ain Shams University
Prof. Dr. Gehan A. Mohamed	Nuclear Materials Authority

Examiners Committee/

Prof. Dr. Osama M.A. El Badry	Zagazig University
Prof. Dr. Atef M. Ibrahim	Al Azhar University
Prof. Dr. Mohamed M. Abu-zeid	Ain Shams University
Prof. Dr. Ibrahim E. El Aassy	Nuclear Materials Authority

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Employee Signature Director of Studies Department

Signature

Faculty Secretary


سنريهم آياتنا
في الآفاق وفي أنفسهم حتى يتبين لهم أنه الحق
أَوَلَمْ يَكْفِ بِرَبِّكَ أَنَّهُ عَلَىٰ كُلِّ شَيْءٍ شَهِيدٌ
- فصلت ٥٣ -

Dedicated to

The soul of my lovely brother,

Ayman

&

My supportive Family

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Abstract

Key words: Egypt, Sinai, Lower Carboniferous, Um Bogma Formation, facies, genesis and diagenesis, radioactivity, trace and rare earth elements, base metals.

The mineralized Lower Carboniferous Um Bogma Formation was studied in eight localities distributed in a vast area east of Wadi Baba. These localities are (from west to east): Talet Seliem, Abu Zarab, Abu Thor, Farsh Al-Azraq, Allouga, Lehyan, Wadi Sewig and Ramlet Hemiyer. Extensive field studies comprised the preparation of geologic maps, the collection of a large number of spot and channel samples and carrying out radiometric measurements.

The Um Bogma Formation in the study area consists of three members showing marked lateral variations in thickness and lithology. Their facies characteristics were determined based on their lithologic and petrographic attributes as well as the primary sedimentary structures. Throughout the study area, the lower member consists of four facies types; namely: mudstone- gibbsite- dolostone- dolomitic limestone, bedded laminated siltstone, dolostone- dolimitic limestone and sandstone. The middle member is made up of five facies; namely: siltstone- claystone-dolostone, laminated siltstone- mudstone, laminated siltstone, siltstone-gibbsite- dolostone and siltstone- sandstone- dolostone. The upper member consists of three facies types; namely: dolostone, siltstone and sandstone-conglomerate.

The detailed petrographic, mineralogic and geochemical characteristics of the studied Um Bogma rocks were determined using several lab techniques. The argillaceous rocks are texturally classified as claystone, mudstone, sandy mudstone, siltstone, sandy siltstone and muddy sandy siltstone. The arenaceous rocks are represented by sandstone, muddy sandstone and gravelly muddy sandstone whereas the rudaceous rocks are muddy conglomerate and muddy sandy conglomerate. On the other hand, the Um Bogma carbonate rocks are petrographically classified as sparite, dolosparite, intra-sparite, dolo- intrasparite, dolomitized macrosparite, dolo-biosparite, dolomitized intra- oo-sparite and dolomitized oo- bio-microsparite.

The light and heavy fractions of the studied Um Bogma rocks consist of large assemblages of essential and accessory minerals that are non-

radioactive, radioactive and U-, Th-, REEs- and base metals- bearing. Based on their forms, habits and modes of occurrences, these minerals could be genetically cassified as primary allogenic, primary authigenic, secondary allogenic and secondary authigenic.

The results of extensive geochemical studies confirmed the varying enrichment of the studied rocks in many trace and rare earth elements as well as base metals. The rocks in Allouga locality and, to a lesser extent, those in Talet Seliem and Abu Zarab have the highest potential as possible resources of these elements. Sequential extraction of Mn, Cu, Fe, Pb, U, Th, Y, La and Dy from five fractions revealed that these elements are exchangeable, bound to carbonates, iron and manganese oxides and organic matter and/or residual.

The distributions of trace elements and REEs among the different rock types show variation based on their affinities to specific lithologies. The REEs generally show enriched patterns and negative Eu anomalies. U enrichment in the rocks is correlated with the occurrence of several types of uranyl silicate minerals such as uranophane, sklodowskite, cuprosklodowskite, carnotite, uranothorite, kasolite and torbernite. The co-existence of these minerals reflects variations in the activities of Ca, Mg, Cu and Pb. The hydrothermal activities related to the Red Sea extension were responsible for the oxidation of sulfides, alteration of primary minerals and genesis of Mn oxides, surficial uranyl and REEs mineralizations. Based on the obtained data, certain localities are recommended for future prospecting plans.

The results of the laboratory radiometric examinations revealed that the studied Um Bogma rocks are variably enriched in U, Th and K. The activity concentrations of ^{238}U, ^{232}Th and ^{40}Kvary among the rocks in the various localities as a result of differences in their mineral and chemical compositions. The rocks in the western and central sectors of the study area are more radioactive than those in the east. In almost all localities, the mean activity concentrations are in the order of $^{232}Th < ^{238}U < ^{40}K$. The total dose rate is extremely higher than the world average value. The D- factor reveals that most of the studied samples have values of the chemically analyzed U greater than those obtained radiometrically reflecting a disequilibrium state characterized by U addition.

Assessing the sedimentary history of the studied Um Bogma rocks revealed that their detrital components were inherited from felsic to mafic igneous rocks and, to a lesser extent, metamorphic and older sedimentary

rocks in Post Archean source areas. These parent rocks were affected by moderate to strong chemical weathering under predominant tropical climatic conditions. The weathering products were transported (mainly mechanically) to the depositional environments by rivers and streams of low to moderate energy. Sediments of the lower and middle members were deposited in shoreline environments (lakes, lagoons, tidal flats and tidal deltas) and, in the eastern localities, fluviatile environments (river channels and alluvial fans). The transition from the middle to the upper members witnessed a minor southeastward sea transgression that resulted in the prevalence of tidal flat and tidal delta environments at the expense of lakes and lagoons with the persistence of fluviatile deposition in the eastern sector of the study area. Generally, deposition of the Um Bogma sediments occurred under warm humid climatic conditions and witnessed fluctuations in the water salinity.

Diagenesis greatly modified the original textural and compositional characteristics of the studied Um Bogma rocks. It commenced during the mesogenic (burial) stage but was more profound during epigenesis. The diagenetic processes are represented by compaction, cementation, replacement, alteration (mainly dolomitization) and dissolution. The effect of each of these processes varied among the different localities, stratigraphic levels and rock types.

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