بسم الله الرحمن الرحيم

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MINERALOGICAL AND GEOCHEMICAL STUDY OF EVAPORITE SEDIMENTS FROM LAKE QUAROUN WATER UNDER VARIOUS CONDITIONS OF SALINE WATER CONCENTRATIONS (FAIYOUM – EGYPT)

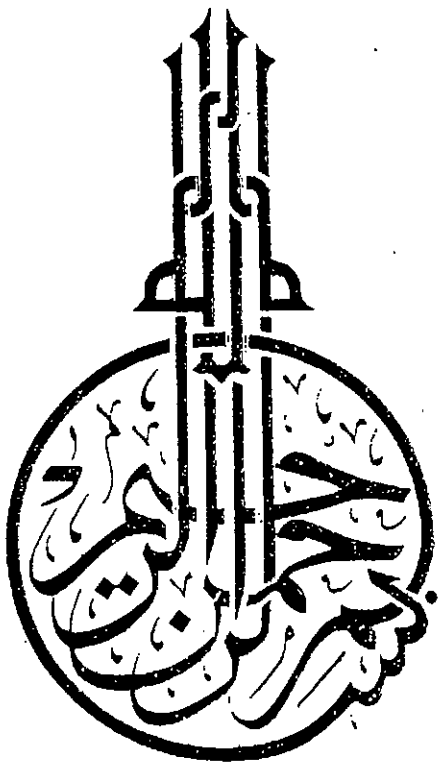
A THESIS

Submitted in partial fulfillment
for the requirements of the Master
Degree of Science in Geology

BY

RAGAB MOHAMED MOHAMED EL- SHEIKH
(B.Sc., in geology)

To
Geology Department
Faculty of Science
Ain Shams University
2004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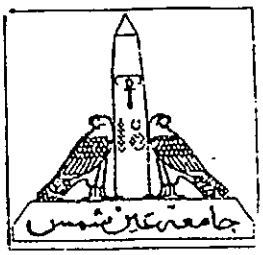

Approval Sheet

Name : Ragab Mohammed Mohammed El sheikh

Title : Mineralogical and Geochemical studies on Evaporites Sediments from Lake Quaroun Under Various Conditions of Saline Water Concentrations (Faiyoum – Egypt)

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Geology

Supervised By :

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To my Father's spirit, my mother, my wife and my sons

NOTE

The present thesis is submitted to the Geology Department, Faculty of Science, Ain Shams University in partial fulfillment of the requirements for the degree of Master of Science in Geology.
Beside the research work materialized in this thesis, the candidate Ragab Mohammed Mohammed Elsheikh 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- Field geology and mapping
8- Geostatistic and introduction of basic programming
9- Laboratory technique
10- Crystallography

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

Prof.Dr.Mohamed El Bokhaty
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ABSTRACT

MINERALOGICAL AND GEOCHEMICAL STUDY ON EVAPORITE SEDIMENTS OF LAKE QUAROUN WATER UNDER VARIOUS CONDITIONS OF SALINE WATER CONCENTRATIONS(FAIYOUM- EGYPT).

The present study deals with the mineralogical and geochemical studies of the evaporite sediments in the Faiyoum Depression (Quaroun Lake).

The studied area lies between latitude 29° 26\ · 29° 27\ N and longitude 30° 40\ , 30° 41\ E in the Western Desert , north of Faiyoum province at a distance of about 112 km south west of Cairo , in the southern coast of lake Quaroun. The area is hot and dry , rainfall is rare .

Thirty three cores were collected from the sediments of the four successive saline and hypersaline ponds , petrographical and mineralogical studies were undertaken using transmitted light microscopy , scanning electron microscopy and X- ray diffraction.

The evaporite sediments of the first pond are characterized by presence of low magnesium calcite and gypsum: however non-evaporate minerals are aragonite , quartz and clay (montimorllonite, kaolinite and illite). The evaporite sediments in the second pond are characterized by the presence of gypsum and carbonate mud. Carbonate mud is represented as low and high magnesium calcite, however non- evaporite minerals are aragonite, quartz and clay (montimorllonite, kaolinite and illite). In the third pond the evaporite sediments are characterized mainly by the presence of gypsum , halite and minor quantities of glouberite, and traces of magnesium

traces of magnesium calcite, however non- evaporite minerals are quartz and clay (montimorllonite, kaolinite and illite). The fourth pond evaporite sediments are characterized by the presence of glouberite, thenardite and halite mainly, gypsum , allenite and leonhardrite as minor. However non- evaporite minerals are quartz and clay (montimorllonite, kaolinite and illite).

Chemical analyses of lake Quaroun water , and the various saline and hypersaline ponds understudy were analyzed and discussed. The present study revealed that the average salinity values of the successive solar ponds water increase from 60.7 g./l. In the first pond to maximum value in the fourth pond which attains to 357g./l., the average salinity value is of about 123 g./l. and 244g./l. respectively in the second and the third pond.

The values of the ion concentrations and molecular ratios reflected the type of mineral precipitation. Such these ratios , mMg^{+2}/mCa^{+2} , Cl^{-}/SO_4^{-2} and mNa^{+}/Mg^{+2}, the postulated flow diagram revealed that the lake Quaroun water and type of the brine of the fourth pond are Cl , Na, Mg and SO_4 brine.

The behaviour of the major ions in the studied brine such as , Cl^{-} , Ca^{+2} , SO_4^{-2} , HCO_3^{-} & CO_3^{-2} and pH were discussed.

Parameters affecting forming evaporite of artificial saline and hypersaline ponds also discussed.