# CLAY MINERALOGY OF CERTAIN GREAT SOIL GROUPS IN RELATION TO SOME SOIL CHARACTERISTICS

رسالة

By

**SAMY MOHAMED AHMED ABD-ALLA**
B.Sc., Agriculture Science (Soil Sci.), Ain Shams Univ., 1983
M.Sc., Agriculture Science (Soils Sci.), Ain Shams Univ., 1988

A thesis

submitted in partial fulfillment of the requirements for the degree

of

**DOCTOR OF PHILOSOPHY**

in

Agricultural Science

(Soil Science)

52163

Department of Soil Science
Faculty of Agriculture
Ain Shams University

1996

631.4
S. M

Central Library - Ain Shams University

# APPROVAL SHEET

## CLAY MINERALOGY OF CERTAIN GREAT SOIL GROUPS IN RELATION TO SOME SOIL CHARACTERISTICS

BY

**SAMY MOHAMED AHMED ABD-ALLA**
B.Sc., Agriculture Science (Soil Sci.), Ain Shams Univ., 198
M.Sc., Agriculture Science (Soil Sci.), Ain Shams Univ., 198

This thesis for Ph.D. degree has been approved by:

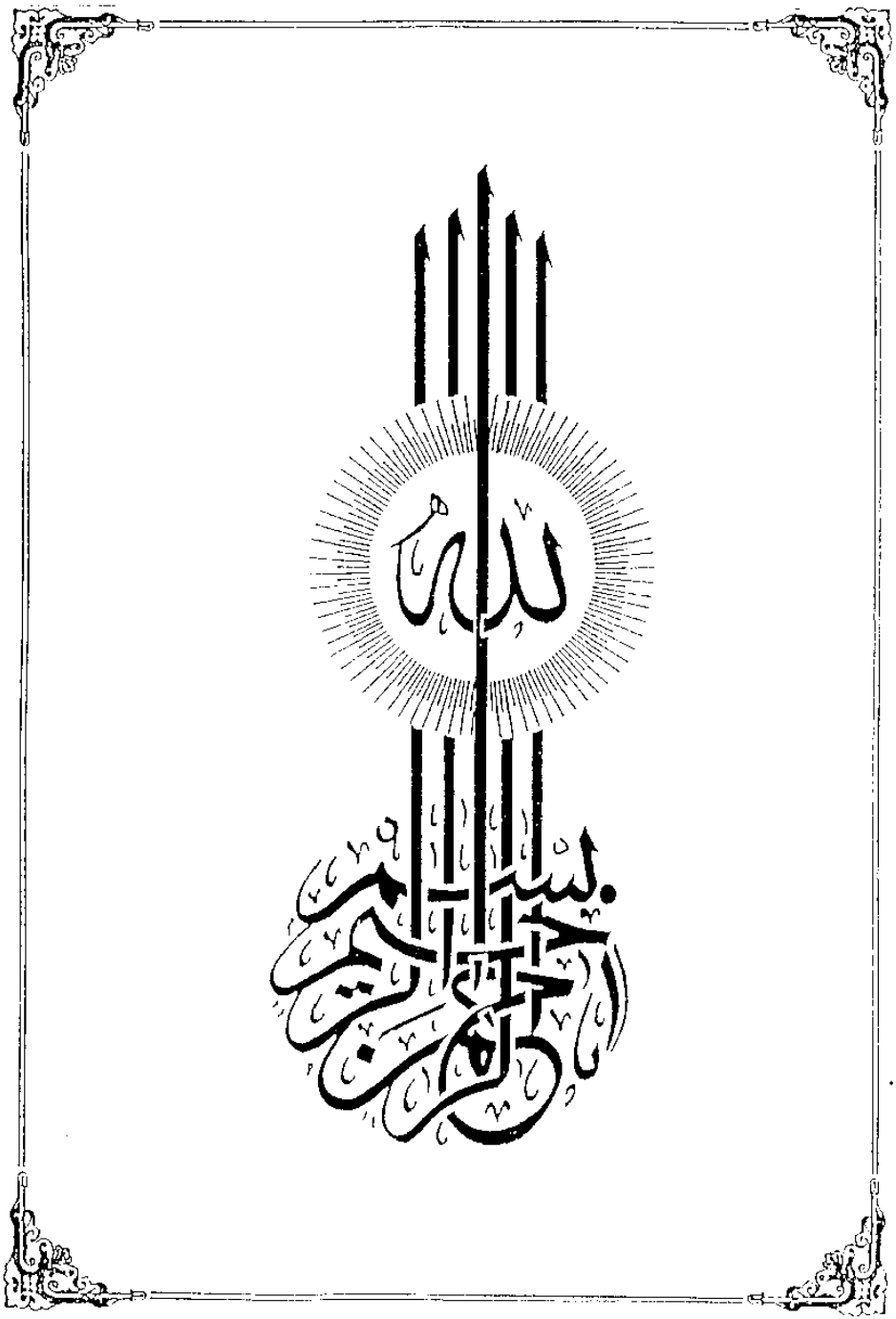
**Prof. Dr. F.H. Abd El-Kader**
Prof. of Soils, Alex. Univ.

**Prof. Dr. A.S. Sheta**
Prof. of Soils, Ain Shams Univ.

**Prof. Dr. Farida H. Rabie**
Prof. of Soils, Ain Shams Univ.
(Supervisor)

Date of examination : / / 1996

Central Library - Ain Shams University




Central Library - Ain Shams University

# CLAY MINERALOGY OF CERTAIN GREAT SOIL GROUPS IN RELATION TO SOME SOIL CHARACTERISTICS

**BY**

**SAMY MOHAMED AHMED ABD-ALLA**
B.Sc. Agriculture Science (Soil Sci.), Ain Sham Univ., 1983
M.Sc. Agriculture Science (Soil Sci.), Ain Shams Univ., 1988

**Under the Supervision of:**

**Prof. Dr. F.H. Rabie**
Prof. of Soils, Ain Shams Univ.

**Prof. Dr. F.M. Abdou**
Prof. of Soils, Ain Shams Univ.

**Prof. Dr. A.M. EL-Araby**
Prof. of Soils, Ain Shams Univ.

Central Library - Ain Shams University

## ABSTRACT

CLAY MINERALOGY OF CERTAIN GREAT SOIL GROUPS IN RELATION TO SOME SOIL CHARACTERISTICS. Unpublished Doctor of Philosophy in Agriculture, University of Ain Shams, 1996.

The aim of this investigation is to study the mineralogical composition of clay fractions in some great soil groups in Egypt namely, Torrerts, Calciorthids, Gypsiorthids and Torrifluvents. Special interest was directed on the identification, formation and types of interstratified layer silicates and intergradient clay minerals.

Sampling locations were selected according to the pedogenic map of Egypt and Land Master Plan to represent the common great soil groups in and outside the Delta region.

The mineralogical composition of clay fractions in each great soil group was identified and discussed in relation to their physical, chemical and morphological characteristics. Some soil characteristics such as, soil moisture characteristics, soil hydraulic conductivity and shrink-swell potential were estimated and discussed in relation to the clay mineralogical composition of these great soil groups.

In order to identify the exact member of interstratified species, detailed X-ray diffraction analyses were conducted on some clay samples saturated with different cations, i.e., Na, Mg, K, Ca, Li solvated with either ethylene glycol or glycerol and heated to different temperature, 110, 180, 350, 500, 550 and 600°C. Each interstratified mineral species was identified according to its respective d-spacing.

The identified species are:
Regular interstratified illite-smectite, regular interstratified chlorite-smectite, regular interstratified chlorite-vermiculite, random interstratified smectite-vermiculite, and the intergradient minerals(chloritized montmorillonite and chloritized vermiculite).

Some of the above-mentioned interstratified species identified by X-ray diffraction were examined by D.T.A. for further confirmation.

Some soil physical properties such as moisture characteristics, COLE and hydraulic conductivity were estimated and correlated with the clay content and clay mineral composition of some representative samples for the studied Great Soil Group.


---


**Key words:** Interstratified minerals, Intergradient minerals, X-ray diffraction analysis, Great soil groups, Clay mineralogical composition.



Central Library - Ain Shams University

Central Library - Ain Shams University

ACKNOWLEDGMENT

The author whises to express his greatest appreciation and deepest gratitude to Prof. Dr. Farida H. Rabie, professor of soil pedology, Soil Department, Faculty of Agriculture, Ain Shams university, for planning this work, deep interest, remarkable encouragement and effective guidance throughout the investigation and preparation of the manuscript.

Special thanks and deep appreciation are extended to Prof. Dr. F.M. Abdou, Soil Department, Faculty of Agriculture, Ain Shams University, for his contribution in supervision, continuous guidance, helpful, and criticism throughout the different stages of investigation.

The author wishes to extend his appreciation for Prof. Dr. A.M. El-Araby, Soil Department, Faculty of Agriculture, Ain shams University, for his great help and valuable guidance throughout this investigation.

I am particularly grateful to all members of Soil Science Department, Faculty of Agriculture, Ain Shams University, for their help and cooperation.

Central Library - Ain Shams University

Central Library - Ain Shams University

## CONTENTS



Central Library - Ain Shams University

CONTENTS (Cont.)



Central Library - Ain Shams University

# LIST OF TABLES



Central Library - Ain Shams University

## LIST OF FIGURES



Central Library - Ain Shams University

LIST OF FIGURES (Cont.)



Central Library - Ain Shams University

## LIST OF FIGURES (Cont.)



Central Library - Ain Shams University

LIST OF FIGURES (Cont.)



Central Library - Ain Shams University