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

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

Department: Geology

Geo- environmental Assessment of Heavy Metals and Organic Compounds in the soils of Shoubra El Kheima Area, Egypt

A Thesis submitted in Partial Fulfillment of the requirement for the Master Degree in Science in

Geology

By

Randa Osman Abdelmegied Mekhimer

(B.Sc in Chemistry and Geology, Menofia University)

To

Department: Geology

Faculty of Science - Ain Shams University

Supervised by

Prof. Yehia H. Dawood

Professor of Mineralogy and Geochemistry,

Geology Department, Ain Shams University

Prof. Ahmed Abdelaziz Melegy

Professor of Environmental Geology,

Geological Sciences Department

National Research Centre

Dr. Ahmed Gad Abd El Wahed

Assistant Professor of Sedimentology and Environmental Geochemistry,

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كلية العلوم – ١١٥٦٦ شارع الخليفة المأمون – العباسية - القاهرة – جمهورية مصر العربية
Faculty of Science –University of Ain Shams- 11566 Abbassia – Cairo - Egypt

Dedication

To My grandmother's soul,

My dear parents

My darling husband and sons

(Omar, Ibrahim and Malik)

And to

My dear brothers, and sisters

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*First and foremost, I am deeply thankful to **Allah**, by grace of whom this work was accomplished.*

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Randa Osman Abdelmegied Mekhimer

ABSTRACT

Shoubra El Kheima is located in the southeast of the Nile delta, and it measures approximately 30 km^2 on the northern corner of Greater Cairo between longitude 31º 14` 7``- 31º 17` 45`` E and latitude 30º 6` 22``- 30º 9` 37`` N. It is characterized by an extremely arid, long hot rainless summer, short rainy mild winter, high evaporation, and low relative humidity. Its soil is considered one of the most fertile soils in the Nile Delta, Egypt. The recent Holocene sediments cover all the study area.

Forty soil samples were collected from the study area from three different land use. In order to identify soil contaminated areas and to assess potential pollutant sources in the study area, The soil samples were analyzed for selected physical and chemical properties including particle size distribution, calcium carbonate, and organic matter contents, pH, Electric conductivity, major oxides, heavy metals, natural radionuclides, and polycyclic aromatic hydrocarbons (PAHs) content. The data were treated statistically and by geographic information system technique.

Textural and mineralogical studies revealed that the agricultural soils in the study area are mainly classified as clayey soil, whereas urban and industrial soil samples are varied in their classification from clayey to loamy sand. Opaques, hornblende, pyroxene, epidote, garnet, staurolite, rutile, zircon, tourmaline, kyanite, sillimanite, biotite, and andalusite are the main heavy minerals in the present sand size.

The obtained data show that the average percentages of major element oxides are $SiO_2 > Al_2O_3 > Fe_2O_3 > CaO > MgO > Na_2O > K_2O > TiO_2 > P_2O_5 > MnO$. The contents of major oxides revealed that the agriculture soil has high contents of Fe, Al, Ti, Mg, Mn, Na, K oxides compared to those of urban and industrial soils. The average concentrations of Cd, Cr, Cu, Ni, Pb, and Zn in the agriculture soil samples are less than the corresponding concentrations of industrial and urban soil samples. Conversely, As shows an opposite trend.

The concentrations of As, Cd, Ni, and Zn in the soil exceed the maximum permissible limits whereas, Cu, Cr, and Pb are within this limit except for some samples. Spatial distribution maps of selected heavy metals in the study area show that

the concentrations of Cu, As, Zn, Pb, Ni, and Cr increase in the southeastern and southwestern parts of the study area.

The soils in agricultural areas are less contaminated than the soils in urban and industrial areas. Most of the sample sites showed very high potential ecologic risk (PER) indicating extreme risk. The enrichment of the studied heavy metals in the soil of Shoubra El Kheima is mainly due to anthropogenic activities, including atmospheric deposition from intense traffic density and complex industries, intensive use of inorganic fertilizers and pesticides in the agriculture processes, and irrigation with wastewater or sludge for a long time in some places.

The obtained average values of ^{238}U, ^{226}Ra, and ^{40}K are higher in 30 %, 20 %, and 20 %, respectively of the studied samples than the activity concentrations of those of the world averages for areas of normal radioactivity. The activity concentrations of the analyzed radionuclides are higher in the agriculture soils than the other urban and industrial soils.

Phenanthrene and pyrene are the dominant PAHs, while the other compounds have minor concentrations. It is observed that the samples that lie close to an industrial complex or the main road have the highest values for total PAHs. Benzo (a) Pyrene has the highest carcinogenic PAHs concentrations in the studied soil samples, followed by Benzo (b) Flouroanthene and Benzo (k) Flouroanthene. Anthropogenic products such as the atmospheric deposition from intensive industrial activities and heavy traffic are considered the main source of PAHs in the studied samples.