RADIOCHEMICAL STUDIES ON THE ADSORPTION AND COMPLEX FORMATION OF DIFFERENT RADIOELEMENTS WITH SOME SOIL INGREDIENTS

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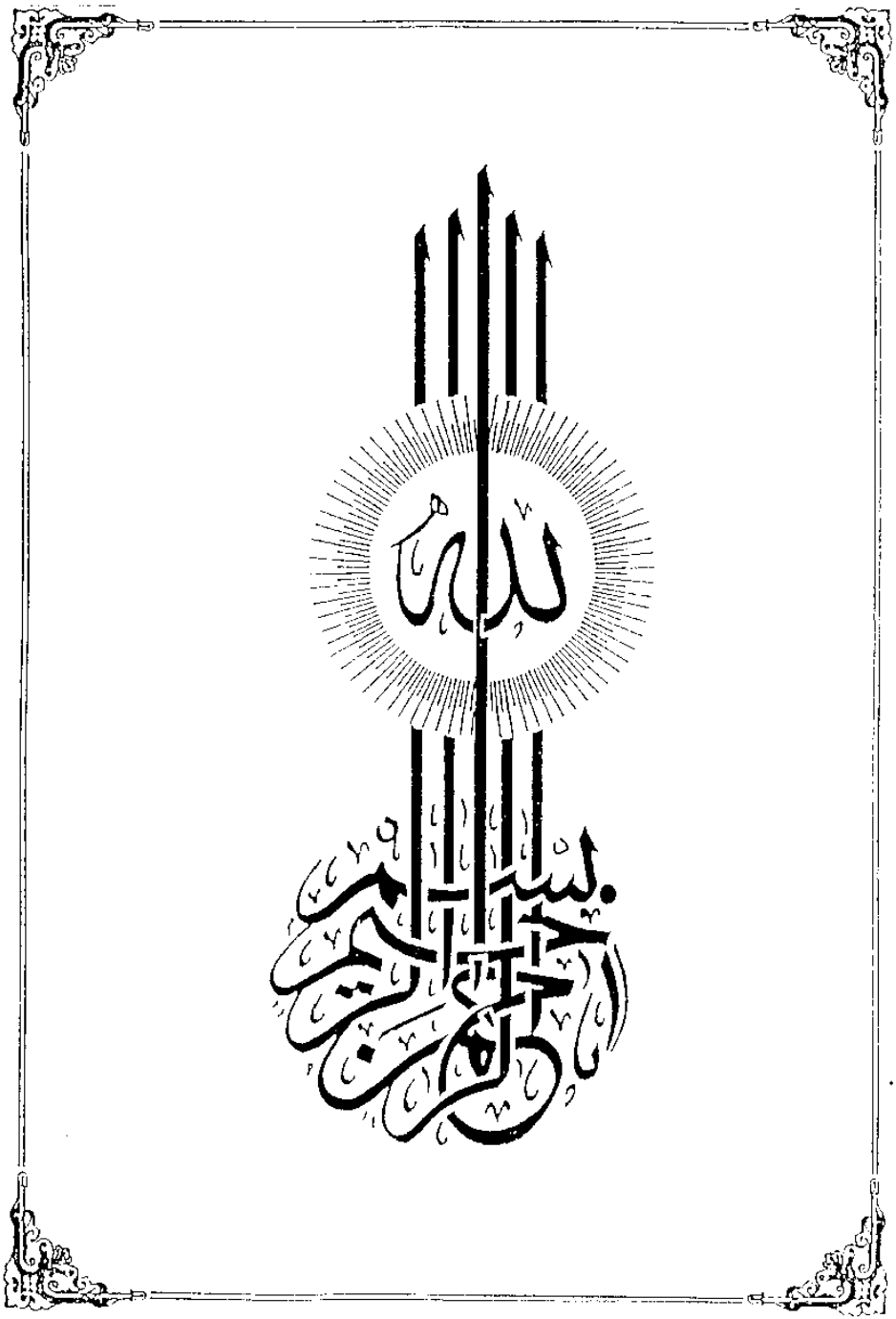

NOTE

Beside the work carried out in this thesis, the candidate has attended course for one year in inorganic and physical chemistry, covering the following topics:

1- Instrumental Analysis.

2- Photochemistry.

3- Advanced Chemical Reaction.

4- Chemical Kinetics.

5- Cement Chemistry.

6- Quantum.

7- Thermodynamics.

8- Coordination Chemistry.

9- Structural Inorganic.

10-Spectroscopy.

She has successfully passed a written examination in these courses from College for Women, Ain Shams University.

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The Aim of the Present Study

This study aims at investigating the possibility of complex formation of certain radionuclides with humus materials present in the environment *e.g.* humic acid. These radionuclides may be accidently or routinely released to the environment.

In the following the main items to be investigated, are given:

1 - Water and soil analysis for the presence of humic acid.

2 - Physical and chemical analysis of humic acid.

3 - Study of the sorption behaviour and complex formation of some radionuclides which are of importance in waste management processes (having either a relatively long half-life such as Cerium-139, Cobalt-60 and Technetium-99 or possessing a relatively high toxicity like Chromium-51).

These studies are of great importance in the process of tracing the leachability and the possible migration of the above mentioned nuclides in the soil and underground water environments.

CONTENTS

CHAPTER II

EXPERIMENTAL

CHAPTER III

RESULTS AND DISCUSSION

Abstract

This study aims at investigating the possibility of complex formation of Cerium - 139, Cobalt - 60, Technetium - 99m and Chromium - 51 with humus materials present in the environment e.g humic acid. These radionuclides may be accidentally or routinely released to the environment. The interaction of humic acid with the above radionuclides was carried out under different experimental conditions such as variation of pH, complex formation, concentration of metal ion, competing ion and carbonate anion concentration.

SUMMARY

SUMMARY AND CONCLUSION

The radioactive contamination is one of the most environmental problems, for its threat to the public health and to the environment. It may produced accidently (charnobel accident), routine release to the environment, as a result of research reactor operation, applications of radioisotopes in different fields (medicine, agriculture and industry) or, from the primary circuit in the Nuclear Power Plants (NPPs) and fuel reprocessing operations. The radioactive contamination of soils and waters may be occurs, therefore, it is important to know the mobilization of radionuclides which may be released to the environment and its reaction with organic materials, specially humic acid, in presence of sea water and soil sediment. This is the aim of the present study.

The most common radionuclides that are hazard to the man and his environment are Ce-139, Co-60, Tc-99m and Cr-51. These radionuclides are emitters with high penetrating range and some of them has a long half-life time, and high radiotoxicity, thus it is very important to study the radiochemical behaviour of these radionuclides when interacting with humic acid in the presence of sea water and soil sediment.

It is noteworthy that, humic substances are most naturally distributed materials on the earth's surface. Humic acid is able to complex polyvalent metal ions leading to soluble or insoluble complexes. The interaction of humic material with radionuclide may significantly influence the availability and transport of the latter in the environment. Humic substances are formed through the breakdown of plant and animal tissues by the natural chemical and biological processes, leading to three fractions namely; humic acid, fulvic acid and humin. Humic acid are found, in nature, in high concentration and more mobilize than fulvic and humin fractions.

The behaviour of these radionuclides are studied in three chapters as follows:

Chapter one - Introduction - It includes sources of radioactive contamination, behaviour of radioactivity in natural water, origin and characteristics of humic substance, general properties of humic substances, major pathways of humic synthesis in nature, and structure of humic acid. A literature survey covering th effect of contact time, pH, metal ion concentration, competing ion, carbonate anion and humate complex on the sorption process is also given.

Chapter two - Experimental - It includes: sampling sites selection, separation of humic acid from waters and soil

sediment and determination of its concentration spectroscopy and fluorimetry. E_4 / E_6 which indicate that the number of aromatic ring in humic acid, was calculated. Elemental analysis of humic acid by using flash combustion method was carried out. The determination of functional groups (total acidity and carboxylic group) and sorption process by batch technique was studied.

Chapter three - Results and Discussion - It includes the experimental results, their interpretations and comparison with other published results.

The results obtained showed that:

1. Humic acid concentration in canal water, sea water and soil sediment was measured spectrophotometrically at 370 nm and the results showed that the highest percentage of humic acid present in clay is 41 mg/Kg, while the lowest percentage present in sea water is 0.09 mg/L.

2. The value of E_4 / E_6 was measured and found to be 1.94, this low ratio indicates that this sample has a high degree of aromatic condensation and infers the presence of relatively low aliphatic structure.

3. The presence of the elements which composed of Fluka humic acid are 50.4, 4.00, 68.00 and 29.90 for carbon, hydrogen, nitrogen and oxygen, respectively. Also, the effective