بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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Experimental Assessment and Modeling of Radio-contaminants Transport in the Soil of a Radioactive Waste Disposal Site

BY

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Dedicated to

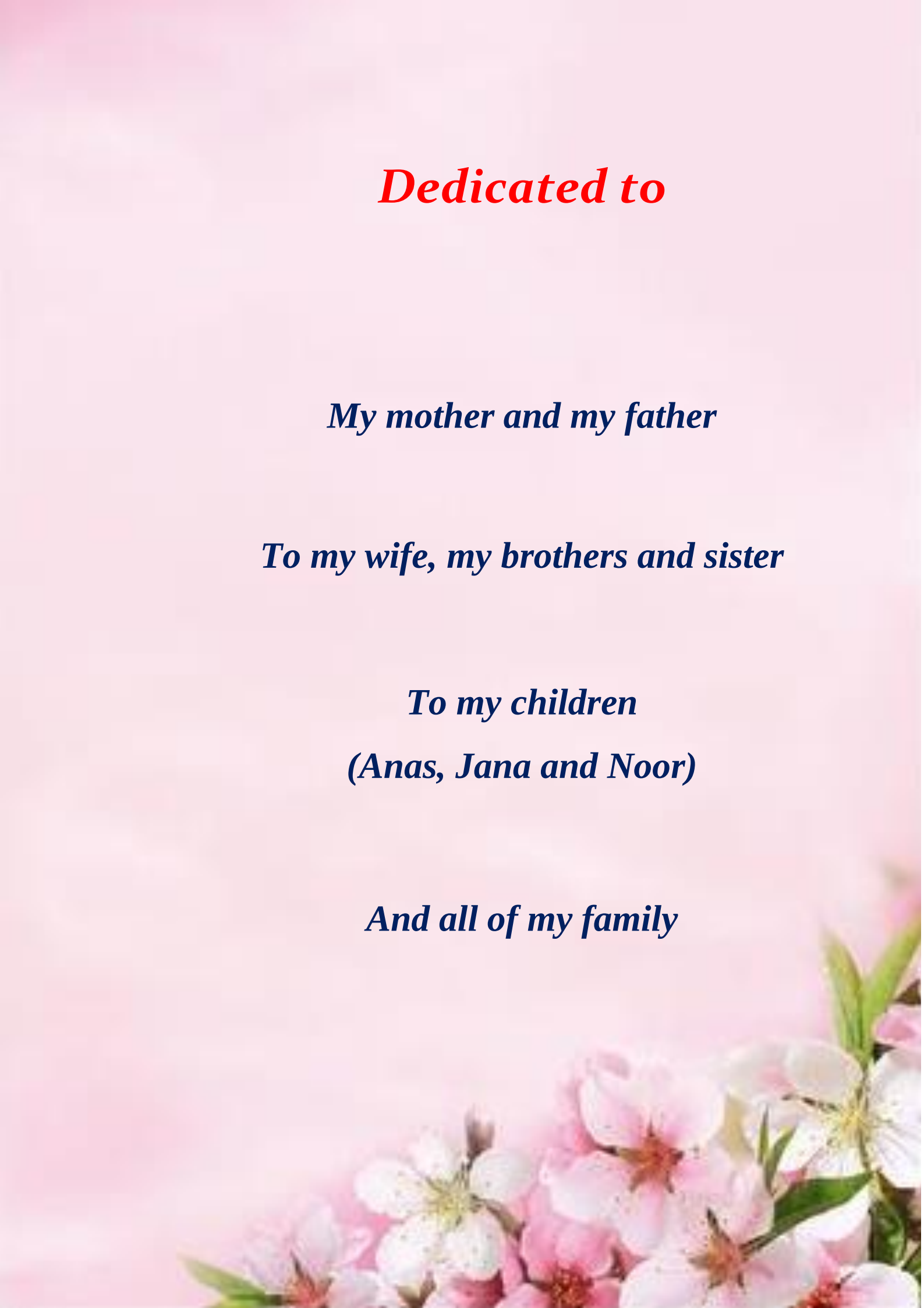
My mother and my father

To my wife, my brothers and sister

To my children

(Anas, Jana and Noor)

And all of my family



ABSTRACT

Low and intermediate level radioactive wastes are produced during research activities of the radiochemical laboratories, research reactors, radioisotope and metallurgical laboratories, activation analysis units, nuclear medicine divisions in hospitals, universities and research institutes as well as industrial activities. These wastes should be isolated to protect human and environment under controlled conditions which is one of the most important factors to be considered for the long-term safety assessment of a radioactive waste disposal facility, particularly in wet geological formations.

Representative sediment samples were collected from a radioactive waste disposal site at Inshas locality. The mineralogy and geochemistry of sediment samples are studied to characterize the sediments and to study the possible roles of grain size, mineral and chemical composition. The clay minerals are considered as important factors in the adsorption of metal ions and as backfill in the radioactive waste disposal sites. The sand and sandstone from the study area have high contents of Fe_2O_3, CaO and MgO reflecting a possible contribution from the nearby basaltic extrusive rocks. The chemical index of alteration (CIA) values reflect a low degree of chemical weathering.

Batch, diffusion, column experiments, adsorption and desorption kinetics were performed to evaluate the radionuclide

behavior in the subsurface environment. The maximum adsorption capacity of Cs^{+}, Co^{2+} and Ni^{2+} onto clay sample was found to be greater than that adsorbed onto different sand samples. The kinetic study showed that the adsorption is followed the pseudo-second-order model with a good correlation coefficient (R^2 = 0.999). The equilibrium investigations of adsorption data were fitted using Freundlich, Langmuir, Dubinin–Radushkevich and temkin isotherm models. The adsorption process of Cs^{+} is exothermic and favored at low temperatures, on the other hand the adsorption of Co^{2+} and Ni^{2+} are endothermic and favored at higher temperatures.

The total adsorbed amount of Cs^{+}, Co^{2+} and Ni^{2+} ($Q_{tot,S}$) and bed capacity (mg/g) in sand column increase with increasing the initial metal ion concentrations. Column performance decreases with increasing the initial concentrations onto the saturated brown sand column. The analysis of the breakthrough curve was done using Thomas, Yoon-Nelson and Adams–Bohart models. The simulation program (GOLDSIM) was used to simulate the radionuclide transport through soil of Inshas disposal site and calculate the maximum effective dose. The air and soil activity of are very low concentration of ^{60}Co, ^{137}Cs and ^{63}Ni radionuclides. All values for resident farmer and transient in air and all pathways do not exceed the dose constraint of 0.3 mSv/yr.

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