



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



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تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



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Performance evaluation of polyacrylonitrile-based polymeric composites as dual-function sorbents for some pollutants of interest to nuclear activities

A Thesis Submitted by

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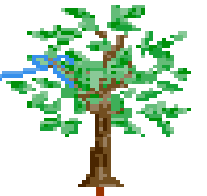
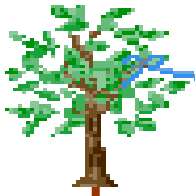
بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ

لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا

إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



Dedicated to
(The Soul of my Parents and Prof. Dr. Wafaa Sanad)

To
My Brothers, My Lovely Wife and My kids

All of those who Love me

Moustafa Ali Moustafa



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Synthesis of PAN/ferrocyanide composite incorporated with cetrimonium bromide and its employment as a bifunctional adsorbent for coremoval of Cs^+ and HCrO_4^- from aqueous solutions

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Abstract

Polyacrylonitrile/ferrocyanide composite incorporated with cetrimonium bromide (PFICB) was synthesized and evaluated as a novel bifunctional adsorbent for coremoval of Cs^+ and HCrO_4^- . Results of the reaction time effect showed that adsorption of Cs^+ and HCrO_4^- onto PFICB were rapid processes. The effect of the solution pH in the range 2.5–10 revealed that PFICB had the ability to simultaneously remove Cs^+ and HCrO_4^- . The maximum adsorption capacity of PFICB was found to be 41.79 mg/g for Cs^+ and 19.39 mg/g for HCrO_4^- . These values were compared with those reported in literature using other adsorbents.

Keywords Ferrocyanide · Cesium · Chromate · Polyacrylonitrile · Adsorption · Coremoval

Introduction

Chemical precipitation, solvent extraction, membrane separation, adsorption and foam separation are the traditional methods applied for removal of radioactive materials from aqueous solutions [1–5]. Nevertheless, utilization of these methods is challenged by the occurrence of cationic and anionic radio-toxicants in radioactive liquid wastes where multi-treatment processes and/or multi-steps are required which is undesirable particularly from the economic point of view. A one-step treatment process is therefore necessary to avoid such drawbacks. Herein, researchers' efforts in our laboratory have been directed in the last years to find appropriate one-step processes for treatment of radioactive liquid wastes contaminated with cationic and anionic radionuclides. Results of these studies showed the potentiality to simultaneously remove $^{60}\text{Co}^{2+}$ and HCrO_4^- [6], $^{63}\text{Ni}^{2+}$ and $^{51}\text{CrO}_4^{2-}$ [7] and $^{137}\text{Cs}^+$ and $^{99}\text{TcO}_4^-$ [8]. Besides,

$\text{As}^{3+}/\text{SO}_4^{2-}$ [9], Ti^+/Cl^- [10], $\text{Cu}^{2+}/\text{HCrO}_4^-$ [11], $\text{Cd}^{2+}/\text{HASO}_4^{2-}$ [12], $\text{Cu}^{2+}/\text{SO}_4^{2-}$ [13], $\text{Pb}^{2+}/\text{NO}_3^-$ [14], $\text{As}^{3+}/\text{HASO}_4^-$ [15] and $\text{Cd}^{2+}/\text{CN}^-$ [16] binary systems have been studied in literature. However, simultaneous removal of cationic and anionic species in these publications is governed by the utilization of multi-step treatment processes. Regarding these published papers, it can be seen that simultaneous removal of $^{134}\text{Cs}^+$ and HCrO_4^- , which are the concerned species in the current study, has not been studied yet. Cesium radionuclides are found in radioactive liquid wastes owing to their applications in many fields such as radiochemistry, medicine, mineral processing, industry and food irradiation [17, 18]. Owing to its solubility and similarity to other alkali elements (e.g. K^+ and Na^+), cesium ion easily absorbs by plants. If ingested, it creates an internal hazard particularly to the reproductive system [19]. Radioisotope production and radiochemistry research laboratories can be responsible for the existence of hexavalent chromium radionuclide ($^{51}\text{Cr(VI)}$) in radioactive liquid wastes. Besides its radiotoxicity, hexavalent chromium exhibits a chemical toxicity when presents in aqueous solutions at concentrations higher than the admissible ones as it has been reported to be mutagenic and carcinogenic in human [20]. Therefore, such contaminants must be removed from aqueous solutions before being discharged into the environment.

Among the abovementioned treatment processes, adsorption process is extensively applied for removal of

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