



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكرو فيلم

بسم الله الرحمن الرحيم



HANAA ALY



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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SYNTHESIS OF GRAPHENE-HYDROXYAPATITE NANOCOMPOSITE FOR THE REMOVAL OF HEAVY METALS FROM WASTEWATERS

Submitted By

Osama Hassan Radwan Abdelbar

B.Sc. of Science (Chemistry/Zoology), Faculty of Science,
El-Menofia University, 2004

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

2021

APPROVAL SHEET
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سببنا انك لا تعلم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدقة الله العظيم

سورة البقرة الآية: ٣٢

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ABSTRACT

Heavy metal pollution is a serious environmental problem that can be cured by different adsorbents. Herein, a new hydroxyapatite / graphene oxide nanocomposite (HAp/GO) material was synthesized from waste eggshell as a green and eco-friendly adsorbent for the effective removal of heavy metals (e.g., Cd, Pb, Cr, Ni, Co) from wastewaters. Nano-structured HAp was synthesized by calcination of waste eggshell followed by hydrothermal treatment in the presence of phosphate solution. However, GO was synthesized using the Hummer's method. The HAp/GO nanocomposite was synthesized from the HAp and GO precursors by ultrasonic treatment. The morphology, composition, crystal structure, functionality and stability of the synthesized sorbent were evaluated using Fourier transform infrared spectrophotometry (FTIR), Raman spectrometry, high resolution transmission electron microscopy (HR-TEM), scanning electron microscopy (SEM), energy dispersive X-ray (EDX), X-ray diffraction (XRD) and N₂-BET (Barrett–Emmett–Teller) surface area measurement techniques. Inductively Coupled Plasma Mass Spectroscopy (ICP-MS) was used to monitor the equilibrium concentrations of the investigated metal ions. The effects of the initial concentration of heavy metals, the dosage of HAp/GO adsorbent, working temperature, and the solution pH on the adsorption capacity was investigated. The synthesized HAp/GO was adopted to achieve superior simultaneous removal efficiencies (≥ 90 %) for (Cd, Pb, Cr, Ni, Co) metal ions in a given polluted sample

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