

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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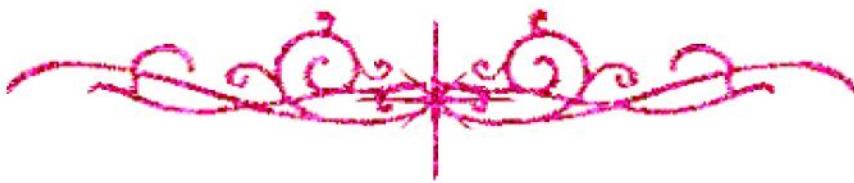
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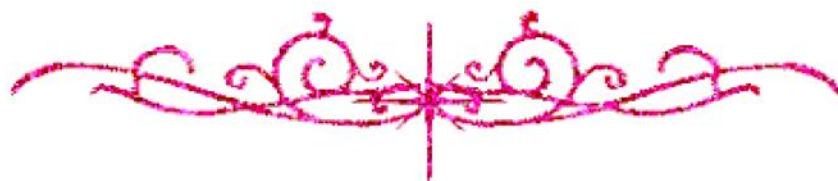


بعض الوثائق الأصلية تالفة





بالرسالة صفحات
لم ترد بالأصل





**NICKEL AND CHROMIUM REMOVAL FROM
WASTEWATER BY THE APPLICATION OF
ELECTROCOAGULATION
USING COPPER AND ZINC ELECTRODES
UNDER VARIOUS OPERATING CONDITIONS**

By

Omar Ahmed Shaker Khalil

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Civil Engineering – Public Works

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

Nickel and Chromium Removal from Wastewater by the Application of Electrocoagulation Using Copper and Zinc Electrodes under Various Operating Conditions

Key Words:

Electrocoagulation; Nickel; Chromium; Copper; Zinc.

Summary:

In this thesis, nickel and chromium removal from wastewater by the application of electrocoagulation using copper and zinc electrodes has been studied. Experiments were conducted by using synthetic water and real wastewater. It was treated at room temperature with various operating conditions. Starting from optimum pH, CD, electrode spacing and salt type at (1, 5, 10, 15, 30, 45, 60, 90) minutes during reaction time. In addition to measuring pH for synthetic and real wastewater, measuring EEC for real wastewater, comparing EC and CC and comparing batch and continuous operation modes. For the results, it was observed that copper is better than zinc in nickel removal and zinc is better than copper in chromium removal as maximum nickel removal reached 99.96% in case of copper and chromium removal reached 99.95% in case of zinc for synthetic and real wastewater. While in real combined wastewater, zinc is better than copper in nickel removal and copper is better than zinc in chromium removal as maximum nickel removal reached 99.81% in case of zinc and chromium removal reached 91.68% in case of copper. It was also observed that EC is better than chemical coagulation and the batch mode is almost the same as continuous mode. It was also noticed that COD decreased in real wastewater after application of EC.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Omar Ahmed Shaker Khalil

Date: / / 2020

Signature:

Dedication

This thesis is dedicated to:-

My mother Naglaa for her kindness and devotion and for her endless support and love.

My beloved father Ahmed who always cares for me and gives me the valuable advice that I need.

My brother Abdallah and my grandfather Mohamed who always push me forward.

My Uncle Ehab for his support and encouragement.

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