بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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MONA MAGHRABY

TREATMENT OF INDUSTRIAL WASTE WATER CONTAMINATED BY AROMATIC NITRO COMPOUNDS

Submitted By

Sarwat Shaioon Mohamed Allam

B.Sc. of Science (/Chemistry), Faculty of Science, Ain Shams University, 1996

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

2020

APPROVAL SHEET

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ABSTRACT

Treatment of Industrial Waste Water

Contaminated by Aromatic Nitro Compounds

The disposal of waste water (red water) that produced during the production of TNT in environmental acceptable manner possesses serious difficulties. For many years this red water were disposed of by the method open burning but the method is not acceptable today owing to the effect of particulates, nitrogen oxide and other harmful products which pollute the air. Some other methods of incineration are available which overcome part of these difficulties, but they are very costly. Using adsorption followed by advanced oxidation processes (AOPs) are the most feasible technologies for red water treatment. In the present work, two types of carbon were used for treatment separately and simultaneously. Bone charcoal (BC) is prepared from animal bones and activated carbon (AC) prepared from Rice Husk. Operational parameters in each step were tested and optimized. The adsorption isotherms of TNT red water at a wavelength 200 nm by (BC) and (AC) have been evaluated. Then, treatment of red water by mixing (BC) and (AC) were assessed, followed by advanced oxidation with ultraviolet and hydrogen peroxide. As a measure of extent of treatment, we use the % removal at wavelength 200 nm, also we measure the total organic carbon (TOC), and chemical oxygen demand (COD) before and after treatment. The removal was favored at low pH, with maximum removal (90%) at pH = 2 for BC while for AC the maximum removal (95%) at pH = 10. After the treatment of red water by adsorption on mixing carbons (BC + AC) followed by AOPs, the removal is 95%, total organic carbon is (95%) and chemical oxygen demand is (97%). According to preceding results the red water after treatment by the recommended method in this work is suitable for discharge safely.

AIM OF THE WORK

The aim of this work includes the following:

1- Preparation of various activated carbons from locally available agro-residues. The study also focuses on physicochemical characterization of these activated carbons. Finally, application of the best activated carbon with advanced oxidation process (AOP) in the treatment of liquid waste of a TNT manufacturing plant in Abu-Zaabal company for specialty chemicals.

2- The removal of nitro-aromatic compounds which represent the major industrial waste water concentration in the TNT manufacturing.

In this concern, the proposed research program is directed to investigate the following:

First: Removal of nitro-organic compounds by applying the adsorption technique using activated carbon (AC) and bone charcoal (BC) separately and simultaneously.

Second: using the advanced oxidation process (AOP) as a promising technique to remediating nitro-organic, compounds which are not adsorbed on the carbon surface in the first stage.

Third: factors affecting both techniques adsorption and AOP such as: equilibrium time, adsorbent mass and pH for adsorption process, amount of oxidant H_2O_2 and exposure time for AOP process.

Finally, design recommended procedures for the integrated treatment process of TNT red water and thus the treated water can be discharged safely.

Contents

Abbreviations

RHAC	Rice Husk Activated carbon
AOPs	Advanced oxidation processes
BC	Bone charcoal
BOD	Biological oxygen demand
COD	Chemical oxygen demand
DNB	Dinitrobenzene
DNT	Dinitrotoluene
DOD	The United States Department of Defense
DS	Dissolved solids
EPA	Environmental protection Agency
FTIR	Forward transmittance infrared
GAC	Granular activated carbon
HLR	Hydraulic loading rates
NDIR	Non-dispersive infrared detector
Rh	Rice husk
SS	Suspended solids
STP	Standard temperature and pressure
TAT	Triaminotoluene
TDS	Total Dissolved solids
TNB	Trinitrobenzenene
TNT	Trinitrotoluene
TOC	Total organic carbon
TSS	Total suspended solids
UVO	UV oxidation

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