USING SOME CHEMICALLY MODIFIED AGRICULTURE WASTES AND NATURAL CLAYS IN THE TREATMENT OF INDUSTRIAL WASTEWATER

Submitted By

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B.Sc. of Science (Chemistry), Faculty of Science, Ain Shams University, 1990

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Master in Environmental Sciences, Institute of Environmental Studies and Research, Ain Shams University, 2015

A Thesis Submitted in Partial Fulfillment
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The Requirement for the Doctor of Philosophy Degree
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APPROVAL SHEET

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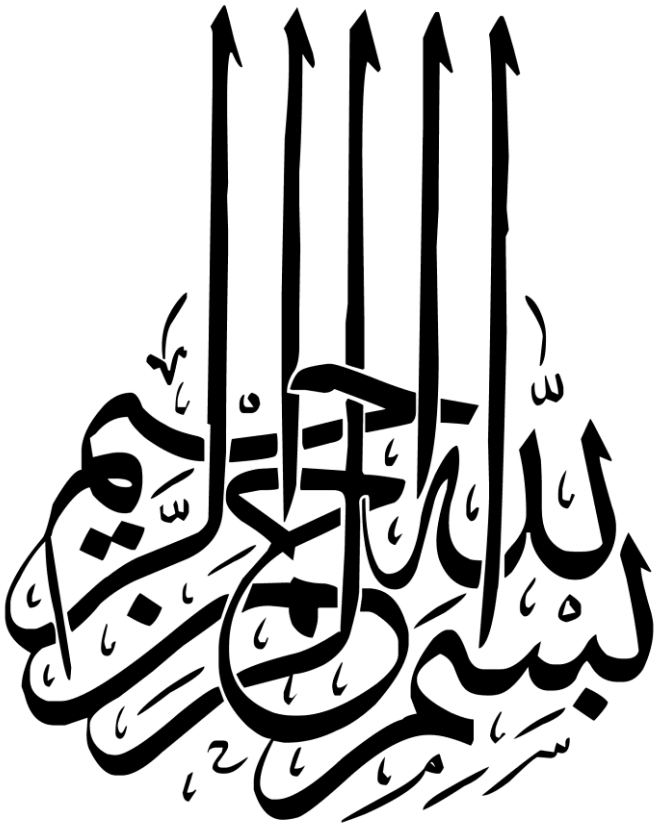
بسم الله الرحمن الرحيم

A C K N O W L E D G M E N T

*At First, I thank **GOD** for being giving me the power to complete this work successfully and all his gifts along my life*

Then I would like to thank all those who have helped me to make this work a success.

***So,** I wish to refer my deep appreciation and gratitude*

To

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Suggesting the subject, interpreting the results, their valuable scientific guidance, help, and encouragement during the work of this thesis.

LIST OF ABBREVIATIONS

AAS	Atomic absorption spectrometry
ACC	Amphoteric corncobs
AFEX™	Ammonia fiber expansion
APAMs	anionic polymers include
BOD	Biological oxygen demand
CCC	Cationic Corncobs.
CMC	Carboxy methyl cellulose
COD	Chemical Oxygen Demand
CPAMs	Cationic Polyacrylamides
CTAC	ammonium salt 3-chloro-2-hydroxypropyl- triethanol amine chloride
ECH/ DMA	Epichlorohydrin/dimethylamine polymers
EDTA	Ethyline diamante tetra acetic acid
EDX	Energy Dispersive X-ray
IR	Infrared spectroscopy
NOM	Natural organic matter
NTU	Nephelometry turbidity Unit
PAMs	Polyacrylamides
PDAD MAC	diallyldimethylammonium chloride
QCs	quaternized cellulose derivatives

STPs	sewage treatment plants
TDS	Total dissolved solid
TGA	Thermogravimetric analysis
TSS	Total suspended solid
USEPA	United states environmental protection agency
WHO	World Health Organization

Contents

Abstract

Using some chemically modified agriculture wastes and natural clays in the treatment of industrial wastewater

In this investigation, chemically modified corncobs were used as coagulant in wastewater treatment. This chemical modification was performed by allowing powdered corncobs to react with ethylene diamine tetra acetic acid (EDTA) and epichlorohydrin in alkaline medium. The factor affecting the nitrogen content in the produced amphoteric corncobs (ACC) e.g. reaction time, temperature and amount of (EDTA) added were studied. The product obtained (ACC) was characterized using analytical and spectrophotometer tools, elemental and thermogravimetric analysis besides FTIR and H^1NMR. The adsorption efficiency of (ACC) for metal ions in water as Cu^{+2} and Zn^{+2} was determined using atomic absorption spectrometry (AAS). It has been shown that there is a noticeable change in the specification of the treated water by the suggested (ACC) exemplified by least amount of organic matter, turbidity, solid substances and other elements existing in wastewater.

Also, the capability of kaolin clay (untreated and thermally treated) and combination with ferric chloride used as coagulants in wastewater treatment via adsorption, and coagulation-

flocculation processes was investigated. The optimum conditions (pH and coagulants dosage) were identified for the both kinds and in combinations of kaolin clay with ferric chloride. The results obtained revealed that kaolin clay is a good coagulant, which can absorb chemical oxygen demand (COD) biological oxygen demand (BOD), turbidity, total suspended solids (TSS) and some elements from wastewater with a good percentage removal. Using the optimum dosage of the combinations of thermally treated kaolin clay - ferric chloride mixture gave high efficiency removal of oil and grease, iron and turbidity. On the other hand, the effects of contact time indicated that the adsorption capacity of thermally treated kaolin clay was higher than the untreated one.

Keywords: Amphoteric corncobs, industrial wastewater, wastewater treatment; kaolin clay; ferric chloride; coagulation and flocculation.

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INTRODUCTION & OBJECTIVES

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1.1. Introduction

Water is a simple, yet extremely important, molecule whose small size and biochemical properties allow it to bond easily with other molecules. In fact, water is involved in almost every biological reaction. Water has many chemical and physical properties that make it useful to cells and organisms. Water sticks to itself and to other things, which allows it to flow slowly and to fill small spaces. Water is the only material that can exist naturally as a solid, liquid, and gas at Earth's natural temperatures. It takes a lot of energy to change the temperature of water, so water maintains stable temperatures well. Water also transmits slight, allowing photosynthesis to occur underwater.

The constituent physical characterizations of water includes : taste , turbidity, temperature , colour & odour . On the other hand , chemical characterizations includes : fluorides, iron , manganese , lead , copper , sodium , nitrate , sulphate , biochemical oxygen demand , chemical oxygen demand , acidity and alkalinity (pH value) , phosphorus , total organic carbon, surfactants , and toxic metal and nonmetal ions .

Growing population, increased economic activity and industrialization has not only created an increased demand for