

# CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME IV

Editors:

Ma'an Alkhatib  
Abdullah Al Mamun  
Faridah Yusof



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***(VOLUME IV)***

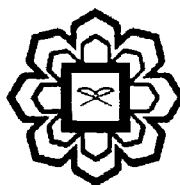
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# CONTENTS

	PREFACE	viii
CHAPTER 1	REMOVAL OF ZINC FROM WASTEWATER BY CARBON NANOTUBES <i>Nassereldeen A. Kabbashi, Ahmad Fadzil Ahmad Shuhaili, Md Z. Alam</i>	1
CHAPTER 2	REMOVAL CHARACTERISTICS OF MANGANESE (MN <sup>2+</sup> ) BY CNTS <i>Nassereldeen A. Kabbashi, Suleyman A.M, Mohamed E.S. Mirghani, Farhana I.Y</i>	8
CHAPTER 3	REMOVAL TECHNIQUES OF CADMIUM FROM WASTEWATER BY CNTS <i>Nassereldeen A. Kabbashi, Muhammad Fikri Bin Rosly, Suleyman Muyibi</i>	15
CHAPTER 4	KINETICS OF ACTIVATED CARBON FROM EFB IN MERCURY REMOVAL <i>Nassereldeen. A. Kabbashi, Ma'an F. Alkhatib, Mohammed Elwathig and Ili Nadirah Bt Jamil</i>	21
CHAPTER 5	CARBON NANOFIBERS TO REMOVE ARSENIC <i>Abdullah Al Mamun, Ma'an Alkhatib, Zahirah Abd. Kadir</i>	26
CHAPTER 6	CARBON NANOTUBES TO REMOVE CHROMIUM <i>Abdullah Al Mamun, Ma'an Alkhatib, Aishah Jamaluddin Ahmad</i>	32
CHAPTER 7	CARBON NANOTUBES TO REMOVE NICKEL <i>Abdullah Al Mamun, Ma'an Alkhatib, Siti Melor Asnida Zainudin</i>	38
CHAPTER 8	ADSORPTION ISOTHERM OF CARBON NANOTUBES IN REMOVING HEAVY METALS <i>Abdullah Al Mamun, Faridah Yusof, Norsyafini Ishak</i>	44
CHAPTER 9	CARBON NANOFIBERS TO REMOVE NICKEL <i>Abdullah Al Mamun, Ma'an Alkhatib, Halema Shajahan</i>	50
CHAPTER 10	ADSORPTION OF LEAD BY CNTS GROWN ON GAC <i>Abdullah Al Mamun, Ma'an Alkhatib, Iman Hawari</i>	54
CHAPTER 11	ADSORPTION OF CADMIUM BY CNTS GROWN ON GACS <i>Abdullah Al Mamun, Ma'an Alkhatib, Nada Hamid Al Samawi</i>	59
CHAPTER 12	PERFORMANCE OF CNTS COLUMN IN REMOVING LEAD FROM WATER <i>Abdullah Al Mamun, Md Zahangir Alam, Muhammad Akram Abdul Hadi</i>	63
CHAPTER 13	STABILITY OF DISPERSION OF (SW-CNT)-CARBOXY-METHYL CELLULOSE (CMC) IN AQUEOUS SOLUTION <i>Ahmad T. Jameel, Mohammed S. Jami and Syarifah R. Kamaruzaman</i>	68
CHAPTER 14	OPTIMUM COLLOIDAL DISPERSION OF CARBON NANOTUBE IN ETHYLENE GLYCOL USING TRITON X-100 AS DISPERSING AGENT <i>Ahmad T. Jameel, Faridah Yusof, Natrah Ibrahim and Alade A. Olanrewaju</i>	74
CHAPTER 15	CHARACTERIZATION OF IMMOBILIZED LIPASE ON MULTI-WALLED CARBON NANOTUBE <i>Nur Hidayah Zainan, Maan Fahmi Al-Khatib and Hamzah Mohd. Salleh</i>	80
CHAPTER 16	PURIFICATION OF SKIM LATEX PROTEIN USING CARBON NANOTUBES AS THE CHROMATOGRAPHIC MEDIA <i>Faridah Yusof and Peer Mohamed</i>	86

CHAPTER 17	COMPUTATIONAL STUDIES OF ADSORPTION GLYCINE <i>Ibrahim Ali Noorbacha, Hamzah Mohd Salleh and Nursafuraa Abu Talib</i>	92
CHAPTER 18	KINETIC STUDIES ON ENHANCED MERCURY ADSORPTION USING ACTIVATED CARBON <i>Nassereldeen Kabbashi, Noor Illi</i>	97
CHAPTER 19	ANALYSIS OF CROSS FLOW ULTRAFILTRATION MEMBRANE <i>Mohammed Saedi Jami, Tariq Jameel and Norasila Binti Ali Mahmud</i>	103
CHAPTER 20	APPLICATION OF CARBON NANOTUBES IMPREGNATED ON ACTIVATED CARBON FOR CADMIUM REMOVAL FROM AQUEOUS SOLUTION <i>Ma'an Alkhatib, Abdullah Al-Mamun, Nurhazwani Muhamad Nor</i>	109
CHAPTER 21	BIOPROCESSING OF MORINGA OLEIFERA FOR REMOVAL OF HEAVY METALS (CADMIUM AND CHROMIUM) <i>Suleyman Aremu Muyibi, Jamal Parveen, Wan Mohd Syraif Wan Sulaiman</i>	117
CHAPTER 22	COAGULATION PERFORMANCE OF BIOACTIVE CONSTITUENTS ISOLATED FROM MORINGA OLEIFERA SEED IN LOW TURBIDITY WATER TREATMENT <i>Suleyman A. Muyibi, Eman N. Ali, Mohamad Ramlan Mohamed Salleh, Hamzah Mohd Salleh and Md Zahangir Alam</i>	123
CHAPTER 23	DESIGN AND PRODUCTION OF CARBON NANOTUBE-BASED BIOSENSOR <i>Ma'an Alkhatib, Mohamad Faizal Bin Khamis, Waleed Fekry Faris</i>	130
CHAPTER 24	DESIGN OF AN ADSORPTION SYSTEM FOR THE REMOVAL OF PHENOL FROM WATER USING ACTIVATED CARBON <i>Ma'an Alkhatib, Ahmad Tariq Jameel, Mohammad N. A. Alherbawi</i>	138
CHAPTER 25	FEASIBILITY STUDY ON THE PRODUCTION OF BIODIESEL FROM MICROALGAE <i>Ma'an Alkhatib, Md. Zahangir Alam, Salma A. S. Binsilm</i>	148
CHAPTER 26	IDENTIFICATION OF SUITABLE RESIN TO BE MIXED WITH COMMERCIALY AVAILABLE CASSAVA STARCH FOR RIGID PACKAGING APPLICATION <i>Ma'an Alkhatib, Noorhaza Bt Alias</i>	155
CHAPTER 27	IMMOBILIZATION OF LIPASE ON MULTI-WALLED CARBON NANOTUBES <i>Ma'an Alkhatib, Hamzah Mohd Salleh, Anas M. N. Sultan</i>	162
CHAPTER 28	INTEGRATION OF ARTIFICIAL NEURAL NETWORK AND PRINCIPAL COMPONENT ANALYSIS TECHNIQUES FOR WASTEWATER TREATMENT PLANT EVALUATION <i>Mohammed Saedi Jami, Nassereldeen A. Kabbashi and Mustapha Mujeli</i>	169
CHAPTER 29	ISOLATION OF BACTERIA FROM OIL-CONTAMINATED SOIL FOR CRUDE OIL DEGRADATION <i>Ma'an Alkhatib, Humaidah Bt Dr Hj Muhammad Nur Lubis, Alade Abass Olanrewaju</i>	175
CHAPTER 30	ISOLATION OF BACTERIA FROM SOIL FOR PLASTICS DEGRADATION <i>Ma'an Alkhatib, Nur Amalina Binti Ahmad, Alade Abass Olanrewaju</i>	183

CHAPTER 31	OPTIMIZATION OF CELLULASE ENZYME PRODUCTION USING ARTIFICIAL NEURAL NETWORK <i>Mohammed Saedi Jami, Md. Zahangir Alam and Lamija Subasic</i>	190
CHAPTER 32	POTENTIAL OF ARTIFICIAL NEURAL NETWORKS IN THE PREDICTION OF WASTEWATER TREATMENT PLANT PERFORMANCE <i>Mohammed Saedi Jami, Nassereldeen Ahmed Kabashi and Norhafiza Binti Abdullah</i>	196
CHAPTER 33	PRODUCTION OF ACTIVATED CARBON FROM OIL PALM EMPTY FRUIT BUNCH FOR ADSORPTION OF CADMIUM IN AQUEOUS SOLUTION <i>Suleyman A. Muyibi, Ma'an Alkhatib, Jeminat Omotayo Amode</i>	202
CHAPTER 34	PRODUCTION OF ACTIVATED CARBON FROM PALM OIL EMPTY FRUIT BUNCH BY CHEMICAL ACTIVATION <i>Ma'an Alkhatib, Monawar Munjid</i>	209
CHAPTER 35	REMOVAL OF AQUEOUS ZINC (II) USING PROCESSED MORINGA OLEIFERA SEEDS <i>Suleyman A. Muyibi, Isam Y. Qudsieh, M. H. A. Rahman</i>	217
CHAPTER 36	REMOVAL OF COLOUR FROM PALM OIL MILL EFFLUENT USING GRANULAR ACTIVATED CARBON (GAC) <i>Ma'an Alkhatib, Abdullah Al Mamun, Iqrah Akbar</i>	224
CHAPTER 37	THERMAL PROPERTIES ENHANCEMENT FOR THE DEVELOPED OF ETHYLENE VINYL ACETATE/EPOXIDIZED NATURAL RUBBER/CARBON NANOTUBES NANOCOMPOSITES <i>Faridah Yusof and Norazlina Mohamed Yatim</i>	232
CHAPTER 38	EFFECT OF CARBON NANOTUBES LOADING ON THE MECHANICAL PROPERTIES OF ETHYLENE VINYL ACETATE/EPOXIDIZED NATURAL RUBBER NANOCOMPOSITES <i>Faridah Yusof and Norazlina Mohamed Yatim</i>	242
	INDEX	251

## CHAPTER 1

### REMOVAL OF ZINC FROM WASTEWATER BY CARBON NANOTUBES

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#### ABSTRACT

Heavy metal refers to any metallic chemical element that has relatively high density and yet it's toxic and poisonous at low concentrations. As trace element, some heavy metals (e.g. zinc, selenium, copper, etc.) are essential to maintain the metabolism in the human body but most of them are toxic for our body. To a small extent they enter our bodies via food, drinking water and air. Therefore, it is very much important to remove these compounds from the wastewater during the treatment process. Nowadays, one of the great nanomaterials that are getting interest of many researchers and engineers is carbon nanotubes. This research intended to study the performance of carbon nanotubes as adsorbent for removal heavy metal (zinc) from artificial water. The effect of contact time, dosage of carbon nanotubes, agitation speed and pH were studied for optimal adsorption of the zinc in synthetic water. Matrix method was used to determine the number of runs and its variation. It is hoped that the results of this project would indicate some possibilities to use carbon nanotubes.

*Keywords:* zinc, carbon nanotube, pH, synthetic wastewater

#### INTRODUCTION

Zinc is an essential element, necessary for sustaining all life. It is estimated that 3000 of the hundreds of thousands of proteins in the human body contain zinc prosthetic groups, one type of which is called zinc finger. In addition, there are over a dozen types of cells in the human body that secrete zinc ions, and the roles of these secreted zinc signals in medicine and health are now being actively studied. Zinc ions are now considered neurotransmitters. Cells in the salivary gland, prostate, immune system and intestine are other types that secrete zinc (Adhoum, 2004).

Carbon nanotubes (CNTs) are relatively new adsorbents that have proven very efficient for treating many kinds of trace pollutants such as dioxin from air or lead, cadmium, fluoride, 1,2-dichlorobenzene from wastewater. The comparisons of CNTs with other commercial adsorbents made by the foregoing researchers suggest that CNTs have great potential in environmental protection applications. However, the studies on the adsorption of heavy metals with CNTs are still very limited in the literature. Although consequences of zinc deficiency have been recognized for many years, it is only recently that attention has been directed to the consequences of excessive zinc intake. Zinc is considered to be relatively nontoxic, particularly if taken orally. However, manifestations of overt toxicity symptoms