CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME IV

Editors:
Ma’an Alkhatib
Abdullah Al Mamun
Faridah Yusof

IIUM PRESS
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
Ma'an Alkhathib, Abdullah Al Mamun & Faridah Yusof: Current Research and Development in Biotechnology Engineering at IIUM Volume IV


Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by:
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
CONTENTS

PREFACE viii

CHAPTER 1 REMOVAL OF ZINC FROM WASTEWATER BY CARBON NANOTUBES 1
Nasserelddeen A. Kabbashi, Ahmad Fadzil Ahmad Shu haili, Md Z. Alam

CHAPTER 2 REMOVAL CHARACTERISTICS OF MANGANESE (Mn2+) BY CNTS 8
Nasserelddeen A. Kabbashi, Suleyman A.M, Mohamed E.S. Mirghani, Farhana I.Y

CHAPTER 3 REMOVAL TECHNIQUES OF CADMIUM FROM WASTEWATER BY CNTS 15
Nasserelddeen A. Kabbashi, Muhammad Fikri Bin Rosly, Suleyman Muyibi

CHAPTER 4 KINETICS OF ACTIVATED CARBON FROM EFB IN MERCURY REMOVAL 21
Nasserelddeen, A. Kabbashi, Ma’an F. Alkhathib, Mohammed Elwathig and Ilia Nadirah B. Jamil

CHAPTER 5 CARBON NANOFIBERS TO REMOVE ARSENIC 26
Abdullah Al Mamun, Ma’an Alkhathib, Zahirah Abd. Kadir

CHAPTER 6 CARBON NANOTUBES TO REMOVE CHROMIUM 32
Abdullah Al Mamun, Ma’an Alkhathib, Aishah Jamaluddin Ahmad

CHAPTER 7 CARBON NANOTUBES TO REMOVE NICKEL 38
Abdullah Al Mamun, Ma’an Alkhathib, Siti Melor Asnida Zainudin

CHAPTER 8 ADSORPTION ISOTHERM OF CARBON NANOTUBES IN REMOVING HEAVY METALS 44
Abdullah Al Mamun, Faridah Yusof, Norsyafinim Ishak

CHAPTER 9 CARBON NANOFIBERS TO REMOVE NICKEL 50
Abdullah Al Mamun, Ma’an Alkhathib, Halema Shajahan

CHAPTER 10 ADSORPTION OF LEAD BY CNTS GROWN ON GAC 54
Abdullah Al Mamun, Ma’an Alkhathib, Iman Hawari

CHAPTER 11 ADSORPTION OF CADMIUM BY CNTS GROWN ON GACS 59
Abdullah Al Mamun, Ma’an Alkhathib, Nada Hamid Al Samawi

CHAPTER 12 PERFORMANCE OF CNTS COLUMN IN REMOVING LEAD FROM WATER 63
Abdullah Al Mamun, Md Zahirung Alam, Muhammad Akram Abdul Hadi

CHAPTER 13 STABILITY OF DISPERSION OF (SW-CNT)-CARBOXY-METHYL CELULOSE (CMC) IN AQUEOUS SOLUTION 68
Ahmad T. Jameel, Mohammed S. Jamil and Syarifah R. Kamaruzaman

CHAPTER 14 OPTIMUM COLLOIDAL DISPERSION OF CARBON NANOTUBE IN ETHYLENE GLYCOL USING TRITON X-100 AS DISPERSING AGENT 74
Ahmad T. Jameel, Faridah Yusof, Natrah Ibrahim and Alade A. Olanrewaju

CHAPTER 15 CHARACTERIZATION OF IMMOBILIZED LIPASE ON MULTI-WALLED CARBON NANOTUBE 80
Nur Hidayah Zainan, Maan Fahmi Al-Khatib and Hanzah Mohd. Salleh

CHAPTER 16 PURIFICATION OF SKIM LATEX PROTEIN USING CARBON NANOTUBES AS THE CHROMATOGRAPHIC MEDIA 86
Faridah Yusof and Peer Mohamed
CHAPTER 17  COMPUTATIONAL STUDIES OF ADSORPTION GLYCINE
Ibrahim Ali Noorbata, Hamzah Mohd Salleh and Nursafwana Abu Talib 92

CHAPTER 18  KINETIC STUDIES ON ENHANCED MERCURY ADSORPTION USING
ACTIVATED CARBON
Nassereldeen Kabbashi, Noor Illi 97

CHAPTER 19  ANALYSIS OF CROSS FLOW ULTRAFLTRATION MEMBRANE
Mohammed Saedi Jami, Tariq Jameel and Norasila Binti Ali Mahmud 103

CHAPTER 20  APPLICATION OF CARBON NANOTUBES IMPREGNATED ON
ACTIVATED CARBON FOR CADMIUM REMOVAL FROM AQUEOUS
SOLUTION
Ma’an Alkhaitib, Abdillah Al-Mamun, Nurhazwani Muhamad Nor 109

CHAPTER 21  BIOPROCESSING OF MORINGA OLEIFERA FOR REMOVAL OF HEAVY
METALS (CADMIUM AND CHROMIUM)
Suleyman Aremu Muyibi, Jamal Parveen, Wan Mohd Syraif Wan Sulaiman 117

CHAPTER 22  COAGULATION PERFORMANCE OF BIOACTIVE CONSTITUENTS
ISOLATED FROM MORINGA OLEIFERA SEED IN LOW TURBIDITY
WATER TREATMENT
Suleyman A. Muyibi, Eman N. Ali, Mohamad Ramlan Mohamed Salleh, Hamzah
Mohd Salleh and Md Zahangir Alam 123

CHAPTER 23  DESIGN AND PRODUCTION OF CARBON NANOTUBE-BASED
BIOSENSOR
Ma’an Alkhaitib, Mohamad Faizal Bin Khamis, Walied Fekry Faris 130

CHAPTER 24  DESIGN OF AN ADSORPTION SYSTEM FOR THE REMOVAL OF
PHENOL FROM WATER USING ACTIVATED CARBON
Ma’an Alkhaitib, Ahmad Tariq Jameel, Mohammad N. A. Alberhawi 138

CHAPTER 25  FEASIBILITY STUDY ON THE PRODUCTION OF BIODIESEL FROM
MICROALGAE
Ma’an Alkhaitib, Md. Zahangir Alam, Salma A. S. Binslim 148

CHAPTER 26  IDENTIFICATION OF SUITABLE RESIN TO BE MIXED WITH
COMMERCIALY AVAILABLE CASSAVA STARCH FOR RIGID
PACKAGING APPLICATION
Ma’an Alkhaitib, Noorhaza Bt Alias 155

CHAPTER 27  IMMOBILIZATION OF LIPASE ON MULTI-WALLED CARBON
NANOTUBES
Ma’an Alkhaitib, Hamzah Mohd Salleh, Anas M. N. Sultan 162

CHAPTER 28  INTEGRATION OF ARTIFICIAL NEURAL NETWORK AND PRINCIPAL
COMPONENT ANALYSIS TECHNIQUES FOR WASTEWATER
TREATMENT PLANT EVALUATION
Mohammed Saedi Jami, Nassereldeen A. Kabbashi and Mustapha Mujeli 169

CHAPTER 29  ISOLATION OF BACTERIA FROM OIL-CONTAMINATED SOIL FOR
CRUDE OIL DEGRADATION
Ma’an Alkhaitib, Humaaidah Bt Dr Hj Mohammad Nur Lubis, Alade Abass
Olanrewaju 175

CHAPTER 30  ISOLATION OF BACTERIA FROM SOIL FOR PLASTICS DEGRADATION
Ma’an Alkhaitib, Nur Amalina Binti Ahmad, Alade Abass Olanrewaju 183
CHAPTER 31  OPTIMIZATION OF CELLULASE ENZYME PRODUCTION USING ARTIFICIAL NEURAL NETWORK
Mohammed Saedi Jami, Md. Zahangir Alam and Lamija Subasic 190

CHAPTER 32  POTENTIAL OF ARTIFICIAL NEURAL NETWORKS IN THE PREDICTION OF WASTEWATER TREATMENT PLANT PERFORMANCE
Mohammed Saedi Jami, Nassereeldeen Ahmed Kabashi and Norhafiza Binti Abdullah 196

CHAPTER 33  PRODUCTION OF ACTIVATED CARBON FROM OIL PALM EMPTY FRUIT BUNCH FOR ADSORPTION OF CADMIUM IN AQUEOUS SOLUTION
Suleyman A. Mayibi, Ma’an Alkhathib, Jeminat Omotayo Amode 202

CHAPTER 34  PRODUCTION OF ACTIVATED CARBON FROM PALM OIL EMPTY FRUIT BUNCH BY CHEMICAL ACTIVATION
Ma’an Alkhathib, Monawar Munjid 209

CHAPTER 35  REMOVAL OF AQUEOUS ZINC (II) USING PROCESSED MORINGA OLEIFERA SEEDS
Suleyman A. Mayibi, Isam Y. Qudsieh, M. H. A. Rahman 217

CHAPTER 36  REMOVAL OF COLOUR FROM PALM OIL MILL EFFLUENT USING GRANULAR ACTIVATED CARBON (GAC)
Ma’an Alkhathib, Abdullah Al Mamun, Iqrah Akbar 224

CHAPTER 37  THERMAL PROPERTIES ENHANCEMENT FOR THE DEVELOPED OF ETHYLENE VINYL ACETATE/EPOXIDIZED NATURAL RUBBER/CARBON NANOTUBES NANOCOMPOSITES
Faridah Yusof and Norazlina Mohamed Yatim 232

CHAPTER 38  EFFECT OF CARBON NANOTUBES LOADING ON THE MECHANICAL PROPERTIES OF ETHYLENE VINYL ACETATE/EPOXIDIZED NATURAL RUBBER NANOCOMPOSITES
Faridah Yusof and Norazlina Mohamed Yatim 242

INDEX 251
CHAPTER 32

POTENTIAL OF ARTIFICIAL NEURAL NETWORKS IN THE PREDICTION OF WASTEWATER TREATMENT PLANT PERFORMANCE

Mohammed Saedi Jami, Nasserelddeen Ahmed Kabashi and Norhafiza Binti Abdulla

Department of Biotechnology Engineering, Faculty of Engineering, International Islamic University Malaysia, Gombak, 50728 Kuala Lumpur, Malaysia.

ABSTRACT

This paper provides a solution on how to unveil the complicated interrelationships of wastewater parameters using artificial neural network (ANN) which is available in MATLAB software. ANNs give precise prediction thus capable of optimizing the performance of the plant. Using real data provided by Indah Water Konsortium Sdn Bhd (IWK), the ANN models developed will train, test, and validate the data to come up with various results that could be used in analyzing how wastewater parameters such as Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Suspended Solids (SS), are affecting each other, also, the networks could be used to gather predicted values of any of the parameters when fresh values of any of the parameters are inserted. These make ANNs valid as a tool to study biological processes.

Keywords: wastewater treatment plant, artificial neural network, biological oxygen demand, chemical oxygen demand, suspended solids.

INTRODUCTION

ANNs resemble the central nervous system. They are networks of highly interconnected neural computing elements that have the ability to respond to input stimuli and learn to adapt to the environment. They cannot be programmed to perform a specific task, instead, like the human brain, they learn from examples. Basically, ANNs consist of three layers: input, hidden, and output. These layers contain nodes, akin to the neurons in the human brain, and each connecting node has weight, representing the degree of influence of that particular node.

The process of learning includes pattern training. During pattern training the network is trained to associate outputs with input patterns. Later on, when the network is assessed with fresh information, it will identify the input pattern and try to generate output associated with the output pattern. Back-propagation neural networks learning algorithm is used mostly in forecasting problem for adjusting the weights of each neuron repeatedly until the error between the desired output and the actual output is at the least.

Neural networks (NNs) are systems that are deliberately constructed to make use of some organizational principles resembling those of the human brain. Such a model resembles the brain in two aspects: (1) knowledge is “acquired” by the neurons through a learning