

CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME I

Editors:

Suleyman Aremu Muyibi
Mohammed Saedi Jami
Zaki Zainudin



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(VOLUME I)

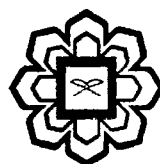
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CONTENTS

PREFACE		v
CHAPTER 1	SELECTION OF POTENTIAL FUNGAL STRAINS FOR THE PRODUCTION OF GLUCOAMYLASE USING NON-FOOD CASSAVA	1 (4157/20570)
	<i>Md Zahangir Alam, Hamzah Mohd Salleh, Juwairiyah Abd Karim, and Aliyu Salihu</i>	
CHAPTER 2	WATER QUALITY MODELING TO ASSESS THE IMPACTS OF PALM OIL MILL EFFLUENT (POME) IN SG. KALUMPANG BASIN	7 (6601/20573)
	<i>Zaki Zamudin</i>	
CHAPTER 3	WATER QUALITY CHARACTERIZATION STUDIES ON SPRING WATER FOR USE IN PONDS FOR KELAH FISH BREEDING IN KELAH SANCTUARY	13 (4164/20576)
	<i>Suleyman Aremu Muyibi, Siti Haryah Binti Morlan, and Mohamed Ismail Abd Karim</i>	
CHAPTER 4	THE SOLID WASTE MANAGEMENT SYSTEM ISSUES ON POLLUTION AND WASTE DISPOSAL PROBLEMS	19 (4286/20578)
	<i>Nassereldeen Kabbashi, Najla Shuhud, and Mohammed Saedi Jami</i>	
CHAPTER 5	SETTLING COLUMN ANALYSIS FOR WATER TURBIDITY REMOVAL USING CHITOSAN	26 (4286/20584)
	<i>Nassereldeen Ahmed Kabbashi and Muhammad Fazil B Anoiar</i>	
CHAPTER 6	PROCESS DEVELOPMENT OF REMOVING LOW TURBIDITY WATER USING CHITOSAN AS A BIOCOAGULANT	32 (4286/20588)
	<i>Nassereldeen Ahmed Kabbashi and Muhammad Fazil B Anoiar</i>	
CHAPTER 7	OPTIMIZATION OF PROCESS CONDITIONS FOR GLUCOAMYLASE PRODUCTION USING NON-FOOD CASSAVA	38 (4157/20590)
	<i>Md. Zahangir Alam, Hamzah Mohd Salleh, Radhiah Ariffin, and Noor Mohammad</i>	
CHAPTER 8	DEVELOPMENT OF RAPID ENZYMATIC PROCESS FOR ACID OIL PRODUCTION FROM SLUDGE PALM OIL	44 (4157/20596)
	<i>Md Zahangir Alam, Hamzah Mohd Salleh, and Noraini Mohd Yusof</i>	
CHAPTER 9	OPTIMISATION OF CHROMATOGRAPHY CONDITION FOR BIOPHENOLS SEPARATION FROM OIL PALM FRUIT FIBER	51 (2937/20598)
	<i>Parveen Jamal, Shahrul Yahaya, Md Zahangir Alam, and Azlin Azmi</i>	
CHAPTER 10	MORINGA SEED OIL EXTRACTION AND CAKE PROCESSING FROM BENCH TO COMMERCIAL PRODUCTION OF ALTERNATIVE WATER TREATMENT CHEMICALS FOR DEVELOPING COUNTRIES	60 (4146/20603)
	<i>Suleyman A Muyibi and Idris M Bugaje</i>	
CHAPTER 11	INVESTIGATION OF ANTIBACTERIAL ACTIVITY OF MORINGA OLEIFERA SEEDS FOR APPLICATION IN WATER TREATMENT	66 (4164/20605)
	<i>Suleyman A Muyibi and Farhana Aina Bt Ahmad Nazir</i>	
CHAPTER 12	SCREENING OF LIGNOCELLULOSIC MATERIALS FOR THE PRODUCTION OF FERMENTABLE SUGAR	72 (4151/20606)
	<i>Md. Zahangir Alam, Abdullah-Al-Mamun, Hikmah Mohd Noor, and Noor Mohammad</i>	
CHAPTER 13	LOCAL SOURCING FOR RENEWABLE AND SUSTAINABLE REPLACEMENT FOR WATER AND WASTEWATER TREATMENT CHEMICALS: ACTIVATED CARBON FROM AGRO-WASTES	77 (4164/20610)
	<i>Suleyman Aremu Muyibi Mohd Ismail Abdulkarim, Md Zahangir Alam, Emad S M Ameen, and Nassereledeen A Kabbashi</i>	
CHAPTER 14	EVALUATION OF THE PERFORMANCE OF WATER TREATMENT SYSTEM FOR KELAH BREEDING IN FISH PONDS	85 (4164/20612)
	<i>Suleyman Aremu Muyibi, Siti Sara Binti Ghazali, and Mohamed Ismail Abd Karim</i>	

CHAPTER 15	DESIGN OF TERTIARY TREATMENT SYSTEM FOR EFFLUENT FROM STP AT IUM FOR HORTICULTURAL USES	91 (4164/2063)
	<i>Suleyman A Muyibi and Tamrin Tajari</i>	
CHAPTER 16	COMPARATIVE STUDIES OF MORINGA OLEIFERA AND ALUMINIUM SULPHATE AS COAGULANTS IN TURBIDITY REMOVAL FROM SURFACE WATER	96 (4164/20618)
	<i>Suleyman A. Muyibi, Eman N Ali, Md Zahangir Alam, and Hamzah M Salleh</i>	
CHAPTER 17	AN EXPERT SYSTEM FOR DESIGN OF WATER TREATMENT PLANT	101 (4286/20619)
	<i>Nassereldeen Kabbashi, Anwar Bin Mohamad, and Suleyman A Muyibi</i>	
CHAPTER 18	ISOLATION AND SCREENING OF POTENTIAL MICROORGANISM FOR BIOREMEDIATION OF HYDROCARBON CONTAMINATED SITES	106 (2937/20625)
	<i>Parveen Jamal, Md Zahangir Alam, and Nur Aneem Fadza</i>	
CHAPTER 19	SLUDGE PALM OIL AS A POTENTIAL SOURCE FOR EMULSIFIER PRODUCING STRAIN	113 (2937/20631)
	<i>Parveen Jamal, Md Zahangir Alama, and Nur Fathiah Abd Samia</i>	
CHAPTER 20	MICROBIAL FERMENTATION FOR PRODUCING SURFACE ACTIVE AGENT BY USING PALM OIL MILL EFFLUENT ISOLATE	119 (2937/20632)
	<i>Parveen Jamal, Md Zahangir Alam, Nur Aneem Fadza, and Wan Mohd Fazli Wan Nawawi</i>	
CHAPTER 21	A BATCH PROCESS PRODUCTION OF COMPOST AND KINETICS ORDER OF REACTION STUDY BY ISOLATED FUNGAL STRAINS	126 (4286/20635)
	<i>Nassereldeen A Kabbashi, Optakun Suraj, and Md Zahangir Alam</i>	
CHAPTER 22	ANALYSIS OF ELECTROFORCED SEDIMENTATION OF ZINC OXIDE	137 (5545/20639)
	<i>Mohammed S Jami, Masashi Iwata, Ma an Alkhatib, and Mujeli Mustapha</i>	
CHAPTER 23	PRODUCTION OF BIODIESEL BY ACID-BASE CATALYZED TRANSESTERIFICATION OF WASTE COOKING OIL IN A BATCH REACTOR	143 (4157/20641)
	<i>Md Zahangir Alam, Parveen Jamal and Nor Rashid Bin Mohamad</i>	
CHAPTER 24	FRACTIONATION, IDENTIFICATION AND QUANTIFICATION OF BIOPHENOLS FROM OIL PALM FRUIT FIBER	150 (2937/20644)
	<i>Parveen Jamal, Shahrul Yahaya, Md Zahangir Alam, and Azlin Azmi</i>	
CHAPTER 25	CELLULASE PRODUCTION FROM RICE STRAW AND CORN COB BY SOLID STATE BIOCONVERSION	158 (4157/20646)
	<i>Md Zahangir Alam, Mazlinor Mohd Awal, and Aliyu Salihu</i>	
CHAPTER 26	NATURAL DISINFECTANTS FOR WATER TREATMENT	164 (4971/20649)
	<i>Mohamed E S Mirghani, I A Ahmed, S A Muyibi, J I Daoud and M A Mikail</i>	
CHAPTER 27	REMOVAL OF WATER TURBIDITY BY USING FABA BEANS	173 (20653)
	<i>Mohamed E S Mirghani, Nasereldin A Kabbashi, and Fasehah Abdul Kadir</i>	
CHAPTER 28	WASTE TO WEALTH: DATE SEED PITS	180 (4971/20656)
	<i>Mohamed E S Mirghani, M A Mikail, I A. Ahmed, M I Abdul Karim and J I Daoud</i>	
CHAPTER 29	EFFECT OF HYDROGEN PEROXIDE ON SETTLEABILITY AND FILTERABILITY OF SLUDGE FROM DRINKING WATER TREATMENT PLANT	188 (5545/20659)
	<i>Mohammed Saedi Jami, Suleyman Aremu Muyibi, and Mohd Shahril Bin Kamaruddin</i>	
CHAPTER 30	ENHANCING THE DEWATERABILITY OF SLUDGE FROM WASTEWATER TREATMENT PLANT	194 (5545/20661)
	<i>Mohammed Saedi Jami, Suleyman Aremu Muyibi, and Nur Salihah Embong</i>	
CHAPTER 31	EVALUATION OF AMMONIA NITROGEN REMOVAL IN AN EXISTING SEQUENTIAL BATCH REACTOR	200 (5545/20664)
	<i>Mohammed Saedi Jami, Suleyman Aremu Muyibi, and Nur Faizah Bt Ismail</i>	
CHAPTER 32	PRODUCTION OF GLUCOAMYLASE FROM RICE BRAN USING	206 (4157/20666)

	POTENTIAL FUNGAL STRAINS	
	<i>Md Zahangir Alam, Hamzah Mohd Salleh, and Nurhidayah Binti Ahmad Hassan</i>	
CHAPTER 33	OPTIMIZATION OF PROCESS CONDITIONS FOR GLUCOAMYLASE PRODUCTION USING RICE BRAN	213 (4157/20668)
	<i>Md. Zahangir Alam, Hamzah Mohd Salleh, and Siti Najilaa Othman</i>	
CHAPTER 34	MEMBRANE PROCESS FOR REUSE OF TREATED PALM OIL MILL EFFLUENT (POME)	219 (5545/20672)
	<i>Mohammed Saedi Jami, Suleyman Aremu Muyibi, Siti Noor Hayati Abdul Kudus, and Munirat Idris Oseni</i>	
CHAPTER 35	PRODUCTION OF FERMENTABLE SUGAR FROM LIGNOCELLULOSIC MATERIALS USING STATISTICAL DESIGN	225 (4157/20674)
	<i>Md. Zahangir Alam, Abdullah-Al-Mamun, and Hikmah Mohd Noor</i>	
CHAPTER 36	STUDY OF THE DEWATERABILITY OF KAOLINE AS A MODEL SUBSTANCE FOR SLUDGE	231 (5545/20676)
	<i>Mohammed Saedi Jami, Tariq Jameel, Mardhiah Farhanah Bt Noor Izan, and Jabir Hussain</i>	
INDEX		237

CHAPTER 23

PRODUCTION OF BIODIESEL BY ACID-BASE CATALYZED TRANSESTERIFICATION OF WASTE COOKING OIL IN A BATCH REACTOR

Md. Zahangir Alam, Parveen Jamal, Nor Rashid Bin Mohamad

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

ABSTRACT

In this research, biodiesel was produced from waste cooking oil via an acid-base catalyzed transesterification process with methanol as a reactant. The five factors involved were reaction time, temperature, agitation, molar ratio of alcohol to oil and the amount of acid and base which are optimized by earlier study. Two factors were optimized namely stirrer speed and temperature. The maximum yield was obtained with the conversion rate of 82.54%. The optimum conditions obtained were: reaction temperature at 75°C and stirrer speed at 400 rpm. The waste cooking oil underwent the pretreatment process to remove the water and food residue. The crude biodiesel was purified by distilled water in a process called biodiesel washing. The process was accelerated by microwave irradiation. The design of experiment was developed by using Minitab software which involved two factors with three levels each.

Keywords: acid-base catalyz, transesterification, waste cooking oil, batch reactor

INTRODUCTION

As the petroleum depositories are kept on declining worldwide, the need for the new source of energy has become crucial. In addition, due to the current environmental problems, the replacement need to be greener power and efficient in order to create a clean energy future. Thus, the renewable energy appears to be the perfect candidate. Biodiesel is one of the renewable energy under the biofuels category. Generally, biodiesel is produced by chemically reacting a fat or oil with an alcohol, in the presence of a catalyst (Van Gerpen, 2003). This reaction yields a mixture of methyl esters, which are known as biodiesel and glycerol as a co-product. Many researches have shown that there are many advantages by using biodiesel (Bajpai and Tyagi, 2006). The oil-based fuels have been proved to give a harmful effect to the environment. Thus, as an alternative fuel for diesel engines, biodiesel is non-toxic, environmentally friendly emission and biodegradable. Furthermore, no extensive engines alterations are needed since it can be used directly in most diesel engines (Van Gerpen, 2003).

Biodiesel has a bright economic prospect in the future as a renewable source of energy. Many countries around the globe have shown their interest to invest in the biodiesel