UNIVERSITI TEKNOLOGI MARA

CHEMICAL ACTIVATION OF BAMBOO ACTIVATED CARBON (BAC) BASED ON MICROWAVE-ULTRASONIC ACTIVATION FOR SUPERCAPACITOR APPLICATION

NORAKMALAH BINTI MOHD ZAWAWI

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ABSTRACT

Activated carbon (AC) has been explored as a raw material for supercapacitor due to its characteristic of having porosity and electrical conductivity, which could liberate a high power. From high surface area and pores size, it leads to a high specific capacitance values more than 70 F/g. High adsorption capacities of AC are determine by pore volume, porosity and surface area. Thus, this present study was focused on the chemical activation and microwave-ultrasonic (Mw-U) activation in order to enhance the properties of AC derived from bamboo. Bamboo has been choose as raw material because it is economical, easy to get and have high total pore volume distributed in the micropore range. BAC was activated using potassium hydroxide (KOH) with different Mw power intensity (100 W, 300 W, 500 W) at 30 minutes of retention time and 60 minutes of soaking time under ultrasonic. The carbonisation process was conducted at temperature 400°C, 600°C and 800°C. Bamboo physical and chemical properties gave a good impact to the BAC performance, which was consist a low of moisture content (0.4%) and high of carbon content (83.4%). KOH activation and Mw-U activation at 500 W produced high surface area, 106.65 m^2/g with total pore volume $4x10^{-2}$ cm^3/g. BET value of surface area is 646.87 m^2/g and total pore volume is $2.8x10^{-1}$ cm^3/g conducted with power intensity of Mw 100 W at 800°C of carbonisation temperature. The capacitance value is analyse under electrochemical analyses, which cyclic voltammetry (CV) and galvanostatic charge and discharge (CDC). The value of specific capacitance, Cs of BAC is 77 F/g at scan rate 25 mV/s in 1 mol/L KOH of electrolyte is produced from CV. While for galvanostastic CDC, the specific capacitance, Cs is 80 F/g at current density, 0.3 Ag^{-1} of BAC. Hence, it can concluded that BAC capable be used as alternating method in producing AC for supercapacitor.

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TABLE OF CONTENTS

		Page
CONFIRMATION BY PANEL OF EXAMINERS		ii
AUTHOR'S DECLARATION		iii
ABSTRACT		iv
ACKNOWLEDGEMENTS		v
TABLE OF CONTENTS		vi
LIST OF TABLES		ix
LIST OF FIGURES		x
LIST OF SYMBOLS		xii
LIST OF ABBREVIATIONS		xiv
CHAPTER ONE: INTRODUCTION		1
1.1	Research Background	1
1.2	Problem Statement	4
1.3	Significant of Study	6
1.4	Scope and Limitations	6
1.5	Objectives	7
1.6	Hypothesis	7
CHAPTER TWO: LITERATURE REVIEW		8
2.1	Activated Carbon and Its Characteristic	8
	2.1.1 Porosity	8
	2.1.2 IUPAC Classification of Adsorption Types	11
	2.1.3 Crystalline and Amorphous Structure of AC	15
	2.1.4 Surface Area of AC	16
2.2	Types of AC	18
2.3	Raw Material for Activated Carbon	19
	2.3.1 Agricultural Waste as AC	20
	2.3.2 Bamboo as AC Precursor	23
2.4	Activated Carbon Processing	26

2.4.1 Physical Activation 26
2.4.2 Chemical Activation 29
2.4.3 Microwave (Mw) Activation 32
2.4.4 Ultrasonic Activation 38
2.5 Supercapacitor as Energy Storage 41
2.5.1 AC in Supercapacitor Application 43
2.6 Summary 47

CHAPTER THREE: METHODOLOGY 49
3.1 Raw Material Preparation 49
3.2 Preparation of Activated Carbon 50
3.2.1 Chemical Activation Preparation 50
3.2.2 Bamboo Activated Carbon (BAC) Parameter 51
3.3 Characterisation Analyses 52
3.3.1 Thermogravimetric Analyses (TGA) 52
3.3.2 Elemental Analyses Spectroscopy (EA) 53
3.3.3 Fourier Transform Infrared Spectroscopy (FTIR) 54
3.3.4 Brunauer, Emmett, Teller (BET) Test 54
3.3.5 Field Emission Scanning Electron Microscope (FESEM) 55
3.3.6 X-ray diffraction (XRD) 55
3.4 Electrochemical Measurement 56
3.5 Outline of Research Study 58

CHAPTER FOUR: RESULT AND DISCUSSION 59
4.1 The Effects of Chemical Agent Activation 59
4.2 Characterisation of AC Precursor 60
4.2.1 Proximate and Ultimate Analyses of Bamboo Raw Material 61
4.2.2 FTIR Analyses of Raw Bamboo 62
4.2.3 Morphology of Raw Bamboo 63
4.3 Proximate and Ultimate Analyses of BAC 64
4.4 Graphitisation of BAC 66