

**UNIVERSITI TEKNOLOGI MARA**

**SURFACE MODIFICATION OF  
BIOCHAR DERIVED FROM  
GAHARU WASTE FOR THE  
TREATMENT OF FINAL  
DISCHARGE LEACHATE**

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## ABSTRACT

In current years, worldwide demands for products based on gaharu have continuously increased especially in the production of essential oil. In future, the growth of gaharu processing in Malaysia is expected to be in increasing pattern. In the meantime, the production of gaharu oil yielded huge amount of waste in the form of woody mass due to the low ratio of oil yield over the amount of agarwood used. As one way to overcome this problem, this research came out with production of biochar using feedstock from gaharu waste. Biochar derived from agricultural waste is increasingly been proven as a worthy medium for adsorption purpose. There is still little information on the outcome of treatment of leachate using biochar if modification has been made as an innovation. This research is evaluating the effect of modification using chemicals onto the surface of biochar that is derived from gaharu residual for the treatment of leachate final discharge. Gaharu biochar carbonized at 800°C and 150 min recorded the maximum value adsorption capacity and BET value which are 73.32 mg/g and 135.68 m<sup>2</sup>/g respectively. Among the chemical that was used to modify the surface of biochar, gaharu biochar washed with ethanol and carbonized at 800°C and 150 min recorded the maximum value adsorption capacity and BET value which is 78.14 mg/g and 287.48 m<sup>2</sup>/g. After the adjustment of pH, leachate with lowest turbidity measured at pH 8. Thus, the dosing test was done at pH 8. It was found that the optimum dosage of biochar is at 2 g to achieve highest removal of final discharge of leachate where the turbidity, colour, COD, and TSS were reduced from 3.175 NTU, 188.5 mg/L, 172 mg/L and 4 mg/L to 1.695 NTU, 184.5mg/L, 16 mg/L and 5 mg/L respectively. From the result obtained, gaharu biochars that modified with ethanol gave higher sorption of methylene blue as compared to unmodified biochar. The result is confirmed with SEM analysis which shows the pore size distribution of biochar surface. Results obtained are highlighting the effectiveness of modification using ethanol onto biochar for treatment of final discharge leachate.

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# TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>ii</b>
<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>xi</b>
<b>LIST OF FIGURES</b>	<b>xiii</b>
<b>LIST OF PLATES</b>	<b>xv</b>
<b>LIST OF SYMBOLS</b>	<b>xvi</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xvii</b>
<b>CHAPTER ONE: INTRODUCTION</b>	<b>1</b>
1.1 Research background	1
1.2 Problem statement	5
1.3 Objectives	6
1.4 Significance of Study	6
1.5 Hypotheses	6
<b>CHAPTER TWO: LITERATURE REVIEW</b>	<b>8</b>
2.1 Introduction	8
2.2 Biochar	9
2.3 Biomass	11
2.3.1 Source of biomass	12
2.3.2 Composition of biomass	16
2.4 Biochar Production Technologies	18
2.4.1 Pyrolysis	19
2.4.2 Biochar Production Technologies	22

2.4.3	Hydrothermal Carbonization	23
2.5	Operating Parameters	24
2.5.1	Temperature	24
2.5.2	Retention Time	26
2.5.3	Heating Rate	27
2.5.4	Particle Size	28
2.6	Biochar Characteristics	29
2.6.1	Specific Surface Area and Porosity	30
2.6.2	Surface Charge and Functional Groups	32
2.6.3	Adsorption Capacity	33
2.7	Biochar Applications	34
2.7.1	Environmental	35
2.7.2	Agricultural	37
2.8	Surface Modification methods	39
2.8.1	Chemical Modification	39
2.8.2	Physical Steam Modification	42
2.9	Municipal Solid Waste (MSW) Landfill	42
2.9.1	Landfill in Malaysia	44
2.9.2	Sanitary Landfill	47
2.9.3	Design of Sanitary Landfill	48
2.10	Landfill leachate	50
2.10.1	Formation of Leachate	50
2.10.2	General Characteristics of Landfill Leachate	52
2.11	Treatment of leachate	54
2.11.1	Physicochemical Leachate Treatment Methods	55
	<i>2.11.1.1 Coagulation-flocculation</i>	55
	<i>2.11.1.2 Ammonium stripping</i>	56
	<i>2.11.1.3 Membrane filtration</i>	56
	<i>2.11.1.4 Adsorption</i>	57
	<b>CHAPTER THREE: RESEARCH METHODOLOGY</b>	<b>58</b>
3.1	Introduction	58