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**ADSORPTION PERFORMANCE OF PALM OIL EFB ACTIVATED CARBON
PREPARED BY ULTRASONIC-KOH ACTIVATION**

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ABSTRACT

ADSORPTION PERFORMANCE OF PALM OIL EFB ACTIVATED CARBON PREPARED BY ULTRASONIC-KOH ACTIVATION

The increasing release of synthetic dyes like methylene blue (MB) from textile industries into water sources has raised serious environmental concerns, as these dyes are toxic, difficult to degrade, and harmful to aquatic life. Existing wastewater treatment systems often struggle to completely remove such pollutants. To tackle this problem, this study focused on developing an eco-friendly and effective adsorbent from palm oil empty fruit bunches (EFB), an abundant agricultural waste in Malaysia. The EFB was transformed into activated carbon (AC) through a combination of potassium hydroxide (KOH) activation and ultrasonic treatment to improve its surface area and pore structure. The material was characterized using Fourier transform infrared (FTIR), iodine number, moisture and ash content, bulk density, and pH_{zpc} measurements. Batch adsorption experiments were then carried out to examine the effects of initial dye concentration, adsorbent dosage, and contact time on the removal efficiency of MB. The highest removal efficiency recorded was 95.70%, achieved at 200 mg/L MB concentration, 0.5 g of adsorbent, and 150 minutes contact time. The activated carbon produced showed excellent adsorption capacity with a high iodine value of 1125.34 mg/g and low ash content of 3.22%. These findings suggest that EFB-UAC is a promising, low-cost, and sustainable material for treating dye-contaminated wastewater and contributes towards better waste management practices in the palm oil industry.

TABLE OF CONTENTS

ABSTRACT	ii
ABSTRAK	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF SYMBOLS	ix
LIST OF ABBREVIATIONS	x
CHAPTER 1	1
INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	3
1.3 Research Questions	4
1.4 Objectives	4
1.5 Significance of Study	5
1.6 Expected Output/Outcomes/Implication	6
CHAPTER 2	7
LITERATURE REVIEW	7
2.1 Textile industry	7
2.2 Dye	8
2.2.1 Methylene Blue	10
2.3 Activated Carbon	12
2.3.1 Empty Fruit Bunches (EFB) as AC	12
2.4 Adsorption improvement method	14
2.4.1 Impregnation Activation	14
2.4.2 Ultrasonic Activation	15
2.4.3 Activation by potassium hydroxide (KOH)	17
CHAPTER 3	20
RESEARCH METHODOLOGY	20
3.1 Material and chemicals	20
3.2 Equipment and instrument	21
3.3 Method and procedure	21

3.3.1	Preparation of activated carbon	21
3.3.2	Characterization of palm oil empty fruit bunch (EFB)	22
3.3.2.1	FTIR Analysis	22
3.3.2.2	Moisture content	23
3.3.2.3	Ash Content	23
3.3.2.4	pHpzc Analysis	24
3.3.2.5	Iodine Test	25
3.3.2.6	Bulk density	25
3.3.3	Adsorption of methylene blue	26
3.3.3.1	Effect of initial of MB concentration	26
3.3.3.2	Effect of adsorbent dosage	27
3.3.3.3	Effect of contact time	27
CHAPTER 4		29
RESULTS AND DISCUSSION		29
4.1	Physicochemical Properties of EFB-UAC	29
4.1.1	Moisture Content	29
4.1.2	Ash Content	30
4.1.3	Point of zero charge (pHpzc)	30
4.1.4	Iodine Test	32
4.1.5	Bulk Density	32
4.1.6	FTIR analysis	33
4.2	Adsorption Batch Study towards Methylene Blue	34
4.2.1	Calibration Curve	35
4.2.2	Effect of Adsorbent Dosage	35
4.2.3	Effect of Contact Time	36
4.2.4	Effect of MB Initial Concentration	37
CHAPTER 5		39
CONCLUSION AND RECOMMENDATION		39
REFERENCES		40
CURRICULUM VITAE		47