

UNIVERSITI TEKNOLOGI MARA

**SURFACE MODIFICATION OF BIOCHAR DERIVED
FROM GAHARU WASTE VIA PYROLYSIS**

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ABSTRACT

Biochar is a solid material obtained from the carbonization of biomass. This research objective is to produce biochar derived from gaharu waste. The gaharu waste was taken from Bukit Larut, Perak. The production biochar was at 3 different temperature, 400oC, 500oC and 600oC. This research also analyzes the surface area and adsorption ability of the biochar using methylene blue. The biochar undergoes modifications using H₃PO₄, NaOH and hot water before the analysis was being performed. The yield of the biochar produced was 42%, 38% and 24% for 400 °C, 500 °C and 600°C respectively. The BET surface area of samples treated by H₃PO₄ was 2.7569, 1.8935 and 1.9578 m²/g for pyrolysis temperature of 400, 500 and 600°C respectively. The samples modified with NaOH had the BET surface area of 16.1636 m²/g at 400°C of pyrolysis temperature. At 500°C and 600°C, the BET surface area were 2.0799 and 1.9744 m²/g respectively. The BET surface area of samples treated by hot water was 37.9505, 2.2321, and 1.4973 m²/g for pyrolysis temperature of 400, 500 and 600°C respectively. The pore volume of the biochar treated with H₃PO₄ was 0.001668 cm³/g at 400°C, 0.001510 cm³/g at 500°C and 0.001825 cm³/g at 600°C. The pore volume for samples treated with NaOH were 0.019201, 0.007659 and 0.006730 cm³/g. The pore volume of samples treated by hot water was 0.021265, 0.005720 and 0.005788 cm³/g at 400, 500 and 600°C respectively. Thus, NaOH is the best surface modification in increasing the porosity of the biochar. The adsorption of methylene blue for H₃PO₄ modification was 0.3547mg/g , 0.2678mg/g and 0.2590mg/g for 400 oC, 500 oC and 600oC respectively. For NaOH modification, the adsorption value was 0.8706mg/g for 400 oC, 0.7305mg/g for 500 oC and 0.8076mg/g for 600 oC. The adsorption of methylene blue for hot water modification was 0.8830mg/g, 0.7083mg/g and 0.7681mg/g for 400 oC, 500 oC and 600oC respectively. The optimum temperature to produce biochar was 400oC and the chemical modifications using NaOH and hot water can increase the ability of methylene blue adsorption.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF RESEARCH

Agarwood or gaharu is the resin impregnated, fragrant and exceedingly profitable heartwood found in family of *Aquilaria* (Nor Azah et al., 2008). *Aquilaria malaccensis* Lam or gaharu after disease by specific organisms builds up a fragrant substance called agar in its wood (Compton and Zich, 2002). The agarwood has been categorized as endangered species.

Gaharu been traded since centuries for its utilization in religious, therapeutic, and fragrance preparations (Compton and Zich, 2002). The gaharu oil is additionally utilized as a part of the creation of conventional drug as against asthma immunizing, cancer prevention agent, hypertension (hostile to stretch), hepatitis, sirosis, diuretic, painkiller, and numerous different illnesses. In traditional Malay medicine, the high quality gaharu or kalambak is utilized to regard different conditions, for example, weakness, pain in the stomach or chest, oedema and as tonic for men and ladies and in addition baby blues solution (Nor Azah et al., 2008).