

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT
OF
BIOCHAR
USING NON-DIRECT FIRING
SYSTEM
FROM GAHARU-PHYSICAL
CHARACTERISTICS**

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ABSTRACT

Biochar has an ability to increase crop yield, reduce soil emission of greenhouse gases, decrease nutrient leaching, improve soil quality, reduce irrigation and fertilizer requirement, and store large amount of carbon. Gaharu that pyrolyzed at different temperatures results in different physical characteristic. Gaharu was firstly place manually in the reactor and pyrolyzed at temperature of 400,500, and 600°C. Produced biochar were further analyzed in observing its pH, surface area, adsorption uptake of dye, and surface morphology. pH, Brunaeuer, Emmett, and Teller (BET) Test, Methylene Blue (MB) Absorption Using UV-Vis Spectroscopy, and Microscope Scanning Images analysis provide physical data information of the produced biochar. pH increases from 6.34 to 9.25 with the increase of temperature. BET surface area, micropore surface area, and specific pore volume shows identical pattern as temperature increases which slightly increased between 400 and 500°C and drastically increased as it reached 600°C. The maximum BET surface area and micropore surface area were 131.5542 and 108.0602m²/g. The maximum specific pore volume observed was 0.042179 cm³/g. At 400°C, the amount of MB dye solution absorbed increased from 2495.63mg/g to 12489.30mg/g as the initial concentration of MB dye solution increases. Microscope scanning images represents the surface morphology of the biochar. Some pores are impeded by volatile and ash contents can reduce the pore volume. The physical data obtained shows biochar produced under different pyrolysis condition influences the physical characteristic of the produced biochar. Higher temperature result in higher surface area. Increase in surface area improve the adsorption characteristic of the biochar produced.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

According to a research done by The Wildlife Trade Monitoring Network of WWF and IUCN (TRAFFIC), Malaysia is considered as important country that produce and trade any kind and forms of agarwood (Gaharu) which includes oil, chips, and processed derivatives like incense sticks and medicine (WYN, 2010). In 2005, Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) declared out of half percent from entire gaharu products originated from Malaysia are being traded internationally. This in returned, make Malaysia a place that is as the main manufacture of gaharu according to recorded trade published by CITES.

Malaysian soil can be separated into two which are soil that is formed stationary inside Malaysia and soil that is develop from delta plains. There are several classifications of coastal soils which are Histosols, Entisols, Inceptisols, and Spodosols. The classification can be further categorize into organic and peat soils, finex textured clay soils, sandy soils and acid sulfate soils (Lee, Hawkins, Day, & Reicosky, 2010). In Malaysia, manufacturing of rice produces large amount of rice husk which considered as waste that can be further process to be used as fuel.

Besides, there are some examples of biochar programs and activities run by government and non-government organization that have been developed to further improves the usage and development of biochar on soil to community especially a farmer. For example, the International Biochar Initiative, the British Biochar Foundation, and the Alberta Biochar Program in Canada. These organizations provide the biochar structural research activities and foundation to the community. In addition, various experimentation network such as European Biochar Research Network UK Biochar Research Centre and Biochar for Sustainable Soils (B4SS) are getting involved in experimentation of producing better quality of biochar.