

ABSTRACT
UTILIZATION OF ACTIVATED BIOCHAR DERIVED FROM
CARBONIZED OIL PALM FRONDS AS RAW MATERIAL FOR
BIO-BATTERY

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This study aims to explore the utilization of biochar produced from oil palm fronds through carbonization as raw material for electrodes in bio-batteries. The scope of the research encompasses the conversion of solid waste from oil palm fronds into biochar, characterization of the resulting product, and evaluation of its feasibility as an environmentally friendly alternative energy material. Carbonization was conducted at temperatures of 400 °C, 500 °C, and 600 °C to observe the impact of temperature on the quality of the biochar. Parameters analyzed in this study included fixed carbon content, ash content, calorific value, and electrical conductivity of the biochar. High-temperature carbonization had a significant effect on the biochar's chemical composition: as the carbonization temperature increased, both ash content and fixed carbon increased, while volatile matter decreased at 500 °C. Furthermore, activation using a 1.5 M concentration yielded the best results, producing biochar with the highest iodine number of 3,998.30 mg/g at a carbonization temperature of 600 °C, indicating very high adsorption capacity. In terms of electrical performance, the voltage, current, and power of the activated biochar increased with higher concentrations of KOH electrolyte. The highest voltage, 1.567 V, was achieved with the combination of 500 °C carbonization and 1.5 M activation. The maximum current of 0.00851 A and maximum power of 0.01334 W were also obtained under the same treatment combination, demonstrating that these conditions are optimal for producing biochar with the best electrode performance.

Keywords : *Palm fronds; Carbonization; Bio-battery; Electrolyte.*