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Electrochemical Properties Of Carbon From Oil Palm Kernel Shell For High Performance Supercapacitors

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ABSTRACT

Electrochemical properties of activated carbon (AC) derived from oil palm kernel shell (PKS) are evaluated and compared with other biomass derived AC for fabricating high performance electrochemical double layer capacitors (EDLC). Cleaned PKS are carbonized by pyrolysis and subsequently activated by physical and chemical methods. The chemically AC show a wider pore distribution (1.4–9.3 nm) whereas the physically activated one has uniform pores (1.5 nm). The electrochemical properties of the two types of AC are evaluated using cyclic voltammetry (CV), charge–discharge cycling (CDC) and electrochemical impedance spectroscopy (EIS) in three-electrode configuration. High specific capacitance (C_S) (210 F g^{-1} in 1 M KOH electrolyte at 0.5 A g^{-1}) is obtained for chemically AC whereas the C_S for the physically AC is 50% lower (123 F g^{-1}). Galvanostatic CDC tests show that the electrodes maintained ~95–97% of C_S after 1000 cycles. The EIS revealed that the PKS AC has low series resistance (< 0.6 Ω) and relaxation time (~0.69 s) which would therefore offers high power density in the EDLC devices.

KEYWORDS: Amorphous materials; Supercapacitors; Pseudocapacitors; Energy storage

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