Nitrogen-doped Oxygen-rich Activated Carbon Derived from Longan Shell for Supercapacitors

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In this study, longan shell as biowaste material has been collected to prepare activated carbon for supercapacitors. The biochar was firstly carbonized and then etched by KOH to transform into porous carbon architecture. With the help of XRD, SEM, Raman and XPS, physical and chemical properties of the samples were investigated and the optimized parameters of preparation is the etching ratio of 1:2 at pre-carbonization temperature of 500 °C following the etching temperature at 700 °C. Due to the nitrogen-doping carbon combined with oxygen-rich functional groups as well in-situ CaCO₃ template, the achieved activated carbon possesses a specific capacitance of 210 F g⁻¹ at a current density of 0.5 A g⁻¹, with a moderate rate capability at 20 A g⁻¹. Symmetrical supercapacitor has also been assembled and its power density reaches 17.2 Wh kg⁻¹ at energy density of 1, 000 W kg⁻¹ with a high capacitance retention of 68.3% from 1 A g⁻¹ to 40 A g⁻¹. After tested at 4 A g⁻¹ for 10,000 cycles, the capacitor only shows slightly capacitance decay with the retention almost 100%, demonstrating a practical application value in supercapacitors.

Keywords: Bio-waste derived; Activated carbon; Nitrogen-doped; Electrochemical capacitors;

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