Porous Biomass Carbon Derived from Peanut Shells as Electrode Materials with Enhanced Electrochemical Performance for Supercapacitors

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A hierarchical porous carbon with high surface area derived from peanut shells was synthesized via a simple, valid and economical route involving hydrothermal treatment, ZnCl₂ activation and pyrolysis. The products were characterized by XRD, SEM, Raman and Brunauer Emmett-Teller (BET) tests. The electrochemical performance was explored by cyclic voltammetry, galvanostatic charge-discharge and electrochemical impedance measurements. It was found that the peanut shell-derived carbon electrode materials in supercapacitors exhibited high capacitance (340 F g⁻¹), excellent rate performance (54.7% capacitance retention from 0.25 A g⁻¹ to 50 A g⁻¹) and outstanding cycle stability (capacitance decay of 4.7% after 10000 cycles at 1 A g⁻¹), which benefit from the unique hierarchical structure. The excellent electrochemical performance endows the peanut shell-derived carbon with promising prospects for high performance supercapacitors.

Keywords: peanut shell; porous carbon; ZnCl₂ activation; supercapacitors; electrochemical performance.

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