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Nitrogen-Doped 3D Hierarchically Porous Carbon Derived from Renewable Biomass for Energy Storage Application

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The development of renewable carbon sources for sustainable supercapacitor is of significance importance. Herein, the synthesis of three-dimensional N-doped carbons derived from lecithin via a simple route was reported. Hierarchical porous carbons with high surface area (up to 1803 $m^2 g^{-1}$) along with nitrogen-doping level (up to 9.2 wt. %) were successfully prepared by hydrothermal carbonization and a subsequent thermal annealing. The electrochemical performance of the carbon electrodes was examined with both two and three-electrode cell configurations in 1 M KOH and 1 M H_2SO_4 electrolytes. The as-prepared electrode features a large specific capacitance (285 F g^{-1} at 0.5 A g-1), high-rate capacitive behavior, and long-term cycling stability (8% loss after 20000 cycles). Furthermore, obtained electrode exhibits an energy density of 24.7 W h kg-1 at a power density of 500 W kg^{-1} in 1 M H_2SO_4. The excellent electrochemical performance of N-doped carbons is attributed to the unique hierarchical porous frameworks along with pseudocapacitive effect. This work opens up a new approach for preparation of hierarchical N-doped porous carbon materials with tailored properties for supercapacitor applications.

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