Biomass Carbon Materials Derived from Starch and their Electrochemical Properties

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Porous carbon was prepared by using starch as a carbon source and ZnCl_2 as an activator. The physical and chemical properties of porous carbon materials were characterized by scanning electron microscope (SEM), transmission electron microscope (TEM), X-ray diffraction (XRD), Raman spectroscopy, Nitrogen adsorption/desorption, and XPS. Nitrogen adsorption/desorption tests show that ZnCl_2 has well pore expansion, with a maximum specific surface area of $1591.83 \text{ m}^2/\text{g}$ and a total pore volume of $0.89 \text{ cm}^3/\text{g}$. Under the 1 A/g current density, the specific capacitance is 249 F/g . When the current density gains from 1 A/g to 10 A/g , the capacitance retention reaches 72.29% . At the same time, it demonstrates high energy density ($34.34 \text{ W}\cdot\text{h/g}$) and power density ($500 \text{ W}\cdot\text{K/g}$). The capacitance retention is 90.4% after 5000 cycles at 2 A/g current density. The results depict that the porous carbon is not only an ideal electrode material for supercapacitors but also a good carrier for the preparation of catalysts from mesoporous materials.

Keywords: starch, porous carbon, electrochemical performance, supercapacitor

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