Nitrogen Self-Doped Porous Carbon Materials Derived from a New Biomass Source for Highly Stable Supercapacitors

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Nitrogen self-doped porous carbon materials with large surface area and excellent cycle stability are successfully synthesized from the waste of *Pteroceltis tatarinowii* Maxim (PTM) bark for the first time. During the synthesis procedure, ethanol is introduced to ensure a homogeneous mixture and good contact of the precarbonized PTM bark with the activating agent (KOH or ZnCl₂), resulting in a unique porous structure. The obtained KOH activated carbon (K-AC) possesses a hierarchical porous structure with a high specific surface area of 1721 m² g⁻¹ and small amount of nitrogen (0.3 wt%). Interestingly, ZnCl₂-activated carbon (Zn-AC) shows a micropore structure with a narrow pore size distribution (0.5–2.0 nm) and a higher nitrogen content of 3.0 wt%. The electrochemical measurement results demonstrate that the as-prepared Zn-AC exhibits a high specific capacitance of 206 F g⁻¹ at a current density of 0.5 A g⁻¹, good rate performance and excellent cycle stability with capacitance retention of 99% over 10,000 cycles. In contrast, K-AC retains only approximately 89% of the initial capacitance value after 10,000 cycles. Thus, such waste PTM bark-derived carbon material, obtained by the ZnCl₂ activated method, is a promising candidate material as an electrode for highly stable supercapacitors.

Keywords: Porous carbon; Nitrogen self-doping; Electrode material; Supercapacitor; Cycle stability

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