Preparation of Nitrogen-Doped Porous Carbon from Melamine-Formaldehyde Resins Crosslinked by Phytic Acid

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A new approach for the fabrication of nitrogen-doped hierarchical porous carbon (NHPC) is presented on the basis of the carbonization of melamine-formaldehyde resins crosslinked by phytic acid. The specific surface area and micropore volume of NHPC greatly increased with an increase in carbonization temperature. The NHPC sample (NHPC-850) synthesized at 850 °C showed a high surface area (2732 m²/g) and a large pore volume (1.46 cm³/g) with hierarchical porous structures of macro-, meso- and micropores. It is thought that phytic acid contributed to increasing the space between carbon frameworks during carbonization. This increase allowed KOH to be more uniformly distributed in the carbon framework, leading to a more effective activation process. NHPC-850 exhibited excellent electrochemical performance in an aqueous 6.0 M KOH solution, including a high specific capacitance (271 F/g at 1.0 A/g), an excellent rate property of 70% at 10.0 A/g, and ~100% retention after 500 cycles.

Keywords: Nitrogen-doped hierarchical porous carbon, melamine-formaldehyde resin, supercapacitor, phytic acid, crosslinker

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