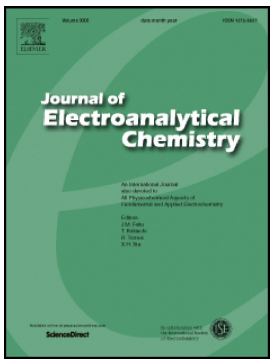

Facile synthesis of chitosan-based carbon with rich porous structure for supercapacitor with enhanced electrochemical performance

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Facile synthesis of chitosan-based carbon with rich porous structure for supercapacitor with enhanced electrochemical performance

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Abstract: Nitrogen and boron co-doped activated carbon (BKACS) was synthesized through the carbonization, KOH activation and subsequently hydrothermal doping reaction process with chitosan as the renewable carbon source. The prepared samples were characterized by XRD, SEM, Raman, XPS and BET for their structure, morphology, specific surface area and elemental composition, respectively. The obtained BKACS has a specific surface area of 1129.6 m^2 g^{-1}, with high conductivity and capacitive character. The BKACS was applied as the electrode material to fabricate the electrochemical double-layer supercapacitor. The supercapacitor performed a high specific capacitance of 316 F g^{-1} at 0.2 A g^{-1} and excellent cycling stability with a capacitance retention of 96.18 % after 5000 cycles at 3 A g^{-1}. The attractive supercapacitor performance of the BKACS material has the high power density, excellent cycling life, and environmental friendliness, making it potentially a promising replaceable function for future energy storing device.

Keywords: chitosan; boron; nitrogen; doping; supercapacitor

1. Introduction

Supercapacitor with the high power density, great maximum power density, perfect working life and a wide operating temperature range has drawn a wide attention of many researchers [1, 2]. According to its different principles of energy storage, surpercapacitor can be divided into electrochemical double layer capacitors (EDLCs) and pseudo-capacitors [3]. Supercapacitor is mainly composed of electrode active material, separator film, electrolyte and current collector. Among these four factors, the electrode active material is the most important part controlling the properties of supercapacitor. Therefore, the development of the novel type high-efficiency supercapacitor electrode material is crucial [4]. At present, the commonly used electrode materials mainly include carbon-based materials, metal oxide materials and conductive polymer materials [5]. Metal oxide-based supercapacitors have the preeminent specific capacitance characteristics, but the high cost of production and the narrow potential window restrict its development. Conductive polymer-based supercapacitors can be designed according to the researcher's ideas,