Synthesis of nanocarbon-based materials for supercapacitors application

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Nowadays, cheap nanocarbon-based materials have been widely used in the energy storage and conversion field. In this study, we present the synthesis of high-efficiency nitrogen-doped carbon materials using kraft pulping residue, black liquor, and wood charcoal as the carbon source. The synthesized catalyst's morphology, structure, and composition were characterized using TEM, XPS, and Raman Spectroscopy. Cyclic voltammetry (CV) and galvanostatic charge-discharge (GCD) techniques have been used to evaluate the electrochemical performance of nanocarbon-based materials.

The synthesized nitrogen-doped carbon materials from black liquor and wood charcoal had high specific surface areas of 2481and 2690 m^2 g^{-1}, respectively, and a large volume of pores with an average size of 2.9−4.6 nm. The nitrogen content was ca. 3−4 at.% in the synthesized nitrogen-doped carbon materials. The specific capacitance of ca. 50−80 F g^{-1} has been achieved in the 1 M Na_2SO_4 aqueous solution at the scan rate of 5 mV s^{-1}. Besides, the specific capacitance retention was 99% after 1000 cycles indicating good electrochemical stability.

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