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Electrospun carbon nanofibers decorated by TiO2 hollow nanospheres for high-performance flexible supercapacitor electrode

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Nowadays, clean and sustainable energy with flexible energy storage devices has gained more attention. Therefore, among various energy storage systems, flexible supercapacitors (SCs) are standing out due to their high capacity, high power density, high flexibility, and long cyclic lifetime. In this work, the electrochemical performances of carbon nanofibers decorated by TiO2 hollow nanospheres (hTiO2-CNFs) supercapacitor electrodes are studied. The hCNF-TiO2 were synthesized using an electrospinning method followed by heat treatment. The inner structure, morphology, crystal structures, distribution of elements, and specific surface areas of the samples were characterized by Transmission Electron Microscopy (TEM) and Field Emission Scanning Electron Microscope (FE-SEM), X-Ray Diffraction (XRD), Energy-dispersive X-ray spectroscope (EDS), and Nitrogen adsorption/desorption isotherms (BET), respectively. In addition, the electrochemical properties were studied by using Cyclic Voltammetry (CV), Galvanostatic Charge-Discharge (GCD), and Electrochemical Impedance Spectroscopy (EIS). It was found that the specific capacitance of the bare-CNF electrode (170.03 F g-1 at a current density of 0.5 A g-1) was improved after being embedded with 5 wt% TiO2 hollow nanospheres (185.70 F g-1). Furthermore, the hCNF-TiO2 exhibits high cycling stability, retaining 98% after 2000 cycles. This shows that TiO2 hollow nanospheres can help enhance the efficiency of the CNF electrode. As a result, this might pave a way for the development of high-performance flexible supercapacitors.

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