

Nitrogen Doping Effect on Enhancement of Electrochemical Performance of a Carbon Nanotube Based Supercapacitor

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Abstract : Supercapacitors (SCs) are known as the future of miniaturized energy sources that can be coupled to a battery to deliver stable and constant energy to microelectronics. Among all their counterparts, electrochemical supercapacitor have drawn the most research attention due to their higher power density and long cycle life. Designing the microstructure and choosing the electroactive materials are two significant factors that greatly affect the performance of the device. Here, we report successful fabrication and characterization of a supercapacitor with interdigitated structure based on Carbon nanotube sheets (CNT sheet). Novel structure of highly aligned CNT sheet as the electrode materials which also offers excellent conductivity and large surface area along with doping with nitrogen, enabled us to develop a device with several order of magnitude higher electrochemical performance than the pristine CNT in aqueous electrolyte including high specific capacitance and rate capabilities and excellent cycle life over 10000 cycles. Geometric parameters such as finger width and gap size were also studied and it was shown the device performance is much depended on them. Results of this study confirms the potential of CNT sheet for future energy storage devices.

Keywords : carbon nanotube, energy storage systems, supercapacitor, nitrogen doping

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