Synthesis and investigation of GO-CuO nanocomposite as supercapacitive material

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Over the past decade, extensive effort has been devoted for developing alternative energy storage/conversion devices with higher energy and power densities due to depletion of fossil fuels and increasing environmental problems. Supercapacitors have attracted great attention due to their higher power densities relative to secondary batteries as well as higher energy densities than traditional electric capacitors [1,2]. Transition metal oxides are widely studied as supercapacitor materials due to variable oxidation states of metal ions which facilitate redox transitions and higher charge storage within the potential range of water decomposition[3]. Excellent energy storage performances and cycling behavior can be achieved by utilizing nanostructured materials mainly due to their higher specific surface area and faster ion diffusion process[4,5]. Recently, copper oxide and its composites have attracted attention in energy storage applications due to the low cost, abundant resources, non-toxicity, and easy preparation methods[6,7]. Herein, a composite of graphene oxide anchored by CuO nanoparticles (GO-CuO nanocomposites) has been fabricated through a coprecipitation method. Sample has been characterized by XRD, FTIR, and TEM techniques. Supercapacitor cells have been fabricated in a real two electrode assembly and the electrochemical supercapacitive behavior of nanocomposite has been investigated using cyclic voltammetry, electrochemical impedance spectroscopy, and chronopotentiometric methods. Supercapacitor devices based on this nanocomposite electrodes have showed large electrochemical capacitance (245 $F.g^{-1}$) at a discharge rate of 0.1 $A.g^{-1}$. They also exhibited greatly improved electrochemical stability and rate performances.

References

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