Fabrication of Nanosized Layered-MnO₂/Activated Carbon Composites Electrodes for High-performance Supercapacitor

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Layered-MnO₂/activated carbon composites were prepared by simply mixing activated carbons and Mn(NO₃)₂ solution, followed by heat treatment at 300 °C in order to develop high-performance and cost-effective active materials for supercapacitor electrodes. The effects of the loading mass of MnO₂, the surface chemistry and pore structure of activated carbons on the electrochemical performance of the composites as supercapacitor electrodes were investigated. The results show that layered α -MnO₂ nanoparticles of about 20 nm were synthesized in the activated carbons prepared by K₂S activation of lignin. A loading of 10 wt.% MnO₂ led to a two-fold increase in the specific capacitance of the activated carbon, reaching 294 F g⁻¹ at 5 mV s⁻¹ in 2 M KOH. The surface chemistry and pore structures of the supporters exert a significant effect on the electrochemical properties of the composites. Moreover, the as-prepared composites as supercapacitor electrodes possess excellent cycle stability and rate capability.

Keywords: activated carbons, layered-MnO₂, electrochemical properties, surface chemistry, pore structure

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