Manganese oxide/graphene oxide composites for high-energyaqueous asymmetric electrochemical capacitors

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Abstract

A high-energy aqueous asymmetric electrochemical capacitor was developed using manganese dioxide (-MnO(sub2)/graphene oxide (GO) nanocomposites. The nanostructured -MnO(sub2)was prepared frommicron-sized commercial electrolytic manganese dioxide (EMD) via a hydrothermal reaction in the pres-ence and absence of sodium dodecylsulphate (SDS), -MnO(sub2)(sub SDS)and -MnO(sub2), respectively. Unlike theas-prepared -MnO(sub2), the presence of SDS during the hydrothermal reaction conferred different mor-phologies on the intermediate precursors for the -MnO(sub2)(sub SDS). Also, the XRD patterns showed that the-MnO(sub2)(sub SDS)are more crystalline than the as-prepared -MnO(sub2). The superior electrochemical perfor-mance of the -MnO(sub2)(subSDS)/GO composite (280 F g(sup-1), 35 Wh kg(sup-1), and 7.5 kW kg(sup-1) at 0.5 A g(sup-1) coupled with excellent long cycle life clearly indicates that this electrode system has the potential of being developed as an efficient aqueous asymmetric electrochemical capacitor. The high performance of the -MnO(sub2)(sub SDS)/GO composite was interpreted in terms of the enhanced crystallinity of the -MnO(sub2)(sub SDS). Interestingly, the electrochemical performance is comparable to or even better than those reported forthe more conductive graphene/MnO(sub2) composites