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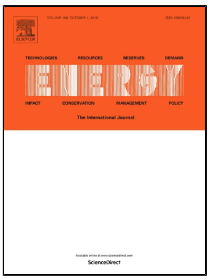

A new quaternary nanohybrid composite electrode for a high-performance supercapacitor

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A new quaternary nanohybrid composite electrode for a high-performance supercapacitor

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Abstract

In this work, a new quaternary nanohybrid of graphene/polyaniline-benzimidazole grafted graphene/MnO_2 was performed as an electrochemical supercapacitors anode. Combination of the high surface area of graphene, the high electrical conductivity of polyaniline and good charge storage capacity of MnO_2 lead to a new electrode material for supercapacitor application. Therefore, the charge storage properties of the nanohybrid for supercapacitor application was investigated using cyclic voltammetry, galvanostatic potentiometry and electrochemical impedance spectroscopy in 0.5 mol L^{-1} H_2SO_4. The prepared hybrid electrode material exhibits surpassing electrochemical performance than graphene/polyaniline and graphene/MnO_2 nanocomposites, including a high specific capacitance of 675 F g^{-1} or 150 mAh g^{-1} at a discharge current of 50 A g^{-1}. The nanocomposite showed excellent rate capability (over 80% retention at 50 A g^{-1}) and high cycling stability with less than 13% of capacitance fading after 2000 cycles of galvanostatic charge-discharge as well as a high columbic efficiency of 96% at a high discharge current of 50 A g^{-1}. The obtained results reveal that such nanohybrid nanostructure would be a good candidate for electrode materials of supercapacitors with high performances at high current densities, good stability and high columbic efficiency in the future.

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