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MnO_2 /Carbon Nanowalls Composite Electrode for Supercapacitor Application

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Abstract

Amorphous MnO_2/carbon nanowalls composite film are developed for the supercapacitor applications. Synthesis of carbon nanowalls template is performed by plasma-enhanced chemical vapor deposition in a CO/H_2 microwave discharge system. A well dispersion of amorphous MnO_2 domains throughout carbon nanowalls template is obtained by potentiostatic anodic deposition technique. Carbon nanowalls enable to improve the capacitive behavior and rate capability of MnO_2, a specific capacitance of 851 Fg^{-1} at a current density of 1 $mAcm^{-2}$ and charge transfer resistance of 1.02 Ω are obtained. MnO_2/carbon nanowalls composite film exhibits energy density of 118 wh/kg, power density of 783 wh/kg, and capacitance retention of 92% after long cycle life of 2000 cycles by charging and discharging at 3 $mAcm^{-2}$. The high density of atomic scale graphitic edges and large surface area of carbon nanowalls in conjunction with the presence of amorphous MnO_2 domains facilitate rapid electron and ion transport and hence offering the potential of the improved capacitive behavior.

*Keywords***:** Electrodeposition; Microwave plasma enhanced chemical vapor deposition; Manganese dioxide; Carbon nanowalls

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