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# MnO<sub>2</sub>/Carbon Nanowalls Composite Electrode for Supercapacitor Application

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## Abstract

Amorphous MnO<sub>2</sub>/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<sub>2</sub> microwave discharge system. A well dispersion of amorphous MnO<sub>2</sub> 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<sub>2</sub>, a specific capacitance of 851 Fg<sup>-1</sup> at a current density of 1 mAcm<sup>-2</sup> and charge transfer resistance of 1.02 Ω are obtained. MnO<sub>2</sub>/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<sup>-2</sup>. The high density of atomic scale graphitic edges and large surface area of carbon nanowalls in conjunction with the presence of amorphous MnO<sub>2</sub> 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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