Preparation of Poly(7-formylindole)/carbon Fibers Nanocomposites and Their High Capacitance Behaviors

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Polyindoles belonging to the fused-ring family have attracted extensive investigation as promising materials due to their unique physical and electrochemical properties. Herein, poly(7-formylindole) (PFIn) film was firstly synthesized electrochemically on carbon fibers by direct anodic oxidation of 7-formylindole in acetonitrile solution containing 0.1 M LiClO$_4$. FT-IR spectra indicated that the polymerization site of monomer happened at the C$_2$ and C$_3$ positions of indole ring. The morphology of PFIn film on carbon fibers was investigated through SEM observation, which indicated that PFIn film tightly wrapped over carbon fibers (PFIn/CF). Electrochemical results indicated that PFIn/CF electrode showed a remarkable specific capacitance of 637 F g$^{-1}$ at 20 A g$^{-1}$. The energy density reached about 42 Wh kg$^{-1}$ at a high power density of 21 kW kg$^{-1}$. Furthermore, PFIn/CF still maintained about 74.1% of initial specific capacitance and 100% coulombic efficiency after 1000 cycles. These results revealed that PFIn/CF was a promising electrode material for the flexible supercapacitors application.

Keywords: Supercapacitors; Conducting polymer; Poly(7-formylindole); Carbon fibers; Capacitance performance

FULL TEXT

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