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Abstract

Highly flexible freestanding carbon nanofibers were electroplated with silver for use in supercapacitor applications. The brittle carbon nanofibers were encased within bendable silver shells to provide superior flexibility and resilience of the supercapacitors. The enhanced electrical conductivity derived from the silver shell structure dramatically increased the capacitance of the supercapacitor. The silver shell also conferred structural stability to the carbon core, thus furnishing stable, long-term electrode performance. Nearly 100% of the specific capacitance was retained after N = 10,000 galvanostatic charge-discharge cycles. The mechanical endurance or stability of the fabricated electrode was evaluated using 1,000 bending cycles, demonstrating that the electrode performance remained unchanged. Cyclic voltammetry and galvanostatic discharge curves were measured at various scan rates and current densities. The fabricated electrodes were characterized by scanning electron microscopy, X-ray photoelectron spectroscopy, and transmission electron microscopy, which clearly illustrated the carbon-core and silver-shell structure.

Keywords: Electroplating, electrospinning, Ag, carbon nanofiber, flexible electrode, supercapacitor.

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