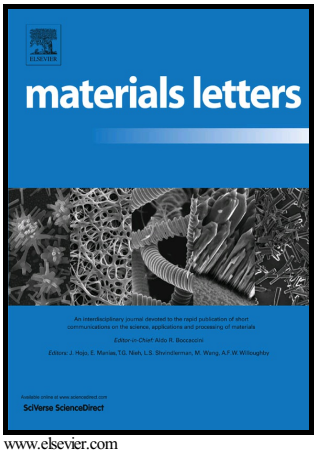

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Hierarchically nanostructured carbon fiber-nickel-carbon nanotubes for high-performance supercapacitor electrodes

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Abstract

This work demonstrates the fabrication of micro carbon fibers with hierarchical nanostructures of nickel-carbon nanotubes by electroless plating and chemical vapor deposition. Characterizations show that the micro coaxial fibers have 1400 times larger surface area, and 100 times larger electrochemical capacitance than pristine carbon fibers, while their mechanical strength has only 8% degradation. These outstanding properties make the micro coaxial fibers promising for applications in flexible or wearable supercapacitor electrodes.

Keywords

Supercapacitor; Carbon fibers; Carbon nanotubes; Electroless plating; Chemical vapor deposition

1. Introduction

Recent strong interests in wearable electronics [1] and multifunctional fiber reinforced composites [2] have stimulated research in fiber-based supercapacitors for the possible integrations with flexible electronics [3,4]. Polyacrylonitrile (PAN)-based carbon fiber (CF) is one candidate for fiber-based supercapacitor electrode with high mechanical strength and modulus. Furthermore, It has excellent electrical and thermal conductivity, which make CFs suitable for flexible electronic and multifunctional