Iron oxide/lignin-based hollow carbon nanofibers nanocomposite as an application electrode materials for supercapacitors

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Iron oxide/lignin-based hollow carbon nanofibers nanocomposite as an application electrode materials for supercapacitors

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Abstract

Iron oxide particle-decorated, hollow, carbon nanofibers (HCNFs), with poly(styrene-co-acrylonitrile) solution as the core and acetic acid lignin as the shell, were manufactured using a coaxial electrospinning technique, using iron(III) acetylacetonate as the iron oxide-precursor additive in the shell. The fabricated HCNFs exhibited a high specific capacitance of 121 $F \cdot g^{-1}$ at 0.5 $A \cdot g^{-1}$, which was 2.18-fold that of solid electrospun nanofibers under the same conditions. The samples also possessed a superior cycling life, with a 90% retention rate after 1000 cycles in 1 M sodium sulfite. In this system, HCNFs exhibited high surface areas, as the result of hollow structures and producing capacitance improvement, while iron oxide particles enhanced electrochemical properties via reversible redox reactions. The attractive performances exhibited by these supercapacitors yielded them potentially promising candidates for future energy storage systems.

Keywords：lignin；carbon nanofiber；electrospinning；electrochemical

1. Introduction

Supercapacitors, also known as electrochemical capacitors, are novel