Calcination-Assisted Hydrothermal Synthesis and Electrochemical Performance of Fe$_3$O$_4$/HSFC Nanocomposites as Li-ion Batteries Anodes

Zilin Mo$^1$, Jianwu Sun$^1$, Aimiao Qin$^{1}*$$^*$, Shuoping Chen$^1$, Lei Liao$^2*$, Rui Du$^1$, Kaiyou Zhang$^1$

$^1$Guangxi Key Laboratory in Universities of Clean Metallurgy and Comprehensive Utilization for Non-ferrous Metals Resources, Key Lab New Processing Technology for Nonferrous Metals & Materials Ministry of Education, College of Materials science & engineering, Guilin University of Technology, Guilin, China

$^2$Guangxi Key Laboratory of Environment Pollution Control Theory and Technology, College of Environmental Science and Engineering, Guilin University of Technology

Guilin, China

*E-mail: 2005032@glut.edu.cn, fangqiu2001@163.com

doi: 10.20964/2017.11.52

Received: 20 July 2017 / Accepted: 7 September 2017 / Published: 12 October 2017

Hydrothermal sisal fiber carbon (HSFC) was synthesized by a two-step hydrothermal modification with sisal fiber as raw material. Then Fe$_3$O$_4$/HSFC nanocomposites were prepared by combining HSFC with nanostructures of Fe$_3$O$_4$ via a hydrothermal process assisted by calcinating. The structure and morphology of Fe$_3$O$_4$/HSFC nanocomposites were characterized by powder X-ray diffraction and scanning electron microscopy(SEM), and their electrochemical performances were tested by constant current charge-discharge tests. The first coulomb efficiency of resulted Fe$_3$O$_4$/HSFC nanocomposite is 64% at the current density of 50mAg$^{-1}$ and the calcination temperature of 600°C. The reversible capacity can maintain 610mAhg$^{-1}$ and 480mAhg$^{-1}$ at the current densities of 50 and 500mAg$^{-1}$ after 50 cycles, respectively. The results show that modification with Fe$_3$O$_4$ nanoparticles is an effective method to improve the electrochemical performances of the HSFC-based materials.

Keywords: sisal fiber carbon; hydrothermal treatment; Fe$_3$O$_4$ nanoparticles; calcination; electrochemical performance

FULL TEXT

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).