Porous Multilayered Films Based on poly(3,4-ethylenedioxythiophene) and poly(indole-5-carboxylic acid) and Their Capacitance Performance

Danqin Li¹, Danhua Zhu², Weiqiang Zhou³*, Xiumei Ma², Qianjie Zhou², Guo Ye¹, Jingkun Xu¹*

¹ School of Pharmacy, Jiangxi Science and Technology Normal University, Nanchang 330013, China
² Jiangxi Key Laboratory of Organic Chemistry, Jiangxi Science and Technology Normal University, Nanchang 330013, China
³ Jiangxi Engineering Laboratory of Waterborne Coatings, Jiangxi Science and Technology Normal University, Nanchang 330013, China
*E-mail: zhouwqh@163.com, xujingkun@jxstnu.edu.cn

doi: 10.20964/2017.04.65

Received: 10 January 2017 / Accepted: 23 February 2017 / Published: 12 March 2017

Layer-by-layer (LBL) technique is a prevalent way to construct multilayered films. Herein, using high conducting poly(3,4-ethylenedioxythiophene) (PEDOT) and good stable redox-active poly(indole-5-carboxylic acid) (5-PICA), an alternately multilayered porous films has been prepared by the electrochemical LBL method. The alternately multilayered films were characterized by scanning electron microscope (SEM), cyclic voltammetry (CV), galvanostatic charge-discharge (CD) and electrochemical impedance spectroscopic (EIS) techniques. Compared with monolayered PEDOT (147.8 F g⁻¹) and 5-PICA (198.3 F g⁻¹), the PEDOT/5-PICA/PEDOT/5-PICA 4-layered film exhibited a higher specific capacitance which reached 281.7 F g⁻¹ at 20 A g⁻¹ in 1.0 M H₂SO₄ solution. Furthermore, the specific capacitance of 4-layered film still had good stability, viz., 73% retention after 1000 cycles at the range of potential -0.15 to 1.0 V and even reached 95% if the potential range was from -0.15 to 0.8 V. Therefore, these results indicated that the PEDOT/5-PICA/PEDOT/5-PICA was a potential electrode material for supercapacitors.

Keywords: Conducting polymers; Electropolymerization; Layer-by-layer films; Specific capacitance

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/).