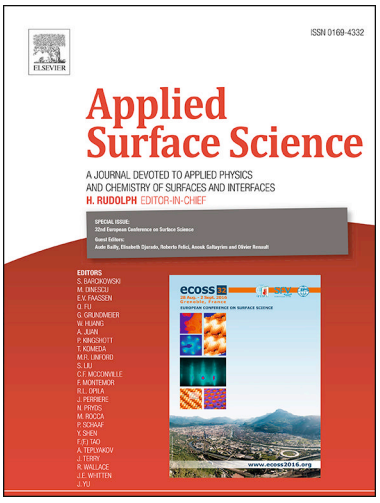
Accepted Manuscript



Full Length Article

MOF-derived porous hollow α-Fe_2O_3 microboxes modified by silver nanoclusters for enhanced pseudocapacitive storage

Zhuying Yu, Xingyan Zhang, Lu Wei, Xin Guo

PII: S0169-4332(18)32405-X
DOI: https://doi.org/10.1016/j.apsusc.2018.08.262
Reference: APSUSC 40299

To appear in: *Applied Surface Science*

Received Date: 3 July 2018
Revised Date: 28 August 2018
Accepted Date: 31 August 2018

Please cite this article as: Z. Yu, X. Zhang, L. Wei, X. Guo, MOF-derived porous hollow α-Fe_2O_3 microboxes modified by silver nanoclusters for enhanced pseudocapacitive storage, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.08.262

MOF-derived porous hollow α-Fe_2O_3 microboxes modified by silver nanoclusters for enhanced pseudocapacitive storage

Zhuying Yu, Xingyan Zhang, Lu Wei*, Xin Guo*

Laboratory of Solid State Ionics, School of Materials Science and Engineering, Huazhong University of Science and Technology, Wuhan 430074, P. R. China

Abstract

Porous hollow α-Fe_2O_3 microboxes with high surface area are prepared by using metal-organic framework as precursor and self-template. To improve the conductivity of the derived α-Fe_2O_3 microboxes and thus enhance their capacitive storage and rate capability as effective electrode material, especially as anode material for supercapacitors, Ag nanoclusters are uniformly deposited on the surface of the α-Fe_2O_3 microboxes (α-Fe_2O_3@Ag microboxes) through a facile solution method. As pseudocapacitive material, the α-Fe_2O_3@Ag microbox electrode displays a high specific capacitance of 701 F g^{-1} at a current density of 0.1 A g^{-1}, and remains 191 F g^{-1} at a high current density of 10 A g^{-1}. Furthermore, the material shows 80% specific capacitance retention after 2,000 charge-discharge cycles, and 72% retention after 10,000 cycles at a current density of 10 A g^{-1}. In addition, asymmetric supercapacitors are assembled with the α-Fe_2O_3@Ag as negative electrodes and commercial activated carbon as positive electrodes. A maximum specific capacitance of 123 F g^{-1} and an energy density of 41.8 Wh Kg^{-1} are demonstrated within a cell voltage of 1.6 V for the device.

Keywords: Fe_2O_3 microboxes; Ag nanoclusters; metal-organic framework; supercapacitor

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** Authors to whom correspondence should be addressed.*
Tel: +86-27-87559804; Fax: +86-27-87559804; E-mail: lwei@hust.edu.cn, xguo@hust.edu.cn.