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PII: S1572-6657(17)30516-7
DOI: doi: 10.1016/j.jelechem.2017.07.032
Reference: JEAC 3420

To appear in: *Journal of Electroanalytical Chemistry*

Received date: 15 March 2017
Revised date: 19 June 2017
Accepted date: 16 July 2017

Please cite this article as: Ying-Chu Chen, Jui-Hung Hsu, Yan-Gu Lin, Yu-Kuei Hsu , Synthesis of Fe2O3 nanorods/silver nanowires on coffee filter as low-cost and efficient electrodes for supercapacitors, *Journal of Electroanalytical Chemistry* (2017), doi: 10.1016/j.jelechem.2017.07.032

Synthesis of Fe_2O_3 nanorods/silver nanowires on coffee filter as low-cost and efficient electrodes for supercapacitors

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Abstract

A simple dip-coating method is developed to form conductive networks of silver nanowire (Ag NW) on coffee filter (CF) as an electrochemical current collector; the iron-oxide (Fe_2O_3) nanorods (NR) are subsequently grown directly on the surface of the Ag NW/CF as a hierarchical electrode via a cost-effective hydrothermal process for supercapacitors. The morphology and microstructure of Fe_2O_3 NR/Ag NW/CF were examined with a scanning electron microscope, X-ray diffractometer, Raman spectra and X-ray photoelectron spectra. The electrochemical results indicate that the Fe_2O_3 NR/Ag NW/CF electrode shows highly reversible features and satisfactory rate abilities. Most significantly, the excellent specific capacitance achieved with Fe_2O_3 NR/Ag NW/CF electrodes is as great as 287.4 F g^{-1}; energy density 64.6 W h kg^{-1} and power density 18 kW kg^{-1} are obtained. The Fe_2O_3 NR/Ag NW/CF electrode has acceptable cycling stability after 5000 cycles.

KEYWORDS: silver nanowires; iron oxides; coffee filter; electrochemical; supercapacitor