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Synthesis of Fe₂O₃ 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 (Fe₂O₃) 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 Fe₂O₃ 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 Fe₂O₃ NR/Ag NW/CF electrode shows highly reversible features and satisfactory rate abilities. Most significantly, the excellent specific capacitance achieved with Fe₂O₃ 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 Fe₂O₃ NR/Ag NW/CF electrode has acceptable cycling stability after 5000 cycles.

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

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