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Reduced graphene oxide-coated mulberry-shaped α -Fe₂O₃ nanoparticles composite as high performance electrode material for supercapacitors

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Highlights

- Fe₂O₃/rGO composites was prepared by a one-pot hydrothermal process.
- Fe₂O₃/rGO_1609 shows high specific capacitance (1051 F g⁻¹ at 1 A g⁻¹).
- Fe₂O₃/rGO_1609 exhibits good rate capability (548 F g⁻¹ at 30 A g⁻¹).
- 85.4% of the capacitance of Fe₂O₃/rGO_1609 can be remained after 1000 cycles.

Abstract

We report a facile method to synthesize nanocomposites with Fe₂O₃ nanoparticles (NPs) loaded on the surface of the reduced graphene oxide nanosheets (rGO) or wrapped into rGO sheets by simply regulating the temperatures and times of the hydrothermal reaction, which combines the growth of Fe₂O₃ NPs and the reduction of graphene oxide simultaneously. The morphology and microstructure of these samples were examined by X-ray diffraction, scanning electron microscopy, transmission electron microscopy, Raman spectra, X-ray photoelectron spectroscopy, Fourier transform infrared spectrometer and nitrogen isothermal adsorption-desorption. The effects of different temperatures and times of hydrothermal reaction on the microstructure and capacitive performance of these prepared composites were investigated in detail. The as-synthesized mulberry-shaped α -Fe₂O₃ NPs/graphene nanocomposite shows remarkable pseudocapacitive activity containing high specific capacitance (1051 F g⁻¹ at 1 A g⁻¹) and excellent rate capability (548 F g⁻¹ at 30 A g⁻¹).

Keywords: Fe₂O₃; mulberry-shaped; graphene composite; supercapacitor

1. Introduction

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