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Self-assembly synthesis of a unique stable cocoon-like hematite @C nanoparticle and its application in lithium ion batteries

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ABSTRACT:

A novel cocoon-like Fe₂O₃@C nanoparticle was fabricated via a facile hydrothermally molecular self-assembly procedure. Compared to bare Fe₂O₃ nanoparticles, the carbon coated Fe₂O₃ nanoparticles exhibit higher specific capacity, excellent rate capacity and cyclic stability as the anode in lithium ion batteries. These cocoon-like Fe₂O₃@C nanoparticles carry enhanced lithium storage properties with a reversible capacity of 358 mAhg⁻¹ after 150 cycles under the current density of 1000 mA g⁻¹, while the carbon-free bare Fe₂O₃ can only deliver a much lower capacity of 127.6 mAhg⁻¹ with a continuously decreasing trend. The excellent performance of Fe₂O₃@C is attributed to the coated carbon layers, which not only enhance the electronic conductivity but also reduce the stress upon the Fe₂O₃ nanoparticles caused by the volume change during the charge/discharge process.

Keywords:

Self-assembly; Fe₂O₃; Carbon coating; Lithium-ion anode

1. Introduction

Since the first commercialization in the 1990s, lithium-ion batteries (LIBs) have become the primary power source for portable electronic devices due to the advantages of high energy density, long life, environmental friendly and so on [1-4]. At present, the anode materials used in most

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