Fe₃O₄ Nanorods and Polyhedrons as Anodes for Lithium Ion Batteries: Morphology and Electrochemical Properties

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A solvothermal process with temperature up to 350°C has been exploited for the fabrication of Fe₃O₄ with diverse morphologies. The influences of solvothermal temperature and treating time on the composition, morphology and electrochemical properties of the resulted Fe₃O₄ samples have been studied. Electrochemical properties of the obtained Fe₃O₄ with morphologies of nanorods, nanoplates and polyhedrons have been explored as anode materials for lithium ion batteries. It has been found that two typical morphologies of nanorods and polyhedrons can be resulted by varying the solvothermal treating times from 12 to 72 h. The morphology evolution of the Fe₃O₄ sample upon treating times has been discussed by analyzing the control experiments. The Fe₃O₄ nanorods obtained under the favorite condition, i.e. solvothermally at 350°C for 12h and then calcined at 500°C for 2h delivered a superior reversible capacity of 807.9 mAh g⁻¹ at 0.2 A g⁻¹ even after 200 charging-discharging cycles, demonstrating excellent cycle stability. It shows also satisfied rate capability of 360 mAh g⁻¹ at current density of 2 A g⁻¹. The superior electrochemical performance of the Fe₃O₄ nanorods has been discussed from the structure character and the composition aspects.

Keywords: Solvothermal preparation; Fe₃O₄ nanorods; Morphology evolution; Anode materials

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