Synthesis and Properties of Nitrogen-Doped Graphene as Anode Materials for Lithium-Ion Batteries

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Nitrogen-doped graphene (N-rGO) was successfully synthesized during the reduction of graphene oxide by the modified Hummers' method. In contrast to the reduced graphene oxide (rGO), N-rGO presented superior morphology, structure and composition as the anode of lithium-ion batteries (LIBs) according to the examination of SEM, TEM, XRD, Raman spectrum and XPS. The doping content of nitrogen in N-rGO was about 7.98 at.%. The electrochemical performances of N-rGO as anodes of LIBs were also evaluated accordingly. Thus-prepared N-rGO showed a higher reversible specific capacity of 332 mAh g⁻¹ during 600 cycles at 500 mA·g⁻¹. Even at 4 A·g⁻¹, a reversible capacity of 208 mAh·g⁻¹ can still be maintained. The improved electrochemical performance of N-rGO as anodes of LIBs could be due to the specific characteristics of the unique nanostructures, the covalent interactions between N and graphene, the good conductivity and high surface areas, which reduce the transfer resistance for Li-ion and electron and provide more extra live regions for Li storage.

Keywords: Lithium-ion batteries, Anode, N-rGO, Synthesis

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