Synthesis and Electrochemical Properties of NiO/Ni Composite as an Anode for Lithium-ion Batteries

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NiO has been widely studied in the field of lithium-ion batteries because of its high theoretical capacity density (718 mAh g⁻¹), abundant raw materials, simple preparation methods and environmental friendliness. However, its poor conductivity as an electrode material still limits its practical application in batteries. In this paper, the Ni metal addition method is used to improve the conductivity of NiO. A Ni-based precursor is first prepared by the water bath method. The NiO/Ni composite with a flower-like structure was obtained by thermal decomposition of a Ni-based precursor in an argon atmosphere. The as-prepared NiO/Ni composite consists of sheet-like NiO and granular Ni, and the NiO content in the NiO/Ni composite is 52.7%. As the anode of a lithium-ion battery, the NiO/Ni composite electrode shows high capacity and a long cycle life with a capacity of 631.2 mAh g⁻¹ at a current density of 0.5 A g⁻¹ for the 100th cycle. It also exhibits excellent rate performance. The discharge capacities of the NiO/Ni composite are 671.2, 460.3, 376.1, 344.9 and 555.8 mAh g⁻¹ at current densities of 0.5, 1, 2, 4 and 0.5 A g⁻¹, respectively. This explains why the NiO/Ni composite can endure a high charge-discharge current density. The results indicate that the NiO/Ni composite is a good anode material for lithium-ion batteries.

Keywords: NiO/Ni composite; Flower-like structure; Anode; Lithium-ion battery

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