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A simple approach to fabricate of Ni-$NiCo_2O_4$@$ZnCo_2O_4$ yolk-shell nano-tetrahedron composite as high-performance anode material for lithium-ion batteries

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Abstract

Transition-metal oxide materials have gained significant attention as high-performance anode materials for lithium ion batteries. Great advances have been achieved in the development of micro/nanostructured materials with controllable shape and tunable pore size. In this work, a facile co-precipitation approach has been developed to fabricate the Ni-$NiCo_2O_4$@$ZnCo_2O_4$ yolk-shell nano-tetrahedron composites, which significantly improve the structural stability and conductivity of the material. The Ni-$NiCo_2O_4$@$ZnCo_2O_4$ is proven to exhibit excellent cycling and rate performance for lithium ion batteries, such as the charge capacity of 1571.9 mA h g^{-1} after 70 cycles at 0.1 A g^{-1}, 1097.5 mA h g^{-1} after 600 cycles at 1.0 A g^{-1}. This superior electrochemical performance may attribute to the yolk-shell architecture and the Ni-doping.

Keywords: co-precipitation approach; Ni-$NiCo_2O_4$@$ZnCo_2O_4$; yolk-shell; lithium ion batteries; anode material

1. Introduction