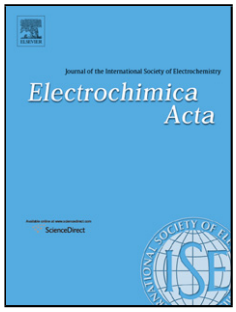

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Control Growth of Mesoporous Nickel Tungstate Nanofiber and Its Application as Anode Material for Lithium-Ion Batteries

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ABSTRACT

Achieving a control over the growth of one-dimensional nanomaterial is significant for the study of energy storage material and device. In the present work, nickel tungstate ($NiWO_4$) nanofiber was synthesized by electrospinning technique combined with subsequent annealing treatment. The obtained $NiWO_4$ nanofiber is found to be highly crystalline and possesses a diameter of about 180 nm and a length of several millimeters. The influence of severe-annealing treatment on the structure and the electrochemical performance is studied and found that the temperature of annealing is a crucial factor in the crystalline phase, purity, structure and morphology. The impurities in the product of electrospinning disappeared, when the annealing temperature is raised from 650 to 670 ^oC, and a pure phase of mesoporous $NiWO_4$ nanofiber is obtained. However, for the temperature raising from 670 to 700 ^oC, the crystalline grains of the nanofiber grew and merged rapidly, as the mesoporous structure is disappeared. The lithium-ion battery furnished by the $NiWO_4$ nanofiber annealed at 700 ^oC as anode material, shows a moderate performance, while the battery provided by $NiWO_4$ nanofiber annealed at 670 ^oC exhibits an excellent lithium storage performance with high initial coulombic efficiency, high specific capacity, good cycle performance and rate performance. The initial coulombic efficiency could reach as high as 77.1%. A high reversible capacity of 514 mAh g^{-1} at a current density of 100 mA g^{-1} is achieved after 100