Three-dimensional Ni₃Sn₄ Negative Electrodes for Lithium-Ion Batteries

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Three-dimensional alloy based Ni₃Sn₄ negative electrodes were fabricated by simple electrodeposition technique on a mesoporous nickel foam substrate to improve the capacity and cyclability of Ni₃Sn₄ anodes for lithium-ion batteries. The combination of thin film geometry with three-dimensional foam structure is aimed to optimize the ionic/electronic current paths, and to accommodate the mechanical stresses induced by the volume changes in the electrode during repeated cycling. The surface morphology of the obtained Ni₃Sn₄ alloy electrodes was characterized by scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy. X-ray diffraction analysis was performed to characterize the phases and possible impurities present in the alloy. The electrochemical features of the electrodes were investigated by cyclic voltammetry and galvanostatic charge-discharge test experiments. Obtained results showed that the as-prepared three-dimensional Ni₃Sn₄ anodes are capable of providing satisfactory lithium storage and promising cycling performance.

Keywords: Three-dimensional anode; electrodeposition; Ni₃Sn₄ alloy; lithium-ion battery

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