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Influence of the doping ratio and the carbon coating content on the electrochemical performance of Co-doped SnO_2 for lithium-ion anodes

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Abstract

Herein, the influence of the dopant concentration and the effect of varying the amount of the carbon coating for the electrochemical properties of Co-doped SnO_2 as lithium-ion anode material are presented. Pure SnO_2 and three different doping ratios of Co-doped SnO_2 ($Sn_{0.95}Co_{0.05}O_2$, $Sn_{0.90}Co_{0.10}O_2$, and $Sn_{0.85}Co_{0.15}O_2$) were synthesized and characterized regarding their structure, morphology, and electrochemical behavior. The results reveal that the Co content has a significant impact on the specific capacity and cycling stability, rendering $Sn_{0.90}Co_{0.10}O_2$ as the sample with the best electrochemical performance among these three dopant ratios. The impact of the carbon coating content was explored for two different concentrations, i.e., 16 wt% ($Sn_{0.90}Co_{0.10}O_2$-C16%) and 50 wt% ($Sn_{0.90}Co_{0.10}O_2$-C50%), reflecting that the carbon coating as such and concerning the eventual amount has a significant influence on the cycling stability, coulombic efficiency, and rate capability.

Keywords: tin oxide; cobalt doping; carbon coating; anode; lithium-ion battery

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