

Accepted Manuscript

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PII: S0013-4686(18)30994-0

DOI: [10.1016/j.electacta.2018.04.209](https://doi.org/10.1016/j.electacta.2018.04.209)

Reference: EA 31776

To appear in: *Electrochimica Acta*

Received Date: 31 January 2018

Revised Date: 29 March 2018

Accepted Date: 27 April 2018

Please cite this article as: Y. Ma, Y. Ma, U. Ulissi, Y. Ji, C. Streb, D. Bresser, S. Passerini, Influence of the doping ratio and the carbon coating content on the electrochemical performance of Co-doped SnO₂ for lithium-ion anodes, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.04.209.

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Influence of the doping ratio and the carbon coating content on the electrochemical performance of Co-doped SnO₂ for lithium-ion anodes

Yanjiao Ma,^{a,b} Yuan Ma,^{a,b} Ulderico Ulissi,^{a,b} Yuanchun Ji,^c Carsten Streb,^c Dominic Bresser,^{a,b,*}
and Stefano Passerini,^{a,b}

^a Helmholtz Institute Ulm (HIU), Helmholtzstrasse 11, 89081 Ulm, Germany

^b Karlsruhe Institute of Technology (KIT), P.O. Box 3640, 76021 Karlsruhe, Germany

^c Institute of Inorganic Chemistry, Ulm University, Albert-Einstein-Allee 11, 89081 Ulm, Germany

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 SnO₂ as lithium-ion anode material are presented. Pure SnO₂ and three different doping ratios of Co-doped SnO₂ (Sn_{0.95}Co_{0.05}O₂, Sn_{0.90}Co_{0.10}O₂, and Sn_{0.85}Co_{0.15}O₂) 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}O₂ 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}O₂-C16%) and 50 wt% (Sn_{0.90}Co_{0.10}O₂-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

***Corresponding author:** dominic.bresser@kit.edu

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