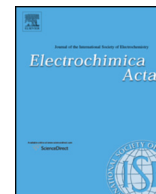




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# Synthesis and Lithium Storage Properties of Zn, Co and Mg doped SnO<sub>2</sub> Nano Materials



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## ABSTRACT

In this paper, we show that magnesium and cobalt doped SnO<sub>2</sub> (Mg-SnO<sub>2</sub> and Co-SnO<sub>2</sub>) nanostructures have profound influence on the discharge capacity and coulombic efficiency of lithium ion batteries (LIBs) employing pure SnO<sub>2</sub> and zinc doped SnO<sub>2</sub> (Zn-SnO<sub>2</sub>) as benchmark materials. The materials were synthesized via sol-gel technique. The structural, chemical and morphological characterization indicates that the Zn, Mg and Co dopants were effectively implanted into the SnO<sub>2</sub> lattice and that Co doping significantly reduced the grain growth. The electrochemical performances of the nanoparticles were investigated using galvanostatic cycling, cyclic voltammetry and electrochemical impedance spectroscopy (EIS). The Co-SnO<sub>2</sub> electrode delivered a reversible capacity of around 575 mAh g<sup>-1</sup> at the 50th cycle with capacity retention of ~83% at 60 mA g<sup>-1</sup> current rate. A capacity of ~415 mAh g<sup>-1</sup> when cycling at 10<sup>3</sup> mA g<sup>-1</sup> and >60% improvement in coulombic efficiency compared to the pure compound clearly demonstrate the superiority of Co-SnO<sub>2</sub> electrodes. The improved electrochemical properties are attributed to the reduction in particle size of the material up to a few nanometers, which efficiently reduced the distance of lithium diffusion pathway and reduction in the volume change by alleviating the structural strain caused during the Li<sup>+</sup> intake/outtake process. The EIS analyses of the electrodes corroborated the difference in electrochemical performances of the electrodes: the Co-SnO<sub>2</sub> electrode showed the lowest resistance at different voltages during cycling among other electrodes.

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