Rapid and facile microwave synthesis of high performing nanostructured SnO_2/C composite anode materials for Li-ion battery

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SnO_2 operates by adopting the alloy/de-alloy reaction mechanism and it has attracted intensive research interest as a promising next-generation anode material for LIBs due to its high theoretical specific capacity of 782 mAh g^{-1}[1], which is more than twice the theoretical capacity of currently used graphite (372 mAh g^{-1}). Interestingly, tin-based lithium storage compounds need reasonably low potentials for Li^+ insertion and they have high storage capacities. However, the practical use of SnO_2 based anodes is challenged by their capacity fading due to the large volume change during repeated charge-discharge cycling process. Such volume variation causes cracking and result in electrical disconnection from the current collector, and eventually limit the cycling capability of electrodes.

In this work an attempt have been made to synthesize a high capacity, good cycle performance, and good rate capacity tin-based anode materials for LIB applications. Accordingly, nanostructured SnO_2 anode materials were synthesized using fast microwave synthesis technique and then SnO_2/C nanocomposites have been prepared to improve the cyclability of the anode materials. The morphology, structural and electrochemical properties of the as-synthesized anode materials were characterized by means of SEM, X-ray diffraction (XRD), and galvanostatic charge/discharge battery tester.

[1] I. A. Courtney, J. R. Dahn, J. Electrochem. Soc. 1997, 144, 2045