

## Effect of preparation temperature and cycling voltage range on molten salt method prepared SnO<sub>2</sub>

M.V. Reddy<sup>a,c,d,\*</sup>, Lee Yann Tsy<sup>a</sup>, Andreea<sup>a,b</sup>, Ang Yen Ling<sup>a,b</sup>, Justin Ng Choon Hwee<sup>a,b</sup>,  
Chong Ai Lin<sup>b</sup>, S. Admas<sup>c</sup>, K.P. Loh<sup>d</sup>, Mkhulu K. Mathe<sup>e</sup>,  
Kenneth I. Ozoemenae<sup>e</sup>, B.V.R. Chowdaria

<sup>a</sup> Department of Physics, Solid State Ionics & Advanced Batteries Lab, National University of Singapore, Singapore 117542, Singapore

<sup>b</sup> NUS High School of Mathematics and Science, 20 Clementi Avenue 1, Singapore 129957, Singapore

<sup>c</sup> Department of Materials Science & Engineering, National University of Singapore, Singapore 117576, Singapore

<sup>d</sup> Department of Chemistry, Graphene Research Center, National University of Singapore, Singapore 117542, Singapore

<sup>e</sup> Energy Materials, Materials Science & Manufacturing, Council for Scientific & Industrial Research (CSIR), Pretoria 0001, South Africa

### Abstract

We prepared nano-sized tin (IV) oxide (SnO<sub>2</sub>) via molten-salt technique: heating a mixture of tin tetrachloride, lithium nitrate and lithium chloride at 280 °C in air. The powders are characterized by X-ray diffraction and transmission scanning microscopy techniques. The XRD studies showed a structure similar to tetragonal structure. The cyclic voltammetry studies showed characteristic cathodic peak potentials of reduction of Sn<sup>4+</sup> to Sn metal in the first cathodic scan, and alloying–de–alloying reaction of Sn at 0.25 and 0.5 V vs. Li for successive cathodic and anodic scans cycled in the voltage range, 0.005–1.0 V. Galvanostatic cycling studies show that reversible capacities (MSM SnO<sub>2</sub> prepared at 280 °C) of 640, 720, 890 mAh g<sup>-1</sup> in the voltage range, 0.005–1.0 V, 0.005–1.3 V and 0.005–1.5 V, respectively at a current rate of 100 mA g<sup>-1</sup>. We also discussed the effect of particle size and its electrochemical properties in the voltage range, 0.005–1.0 V.