Nano-structured SnO_2 Anodes for Lithium-ion Batteries

L. Yuan*, K. Konstantinov, G. X. Wang, H. K. Liu
Battery Technology Research Program
Institute of Superconducting & Electronic Materials
University of Wollongong, NSW 2522, Australia

A series of nano-crystalline SnO_2 (Fig.1.&Fig.2.) and Carbon-SnO_2 nano-composites (Fig.3.) have been used as anode materials in Li-ion batteries. The initial SnO_2 powder obtained *in situ* by spray pyrolysis technique presents a structure such as broken-hallow-spheres with porous on the inside and outside particle surfaces. This structure promises the highly developed specific surface area confirmed to be about $20m^2/g$. Materials with different crystallinity and specific surface areas have been prepared by additional heat treatment at 600ºC, 800ºC, 1000ºC and 1200ºC for 3 hours. Using detailed morphological and structural analyses we are trying to clarify the mechanism by which the factors such as crystallinity and specific surface area affect the battery cycle life and capacity. We suggest that the presence of intervening free volumes between the spherical particles or presence of carbon matrix provide an effective cushion against the specific volume change in the tin regions. The effect of the crystal size on the battery performance is also discussed in this paper.

Corresponding author: Tel.: +61-2-4221 3017
Fax: +0061-2-4221 5731.
email address: ly93@uow.edu.au

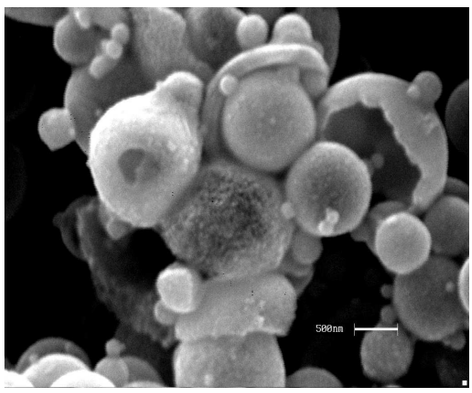

Fig.1. SEM micrographs of sprayed SnO_2 after heat treatment at 800ºC for 3hours

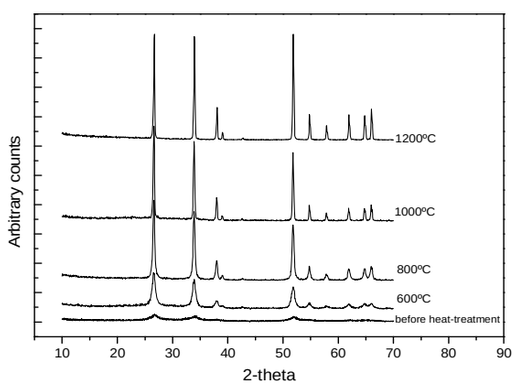

Fig.2. Power X-ray diffraction patterns for the series of Sprayed SnO2.

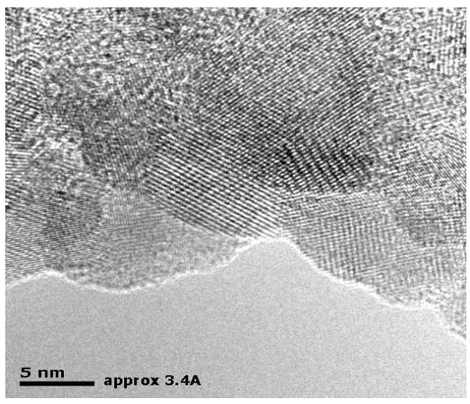

Fig.3. TEM micrographs of sprayed SnO_2-carbon composite powder (SnO_2: Carbon = 61: 39).