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Novel 3-D superstructures of SnO_2@C core-shell nanochain for energy storage application

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Supporting information

Experimental details

In a typical synthesis, 0.324g of $Na_2SnO_3 \cdot 3H_2O$ and 6 g of D-glucose were dissolved in 40 mL of deionized water. The solution was then transferred into a 50 mL Teflon-lined stainless steel autoclave, sealed, and kept at 180 °C for 5 h in an oven before cooling down to room temperature. Afterwards, the as-obtained SnO_2@C precursor were calcined at 700 °C in flowing argon for 2 h to obtain the SnO_2@C core-shell nanostructure.

X-ray diffraction, Raman spectra

Fig. 1(a) shows an X-ray diffraction (XRD) pattern of the SnO_2@C sample, all the reflection peaks can be well indexed as the tetragonal rutile SnO_2 structure (JCPDS Card No 41-1445). From Raman spectra in Fig. 1(b), it can be found that there are two typical carbon peaks[16] at 1580 cm^{-1} (G band) and 1340 cm^{-1} (D band) in addition to SnO_2 peaks (A_{1g}) at about 630 cm^{-1}.[2]

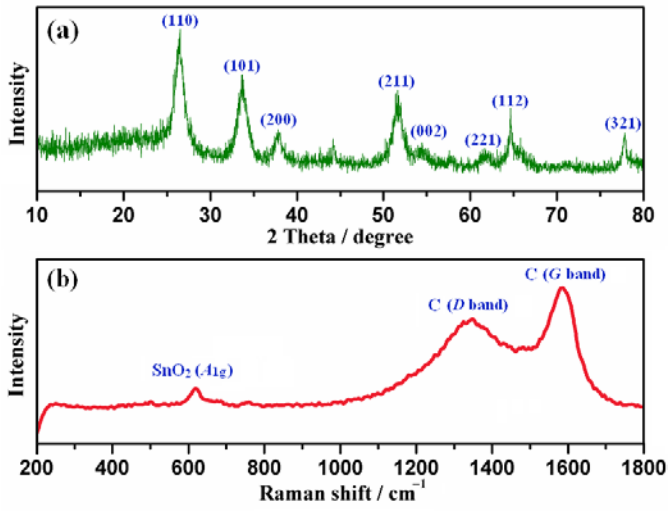

Fig. 1 XRD pattern (a) and Raman spectra (b) of SnO_2@C sample.

SnO_2 Content Information

To determine SnO_2 content in SnO_2@C nanochain sample, both inductively coupled plasma-optical emission spectroscopy (ICP-OES) [1] and thermogravi-metric analysis (TGA) [2] are carried out in this study. Fig. 1 shows the TGA curve under air with a temperature ramp of 10 °C/ min.

Chemical analysis based on ICP-OES shows that the SnO_2@C nanochain sample contains 37.42 wt.% Sn, which corresponding to a 47.51% SnO_2 content. This result is in agreement with the 45.87% (100%-54.13%) of SnO_2 determined by the TGA.

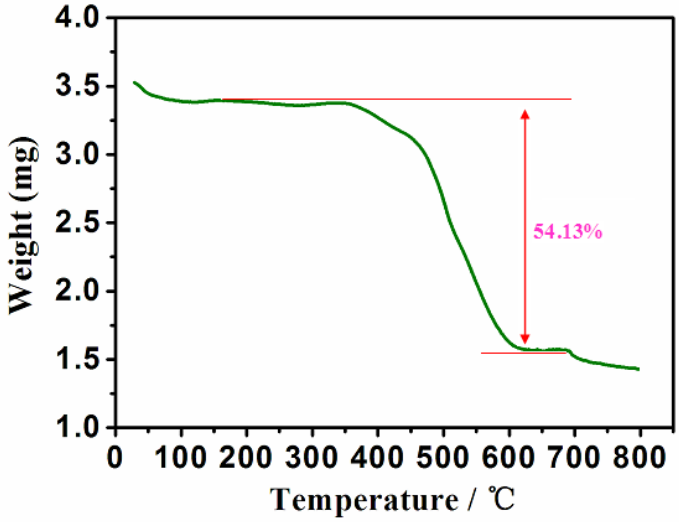

Fig. 2. TGA curve under air with a ramp of 10 °C/min

References:

1. J. Read, D. Foster, J. Wolfenstine, W. Behl, *J. Power Sources*, 2001, **96**, 277.
2. X.W. Lou, D. Deng, J. Y. Lee, L. A. Archer, *Chem. Mater.*, 2008, **20**, 6562.