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$_2$SnO$_3$·3H$_2$O 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.](image-url)
SnO₂ Content Information

To determine SnO₂ content in SnO₂@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 SnO₂@C nanochain sample contains 37.42 wt.% Sn, which corresponding to a 47.51% SnO₂ content. This result is in agreement with the 45.87% (100%-54.13%) of SnO₂ determined by the TGA.

![TGA curve under air with a ramp of 10 °C/min](image)

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

References: