Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting information

One-dimensional Carbon-SnO_2 and SnO_2 Nanostructures via Single-spinneret Electrospinning: Tunable Morphology and Underlying Mechanism

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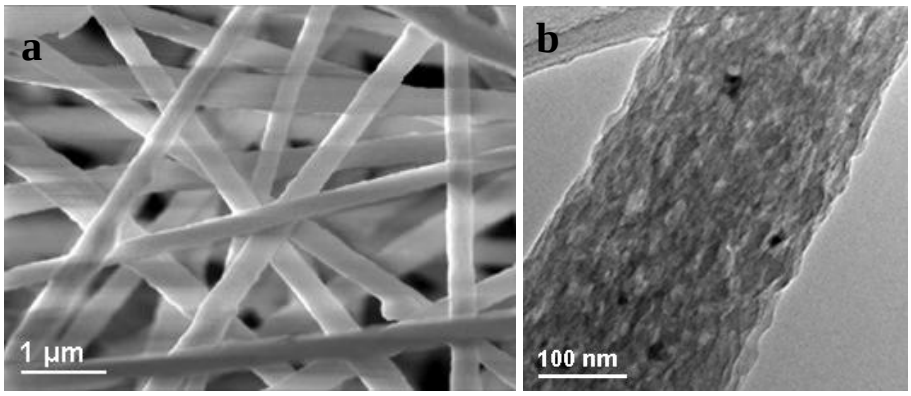

Fig. S1 (a) FESEM and (b) TEM images of electrospun PAN/SnS hybrid nanofibers. Uniform nanofibers with diameter ranging from 300 to 400 nm were obtained through electrospinning. The length can reach up to tens of micrometer due to the continuity of electrospinning. The TEM image shows the homogeneous distribution of SnS in PAN nanofibers.

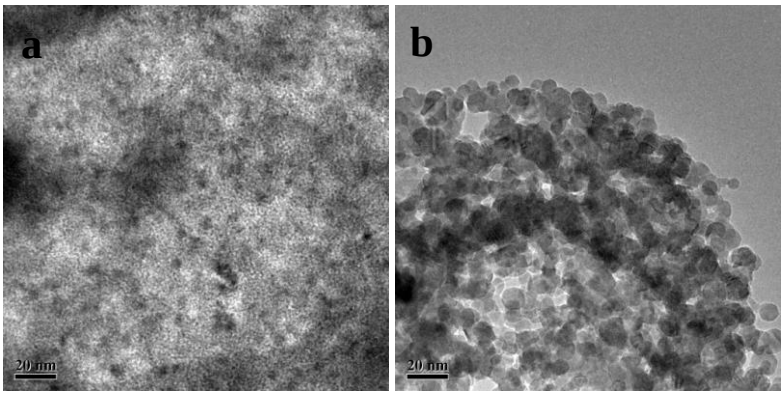

Fig. S2 TEM images of (a) $Sn(CH_3COO)_2$ and (b) $SnSO_4$ dispersed in PAN/DMF solution, indicating the size of tin salt nanoparticles is about 10 nm or less. The TEM samples were prepared by casting tin salt dispersion in PAN/DMF onto the copper grid.

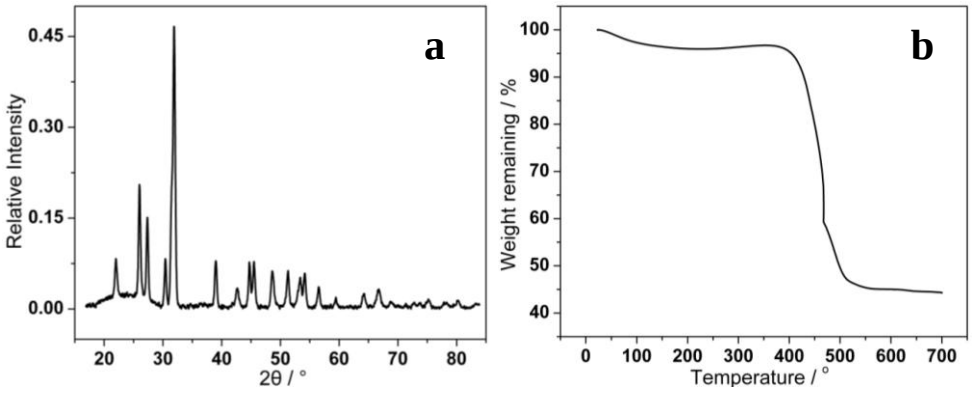

Fig. S3 (a) XRD pattern of carbonized PAN/SnS hybrid nanofibers, indicating that SnS is not converted to SnO_2 under the carbonization condition. (b) TGA curve of carbonized PAN/SnS hybrid nanofibers under the following condition: heated from room temperature to 700 ºC at 10 ºC/min in air, and kept at 700 ºC for 10 min. The content of Sn-containing compound in carbonized hybrid nanofibers is measured to be around 45 wt%.

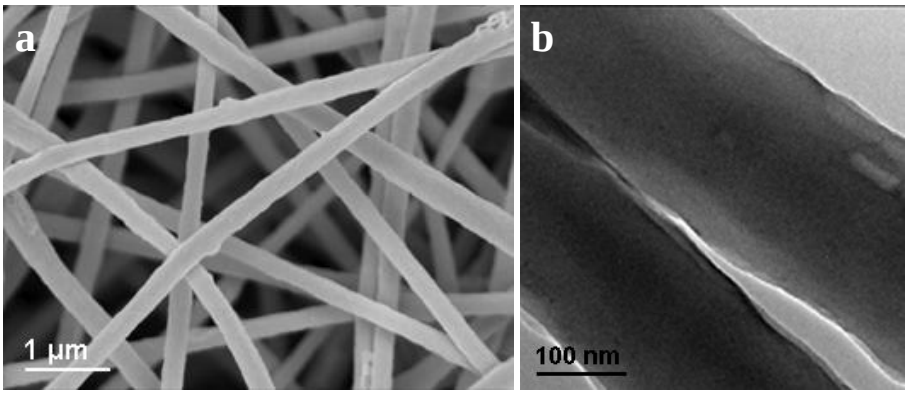

Fig. S4 FESEM and TEM images of carbonized PAN/SnS hybrid nanofibers. The fibrous morphology is maintained after carbonization, while the diameter is reduced to 200-300 nm due to the formation of carbon upon cross linking and removal of N and H from PAN. The homogeneous morphology is also observed from TEM image, indicating the uniform distribution of Sn-containing mixture in carbon nanofibers.

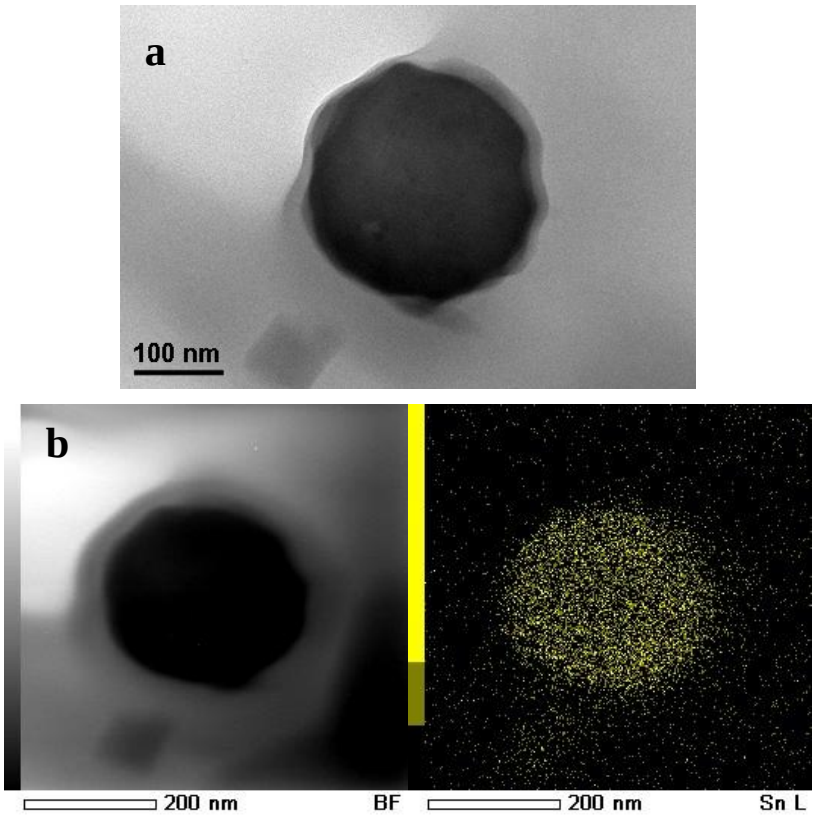

Fig. S5 (a) Cross section TEM image and (b) corresponding STEM Sn mapping of carbonized PAN/SnS hybrid nanofibers. It is shown that element Sn distributes uniformly in carbon nanofiber, indicating that no diffusion occurs during carbonization. This is due to the high thermal stability and melting point of SnS.

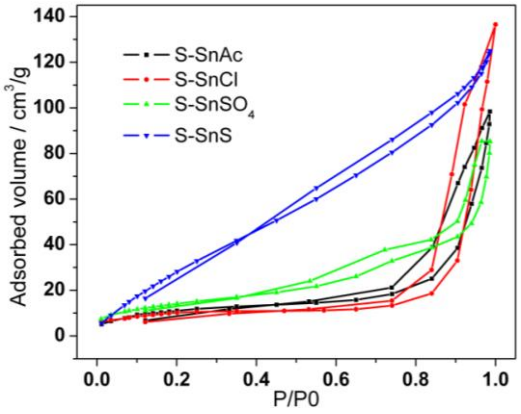

Fig. S6 N_2 adsorption/desorption isothermal profiles of SnO_2 nanofibers/nanotubes from different precursors. Typical isothermal profiles are observed for SnO_2 nanofibers/nanotubes derived from all precursors, in which SnS-derived SnO_2 nanofibers clearly shows their higher surface area.