Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Electronic Supplementary information

S-doped porous carbon nanospheres confined SnS with enhanced electrochemical performance for sodium-ion batteries

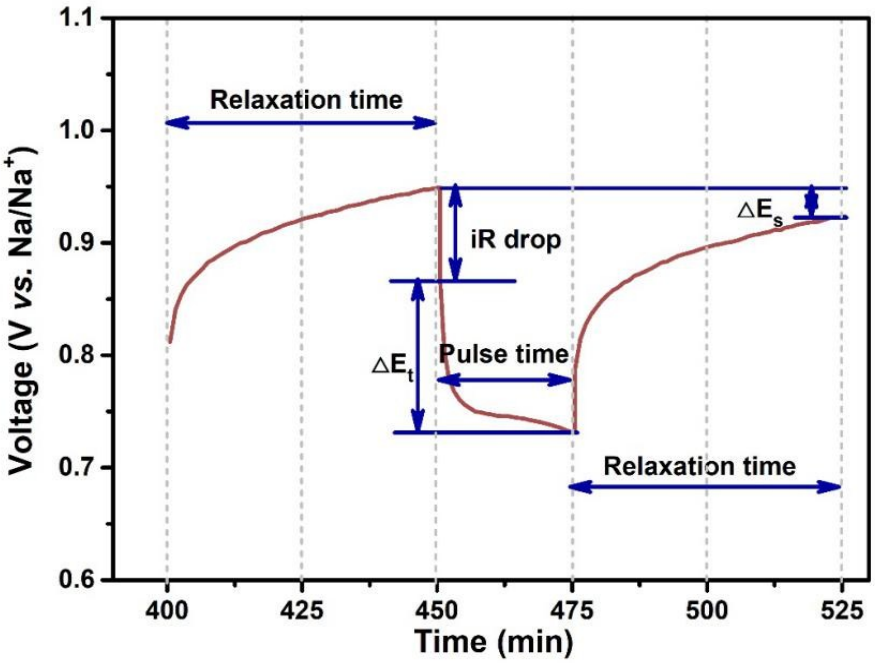

Fig. S1. E vs. t profile for a single GITT during discharge process.

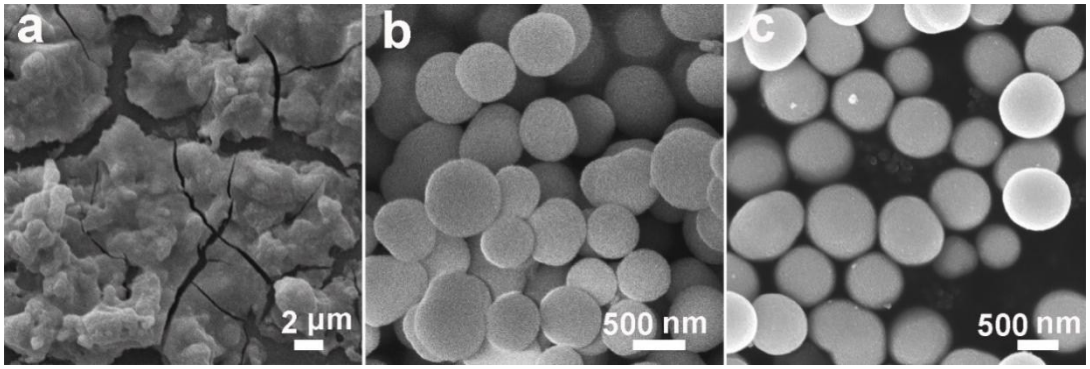

Fig. S2. The SEM images of Sn-Precursor obtained by using different raw materials. (a) 0.2 g $SnCl_2 \bullet H_2O$; (b) 0.2 g ascorbic acid/0.1 g $SnCl_2 \bullet H_2O$; (c) 0.4 g ascorbic acid/0.2 g $SnCl_2 \bullet H_2O$.

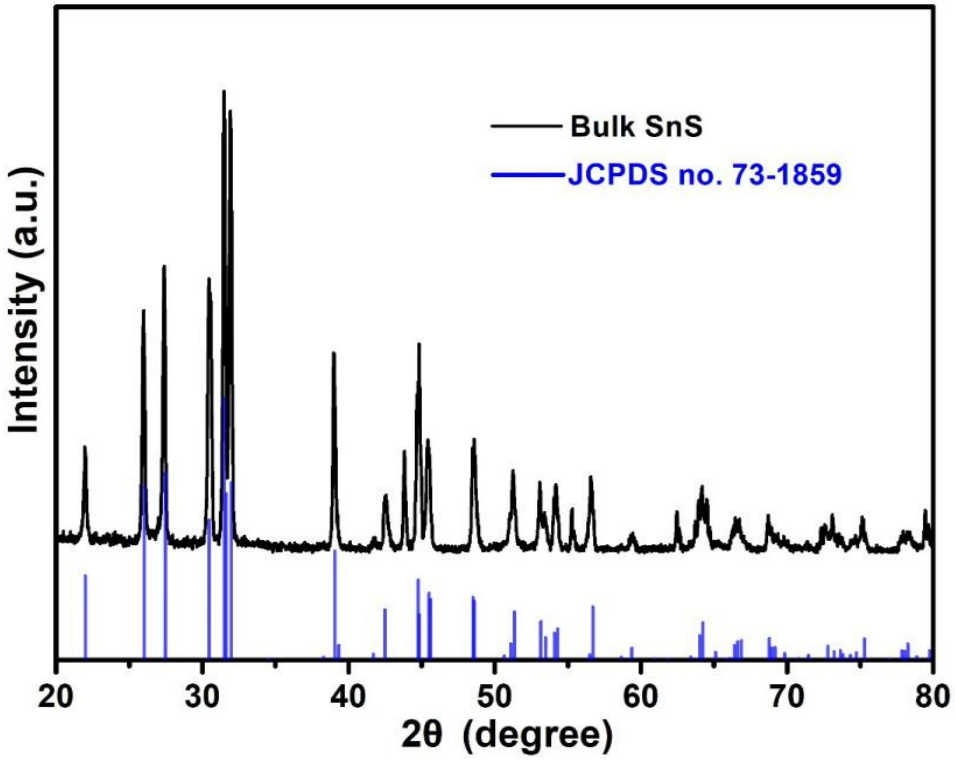

Fig. S3. XRD patterns of the bulk SnS obtained by annealing Sn with S powder in Ar atmosphere at 400 ^{o}C.

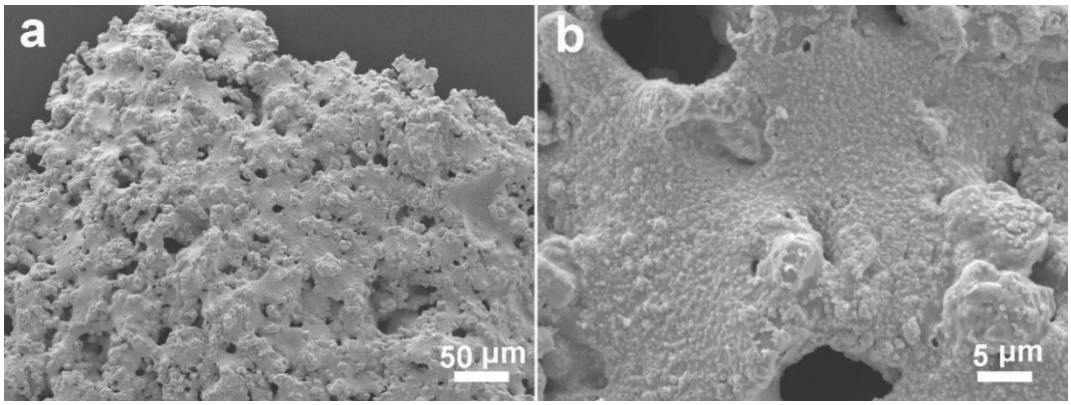

Fig. S4. The SEM images (a, b) of bulk SnS.

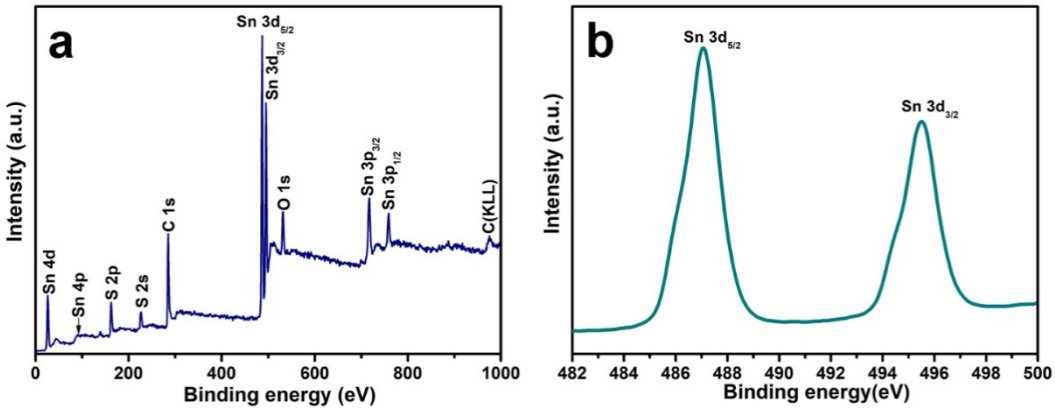

Fig. S5. Typical XPS survey spectra (a) and the corresponding Sn 3d (b) XPS spectra of the SnS@SPC composite.

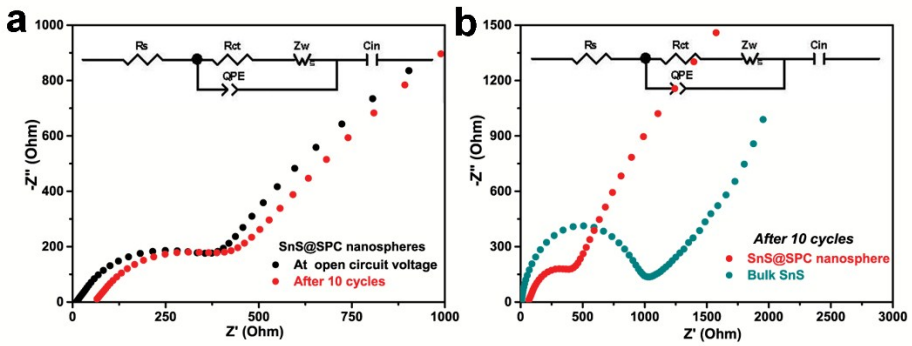

Fig. S6. Electrochemical impedance spectra of the SnS@SPC electrode at open circuit voltage and after 10 cycles (a) and the bulk SnS electrode (b) after 10 cycles. Inset is the equivalent circuit model for the impedance spectra. R_s is the combination of electrolyte resistance and ohmic resistance of cell components. R_f is the resistance of solid electrolyte interface (SEI) films. For the fresh electrodes, no SEI films were formed. R_{ct} is represented for the charge transfer resistance of electrochemical reactions. C_f, *QPE*, Z_w and C_{in} are the surface-passivating layer capacitance, double layer capacitance, Warburg impedance, and the reflection of intercalation capacitance, respectively.

Table S1 Fitting parameters of components for Nyquist plots of SnS@SPC at open circuit voltage or after 10th cycle.

Samples	R_s (Ω)	R_f (Ω)	R_{ct} (Ω)	R_{cell} (Ω)(R_{cell}=R_s+R_f+R_{ct})
Open circuit voltage	10.68		334.2	344.88
10th cycle	10.83	18.16	363.4	392.39

Table S2 Fitting parameters of components in analog circuit for Nyquist plots of Fig. S6b.

Samples	R_s (Ω)	R_f (Ω)	R_{ct} (Ω)	R_{cell} (Ω)(R_{cell}=R_s+R_f+R_{ct})
SnS@SPC	10.83	18.16	363.4	392.39
Bulk SnS	3.21	27.65	873.6	904.46