Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Lithium-ion storage performances of sunflower-like and nano-sized hollow SnO_2 spheres by spray pyrolysis and the nanoscale Kirkendall effect

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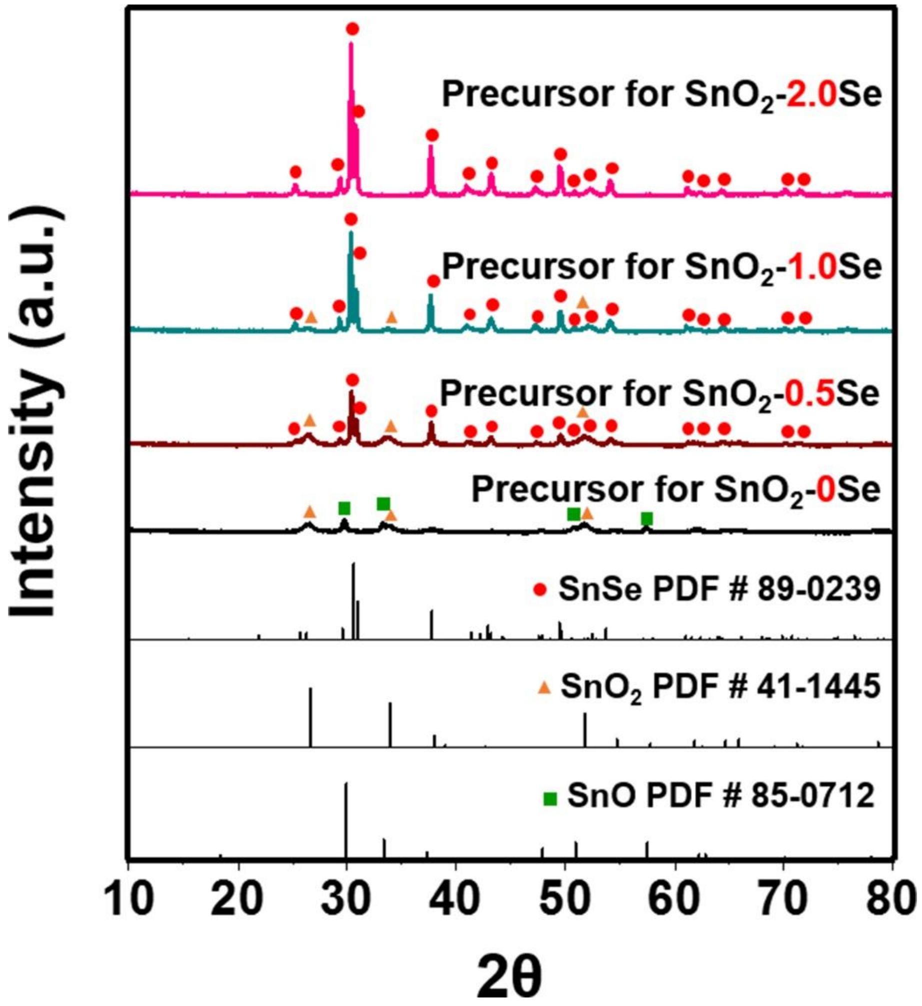


Fig. S1 XRD patterns of precursor for SnO_2-0Se, SnO_2-0.5Se, SnO_2-1.0Se, and SnO_2-2.0Se directly formed by spray pyrolysis.

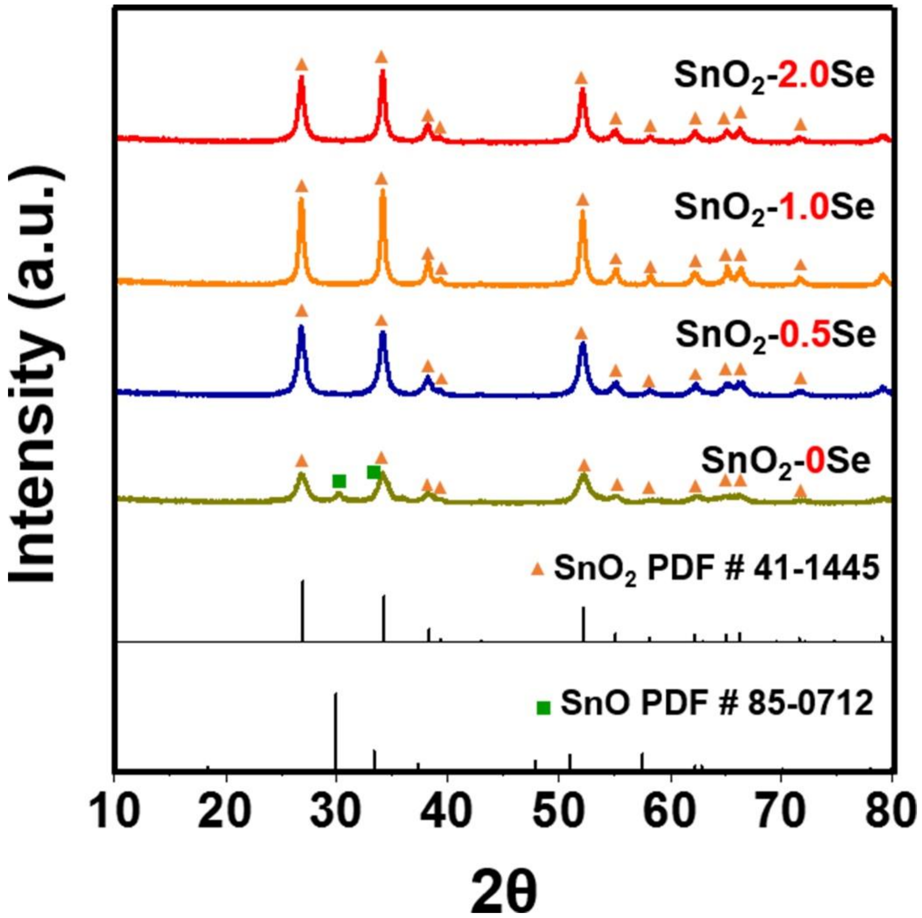


Fig. S2 XRD patterns of SnO_2-0Se, SnO_2-0.5Se, SnO_2-1.0Se, and SnO_2-2.0Se formed by spray pyrolysis and subsequent oxidation process.

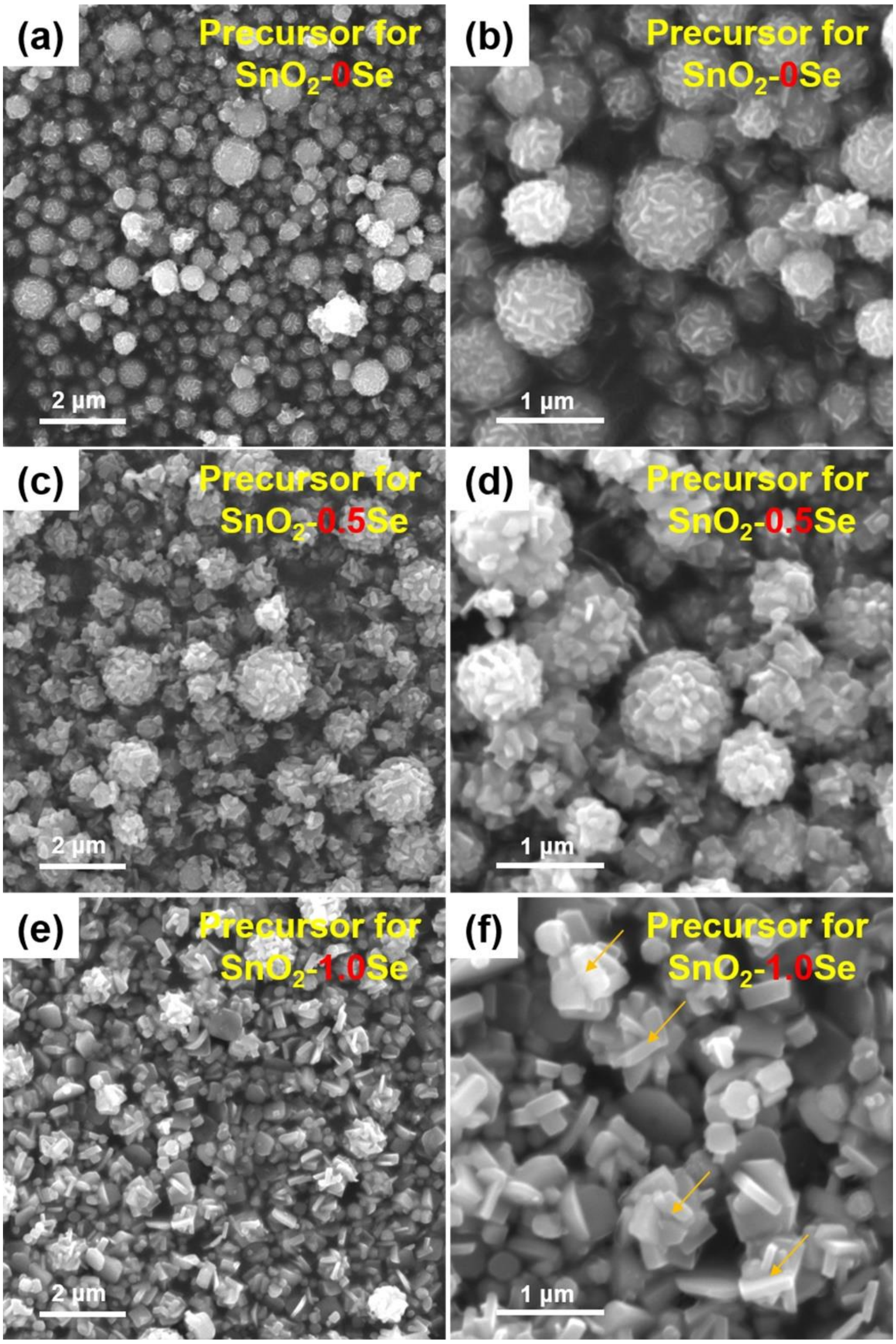


Fig. S3 SEM images of precursor for SnO_2-0Se, SnO_2-0.5Se, and SnO_2-1.0Se directly formed by spray pyrolysis.

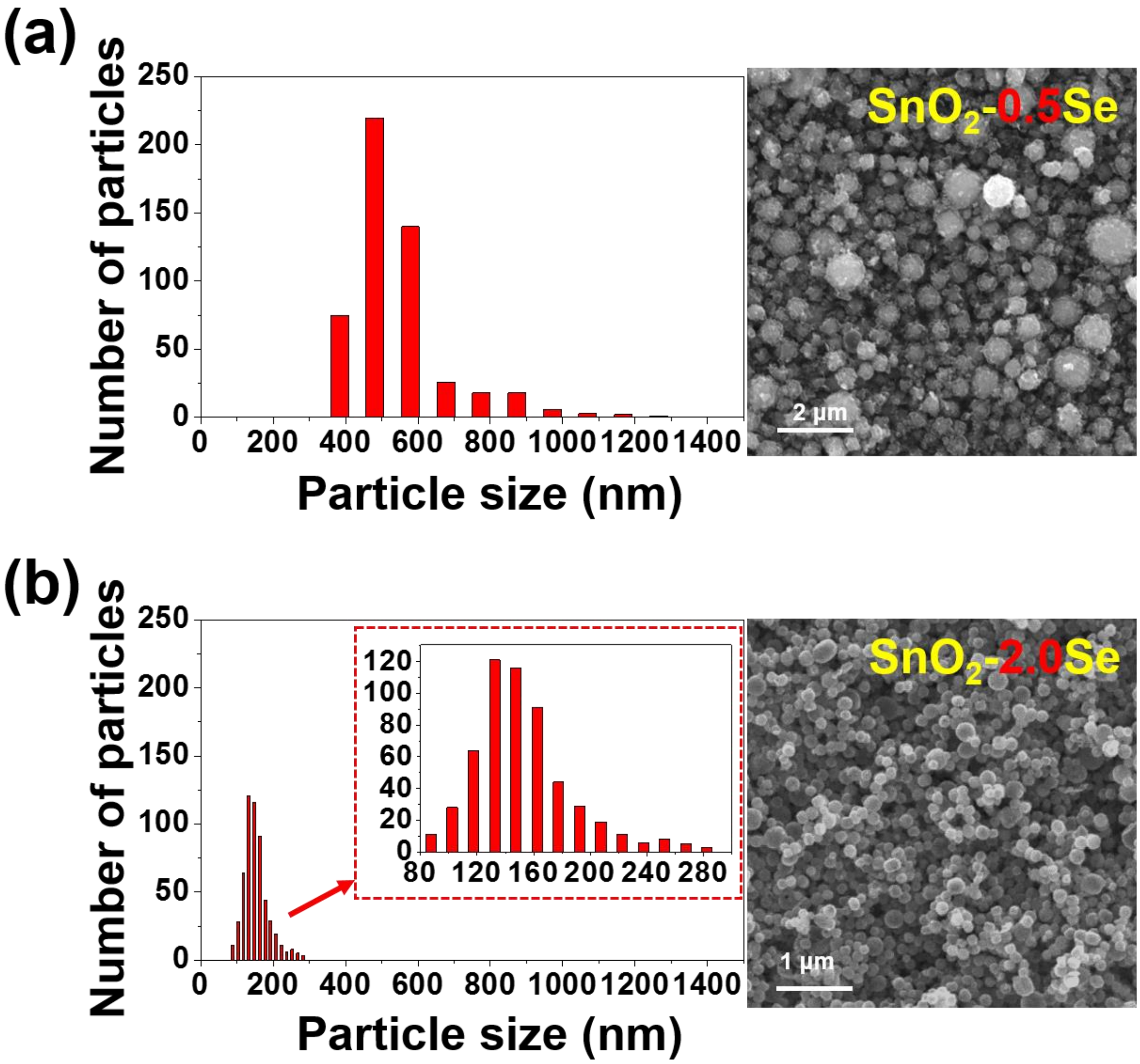


Fig. S4 Particle size distributions of (a) SnO_2-0.5Se and (b) SnO_2-2.0Se samples.

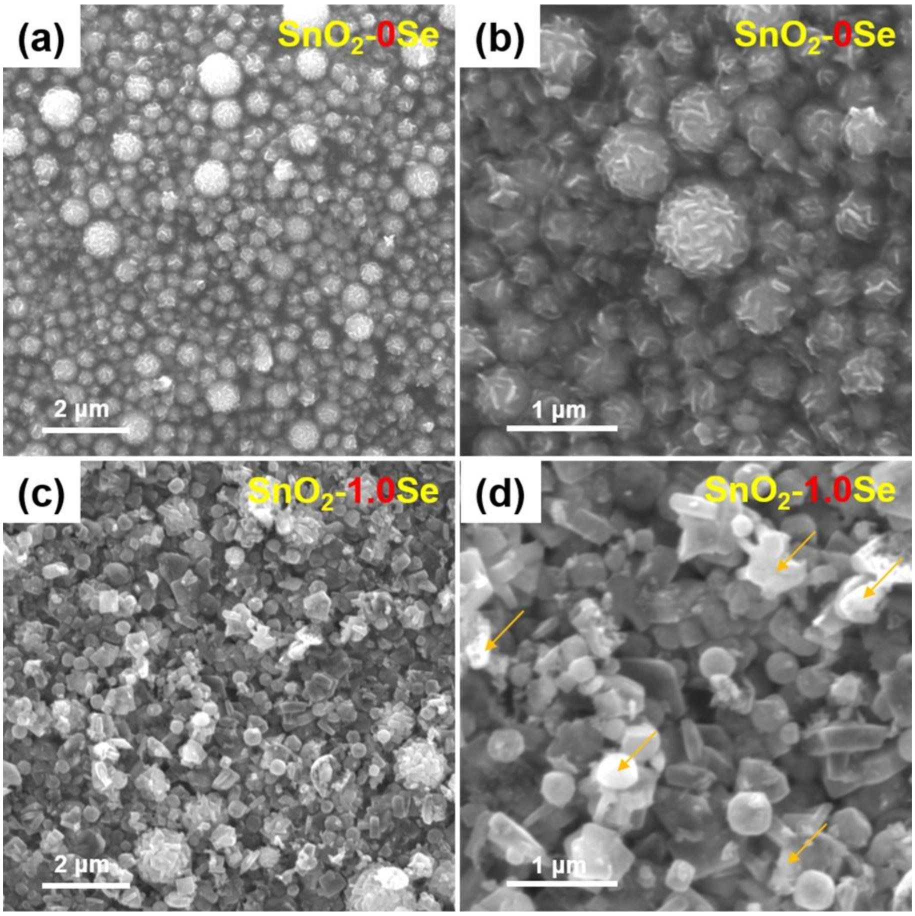


Fig. S5 SEM images of SnO_2-0Se and SnO_2-1.0Se formed by spray pyrolysis and subsequent oxidation process.

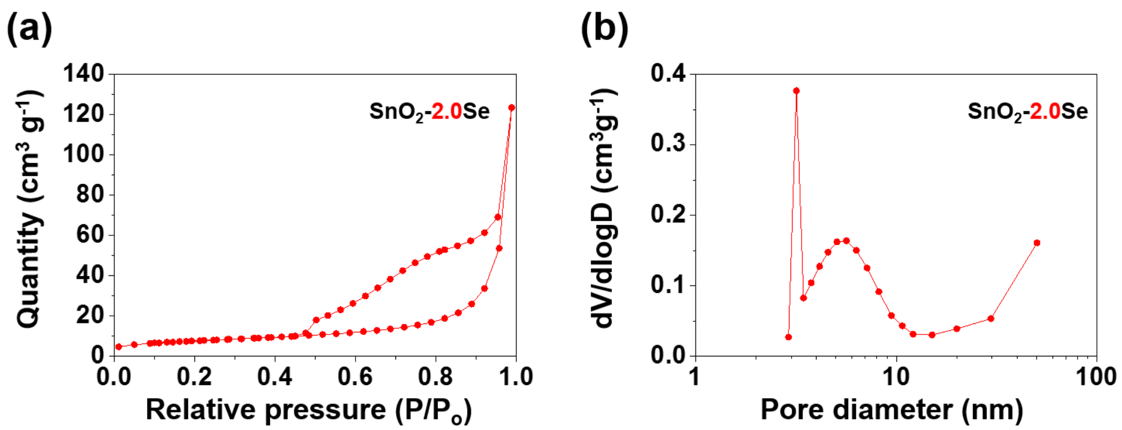
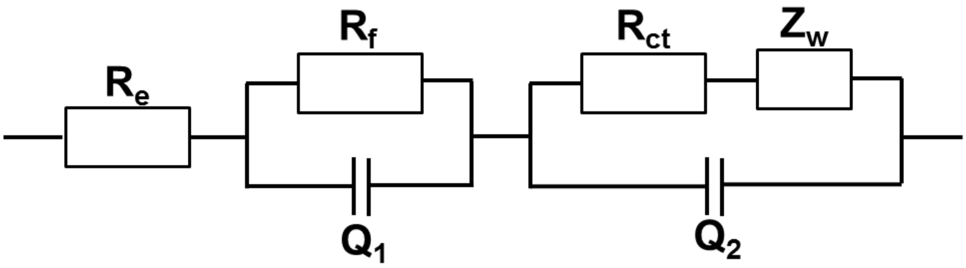


Fig. S6 (a) N_2 gas adsorption and desorption isotherm and (b) BJH pore size distribution of hollow SnO_2 nanospheres (SnO_2-2.0Se).



R_e : the electrolyte resistance, corresponding to the intercept of high frequency semicircle at Z_{re} axis

R_f : the SEI layer resistance corresponding to the high-frequency semicircle

Q_1 : the dielectric relaxation capacitance corresponding to the high-frequency semicircle

R_{ct}: the denote the charger transfer resistance related to the middle-frequency semicircle

Q_2 : the associated double-layer capacitance related to the middle-frequency semicircle

Z_w : the Li-ion diffusion resistance

Fig. S7 Randle-type equivalent circuit model used for ac impedance fitting.

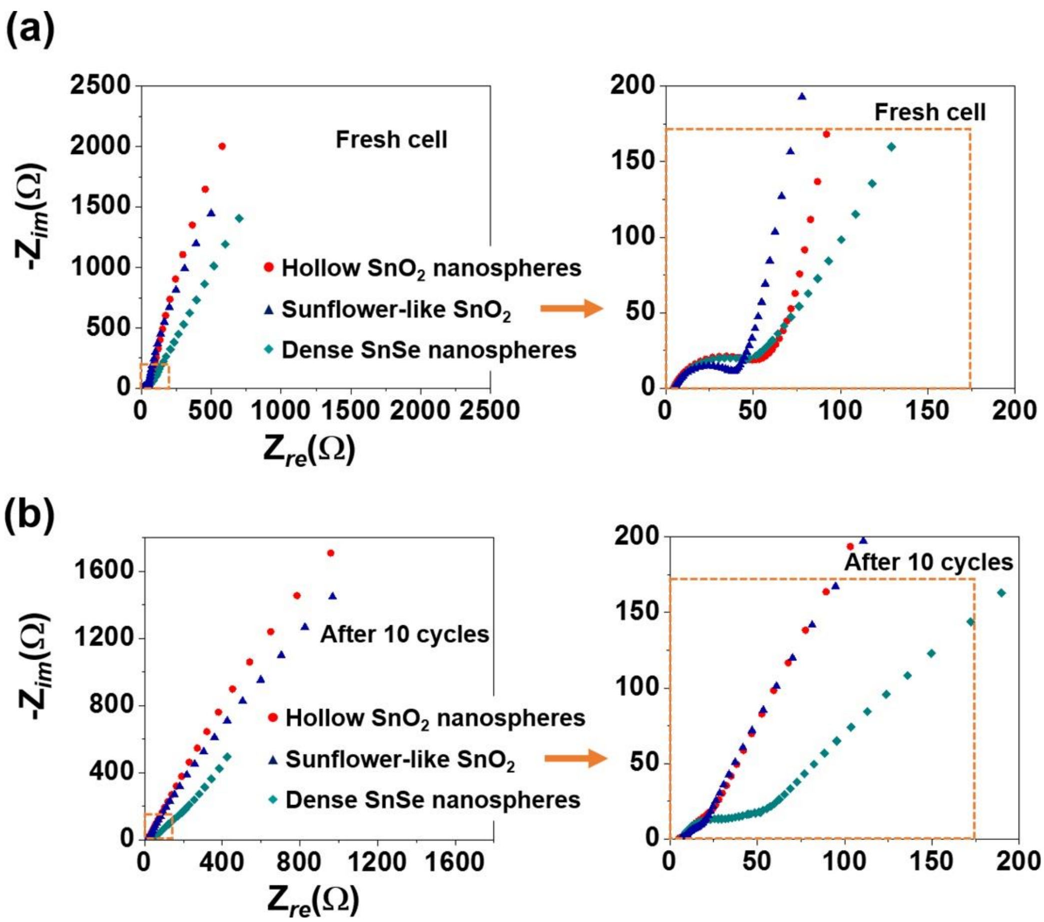


Fig. S8 Nyquist plots of dense SnSe nanospheres (precursor powders for SnO_2-2.0Se), sunflower-like SnO_2 (SnO_2-0.5Se), hollow SnO_2 nanospheres (SnO_2-2.0Se) : (a) fresh cell, (b) after 10 cycles.

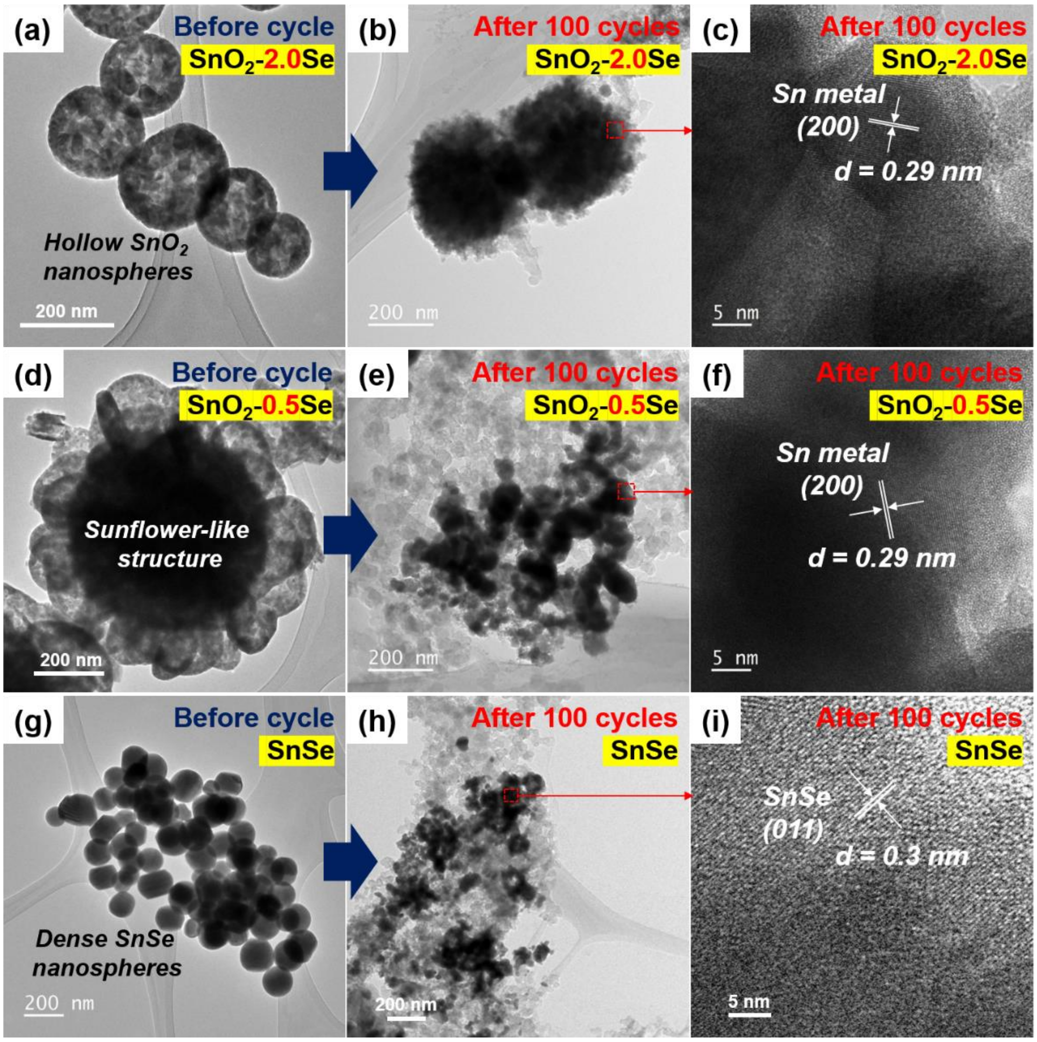


Fig. S9 TEM images of SnO_2-2.0Se, SnO_2-0.5Se, and SnSe before and after 100 cycles : (a-c) SnO_2-2.0Se, (d-f) SnO_2-0.5Se, and (g-i) SnSe.

Table S1. Electrochemical performances of various nanostructured SnO_2 materials applied as lithium-ion batteries reported in the previous literatures.

Various hollow SnO_2 materials	Potential range (V)	Current density [A g^{-1}]	Discharge capacity [mA h g^{-1}] (cycle number)	Rate capacity [mA h g^{-1}] (Current rate [A g^{-1}])	Ref
SnO_2 hollow spheres	0.001-1.0	2.0	643 (300)	597 (7.0)	[S1]
SnO_2@carbon hollow spheres	0-3.0	0.5	460 (100)	210 (3.0)	[S2]
Carbon-coated SnO_2 hollow spheres	0-3.0	0.1	900 (50)	670 (2.0)	[S3]
SnO_2 fiber-in-tube	0.001-1.0	1.0	640 (300)	591 (5.0)	[S4]
N-doped carbon-coated SnO_2 submicroboxes	0.001-2.0	0.5	491 (100)	256 (5.0)	[S5]
SnO_2 hollow nanostructures	0.001-2.0	0.1	540 (50)	460 (7.8)	[S6]
SnO_2-carbon composite microspheres	0.001-1.2	1.5	509 (1000)	389 (9.0)	[S7]
Carbon nanotube @SnO_2-Au coaxial nanocable	0.01-1.2	0.18	626 (40)	392 (7.2)	[S8]
SnO_2-C hollow nanostructures	0.01-3.0	0.2	577 (500)	415 (5.0)	[S9]
SnO_2 hollow nanoplates	0.01-1.0	1.0	635 (300)	267 (30.0)	[S10]
Mesoporous SnO_2 nanowire	0-1.2	0.4	773 (50)	250 (20.0)	[S11]
Hollow SnO_2 nanospheres	***0.001-3.0***	***3.0***	***1043 (500)***	***638 (10.0)***	***This study***

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