Supporting Information

Cation-exchange construction of $ZnSe/Sb_2Se_3$ hollow microspheres coated by nitrogen-doped carbon with enhanced sodium ion storage capability

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The supporting information contains Fig. S1-S7 and Table S1-S3.

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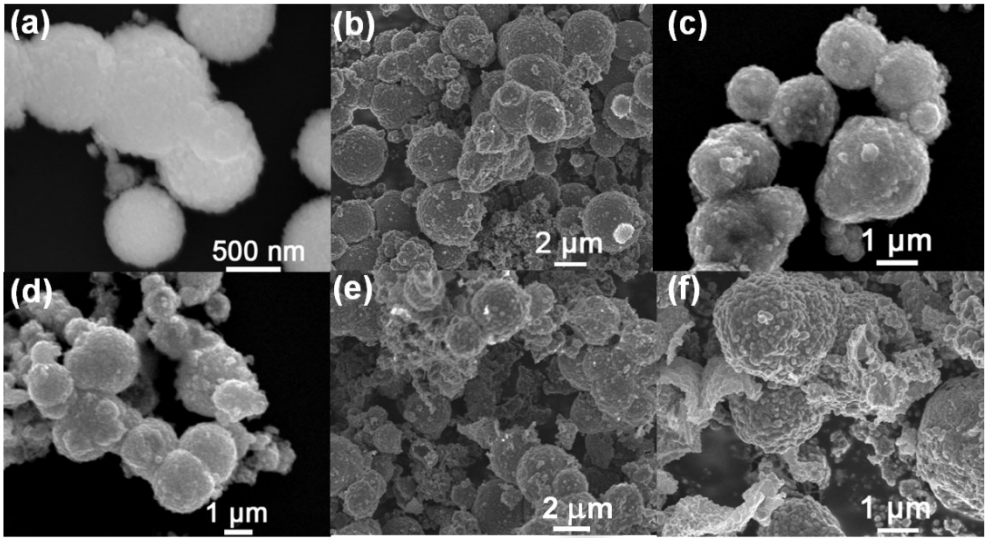

Fig. S1 SEM images of (a) ZnSe precursor, (b) ZnSe@NC, (c) ZnSe/Sb_2Se_3@NC (10:1), (d) ZnSe/Sb_2Se_3@NC (50:1), (e) ZnSe/Sb_2Se_3@NC (100:1) and (f) ZnSe/Sb_2Se_3@NC (200:1).

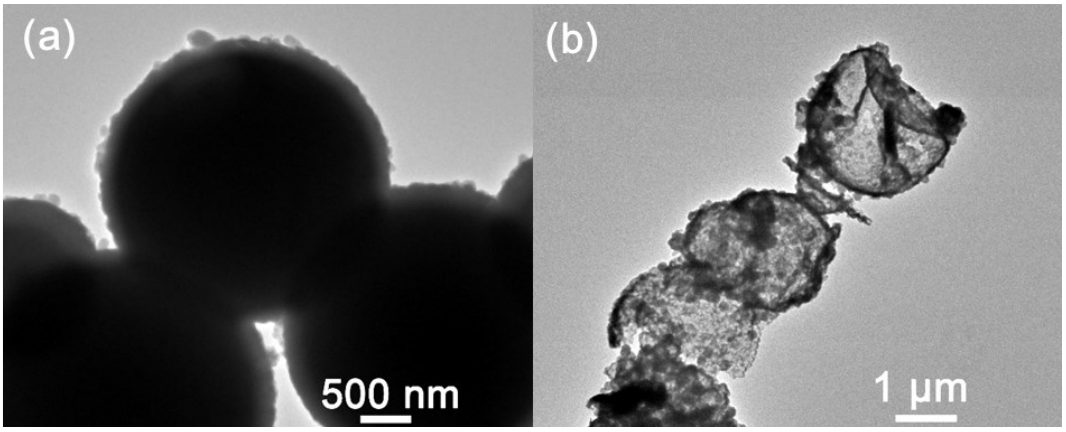

Fig. S2 TEM images of (a) ZnSe@NC and (b) Sb_2Se_3@NC samples.

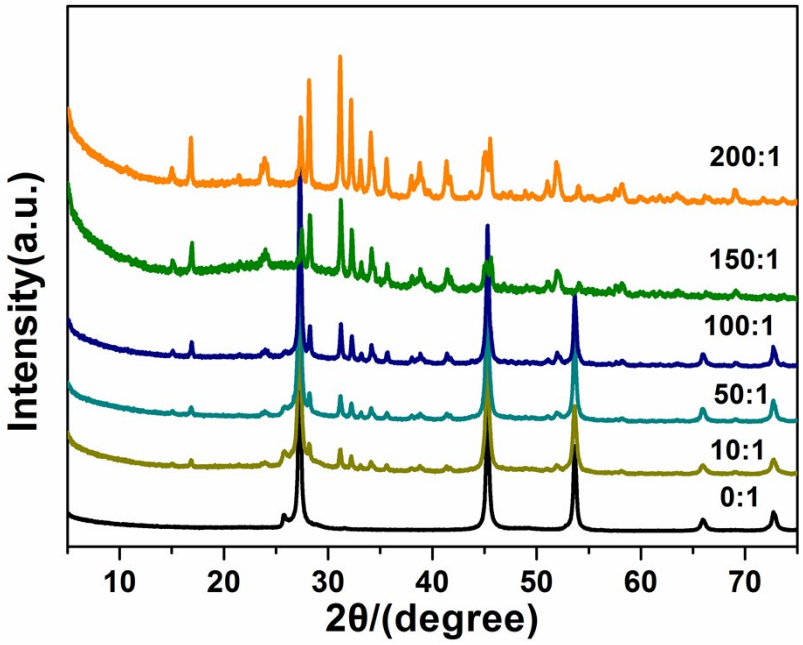

Fig. S3 XRD curves for the sample obtained from different weight ratios of ZnSe@PDA : $SbCl_3$ during the ion exchange process.

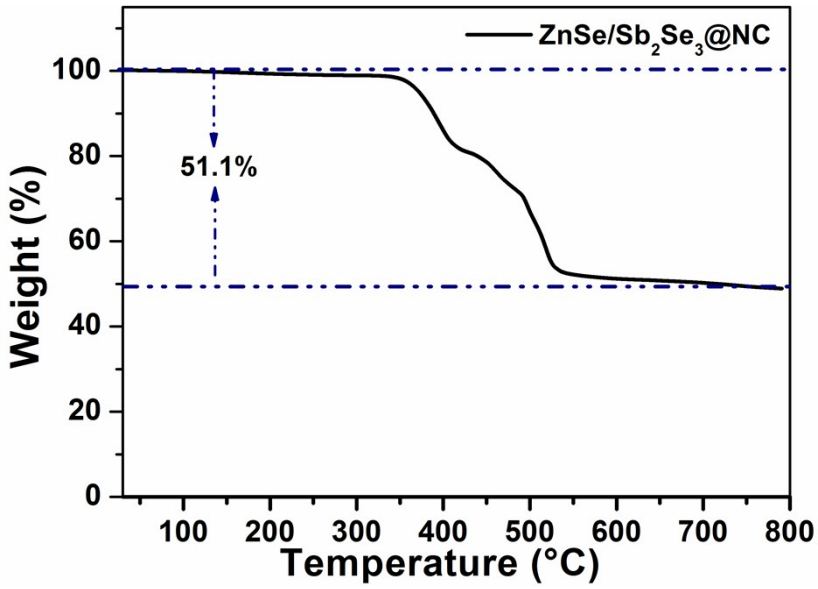

Fig. S4 TGA curve of the $ZnSe/Sb_2Se_3$@NC in the air atmosphere.

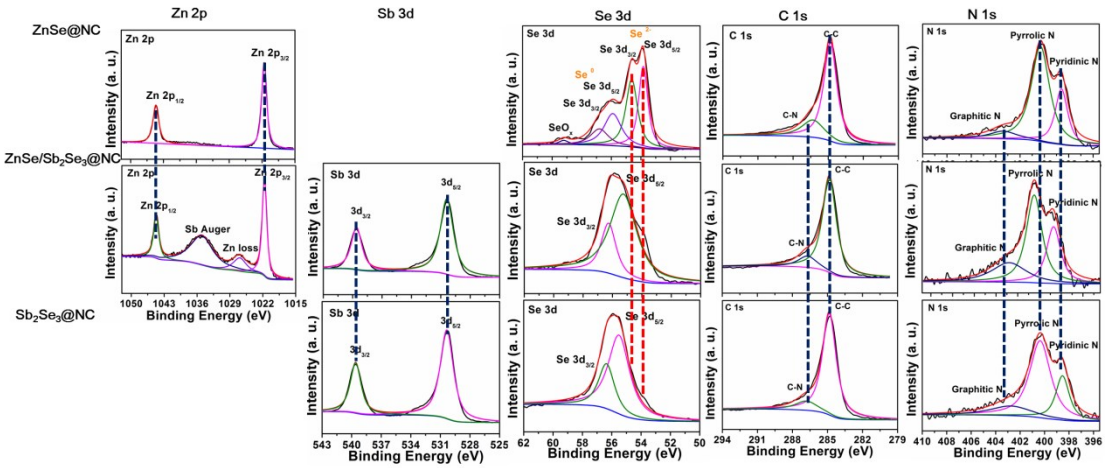

Fig. S5. Comparison of the XPS spectra for ZnSe@NC, Sb_2Se_3@NC and ZnSe/Sb_2Se_3@NC.

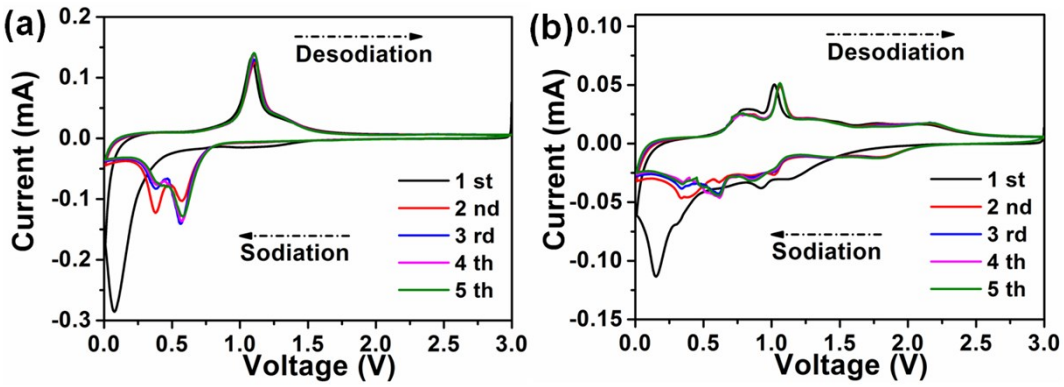

Fig. S6 CV curves for (a) ZnSe@NC and (b) Sb_2Se_3@NC electrodes at the scan rates of 0.1 mV S^{-1}.

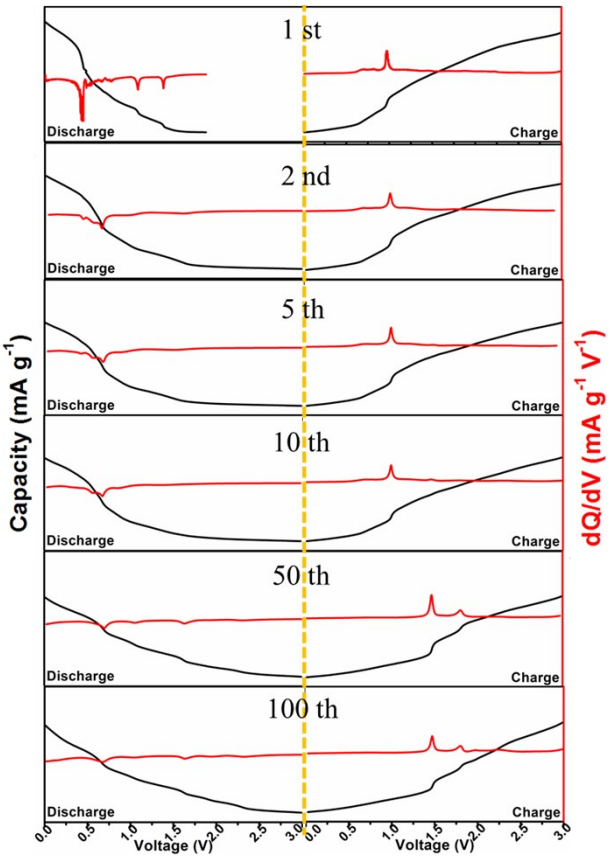

Fig. S7 The selected discharge/charge profiles and the corresponding d*Q*/d*V* curves at 0.5 A g^{-1} (0.05 A g^{-1} for the initial cycle) of ZnSe/Sb_2Se_3@NC.

Table S1 ICP result of the $ZnSe/Sb_2Se_3$@NC hollow microsphere.

Analyte	Conc.Units
Zn	17.69 mg/L
Sb	13.36 mg/L

Table S2 The at% and wt% of the N element in the samples.

		ZnSe@NC	ZnSe/Sb_2Se_3@NC	Sb_2Se_3@NC
N	at%	9.76	8.90	8.42
	wt%	8.71	5.57	5.61

Table S3 Initial capacity loss comparisons with other selenide anodes and $ZnSe/Sb_2Se_3$@NC hollow microsphere as anode materials for SIBs.

Materials	Initial discharge capacity	Initial charge capacity	Initial Coulombic efficiency	References
$ZnSe/Sb_2Se_3$@NC hollow microsphere	570.5 mAh g^{-1}	516.5 mAh g^{-1}	90.5%	Our work
$CoSe_2$/(NiCo)Se_2 box-in-box hollow nanocubes	661 mAh g^{-1}	574 mAh g^{-1}	79.6%	[1]
$MoSe_2$/C nanotubes encapsulated with $CoSe_2$ nanoparticles	590 mAh g^{-1}	450 mAh g^{-1}	76.3%	[2]
SnSe/C wrapped Within N-doped graphene	652.6 mAh g^{-1}	486.1 mAh g^{-1}	74.49%	[3]
rGO-overcoated Sb_2Se_3 nanorods	940 mAh g^{-1}	682 mAh g^{-1}	72.6%	[4]
$CoSe_2$ nanobuds encapsulated into boron and nitrogen codoped graphene (BCN) nanotubes	926 mAh g^{-1}		68.5%	[5]
$FeSe_2$@C hollow nanocubes	858 mAh g^{-1}	539 mAh g^{-1}	62.8%	[6]
ZnSe-NC@$CoSe_2$-NC polyhedrons	882.6 mAh g^{-1}	502.5 mAh g^{-1}	56.9%	[7]
N-ZnSe@rGO polyhedra	1022 mAh g^{-1}	562 mAh g^{-1}	54.9%	[8]

Notes and references

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