Supporting Information for

Hierarchically Porous-Structured $Zn_xCo_{1-x}S$@C-CNTs Nanocomposites with High-Rate Cycling Performance for Lithium-Ion Batteries

Hao Wang,[&,†] Ziliang Chen,[&,†] Yang Liu,[†] Hongbin Xu,[†] Licheng Cao,[†] Huilin Qing,[†] and Renbing Wu,[,†]*

[†]Department of Materials Science, Fudan University, Shanghai 200433, P. R. China

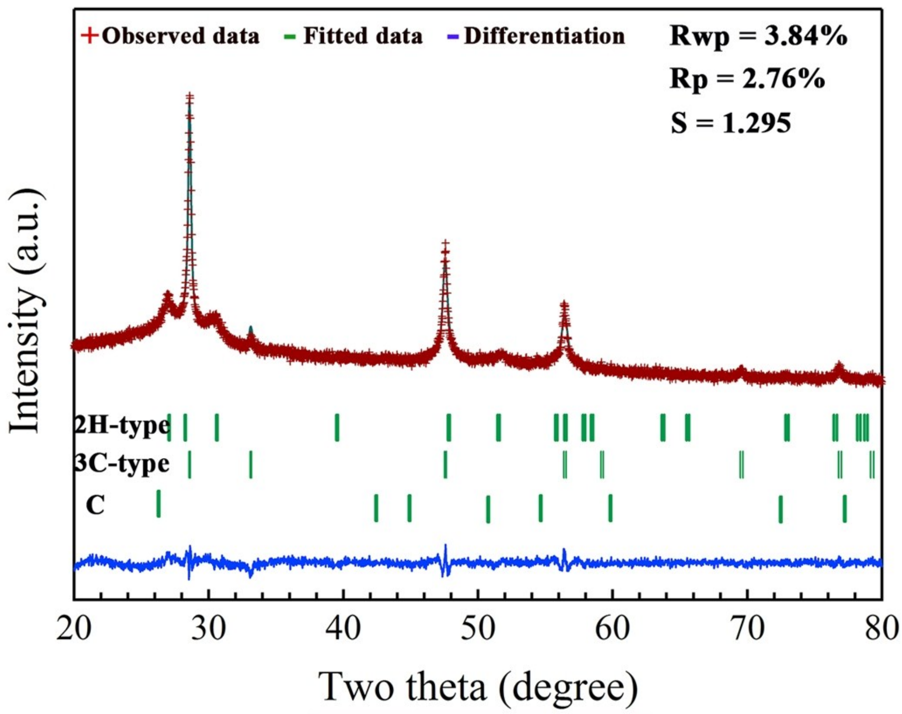

Fig. S1 Rietveld refinement image for the XRD pattern of $Zn_xCo_{1-x}S$@C-CNTs

Table S1. Rietveld refinement result for the XRD pattern of $Zn_xCo_{1-x}S$@C-CNTs

Sample	Phase	Space group	Lattice parameters (Å)		Amount (wt.%)
			a	*c*	
$Zn_xCo_{1-x}S$@C-CNTs	3C-type	*F*-43*m*	5.3946(5)	–	71
	2H-type	$P6_3mc$	3.8025(3)	6.1863(5)	22
	C	$P6_3/mmc$	2.48(3)	6.73(2)	7

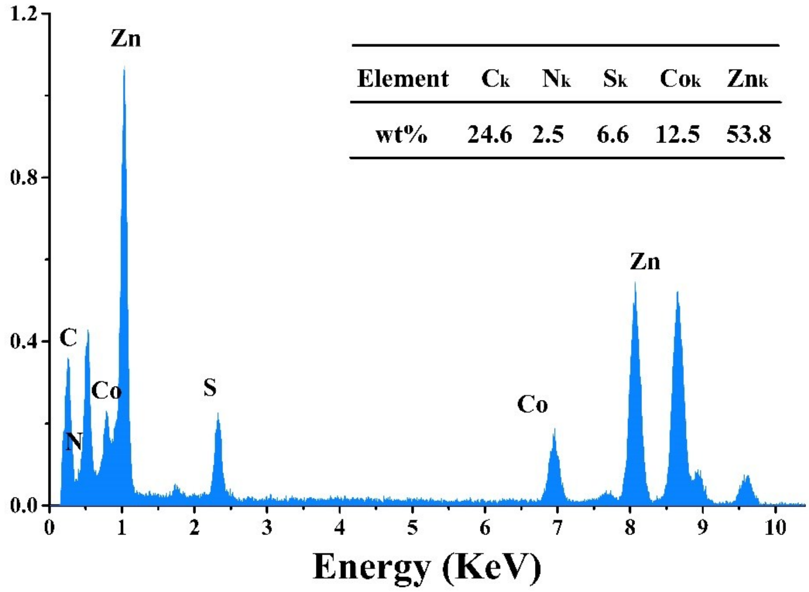

Fig. S2 Energy Dispersive Spectrometer (EDS) spectrum of $Zn_xCo_{1-x}S$@C-CNT.

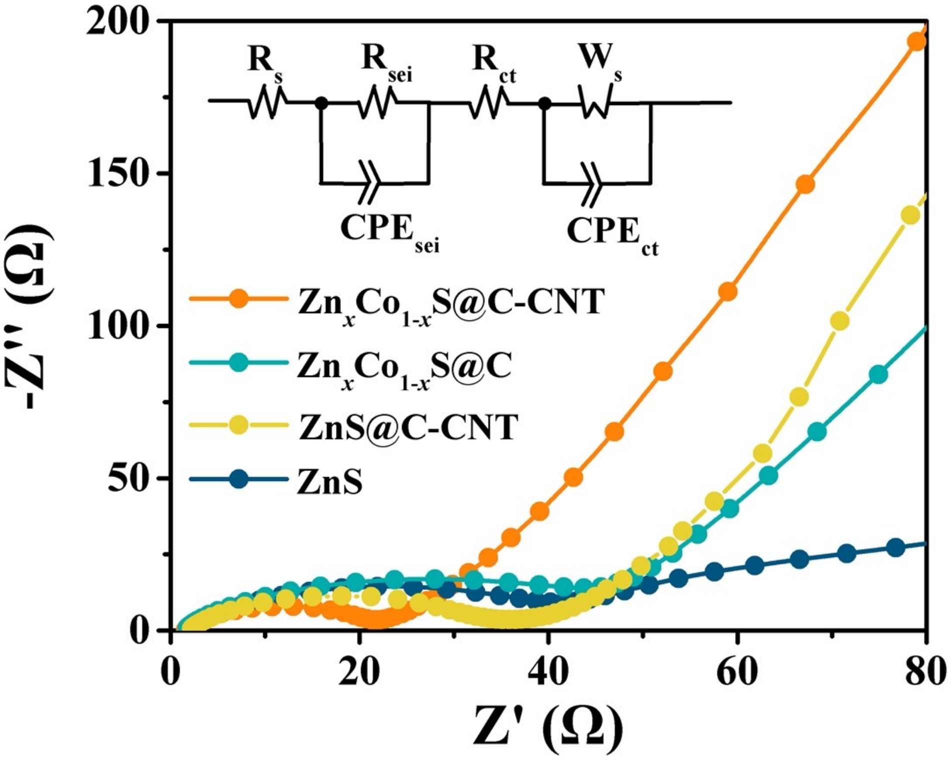

Fig. S3 Electrochemical Impedance Spectroscopy of $Zn_xCo_{1-x}S$@C-CNTs and commercial ZnS as anodes for LIBs.

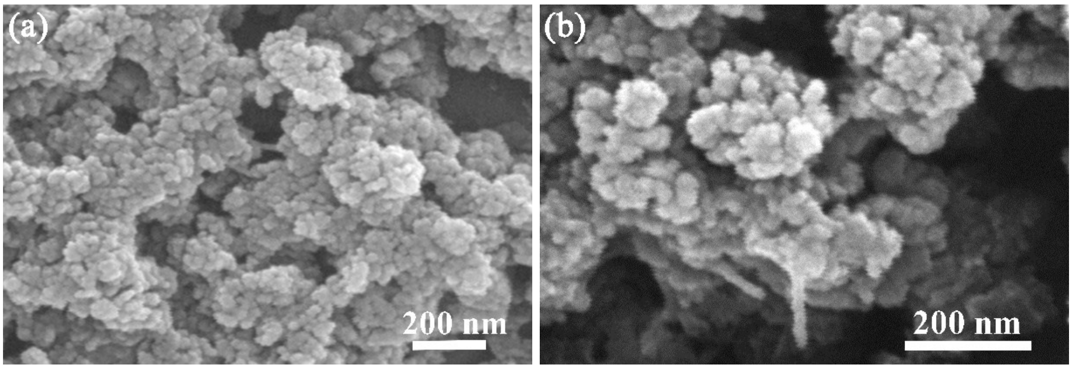

Fig. S4 (a-b) TEM images of $Zn_xCo_{1-x}S$@C-CNTs anodes after cycling for over 1000 times at a current density of 1.2 A g^{-1}.

Table S2 Comparison of electrochemical performances of $Zn_xCo_{1-x}S$@C-CNTs anode with previously reported zinc chalcogenides-based electrodes.

Products	Synthetic method	Electrode formulation[a]	Cycling stability (A/B/*n*)[b]	Ref.
Yolk-shell-structured Zn-Fe-S	spray pyrolysis	70:20:10(CMC)[c]	913/0.5/50	[S1]
ZnS-RGO	spray pyrolysis	70:20:10(CMC)	628/1/300	[S2]
ZnS/RGO	hydrothermal	80:10:10	790/0.49/300	[S3]
ZnS@C	Precipitation Method	75:15:10	304.4/0.4/300	[S4]
ZnS@porous carbon	MOF-derived	Bind-free	438/0.1/300	[S5]
ZnS/graphene	Solvothermal	Bind-free	570/0.2/200	[S6]
Core-shell structured ZnS-C	Chitosan-assisted hydrothermal	70:15:15(CMC)	530/0.1/600	[S7]
Spherical ZnS/C	Spray pyrolysis	70:15:15(CMC)	868/1/300	[S8]
ZnS/C	Solvothermal	70:15:15(CMC)	741/0.1/300	[S9]
ZnS@NC	Hydrothermal	70:15:15 (SA)[d]	690/0.1/100	[S10]
Co-Zn-S@NS-C-CNT	Bimetal-organic-frameworks derivation	80:10:10	941/0.1/250	[S11]
$Zn_xCo_{1-x}S$	Oil phase approach	80:10:10	750/0.2/100	[S12]
$Zn_xCo_{1-x}S$@C-CNTs	Precipitation Method	70:20:10	635/1.2/1000	Our work

[a]Weight ratio of the active material, carbon and binder. PVDF was used as binder if not mentioned. Other values used were specified.

[b]A/B/*n* means the capacity of A (mAh g^{-1}) remained after *n* cycles at the certain current density of B (A g^{-1}).

[c]CMC means carboxymethyl cellulose.

[d]SA means sodium alginate.

Reference

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