Supplementary Material for

Tailoring the Electrochemical Properties of ZnS Electrodes via Cobalt Doping for Improved Supercapacitor Application

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Table S1. Structural parameters such as d-spacing and crystallite size comparison of pure and Co doped ZnS samples obtained from XRD curves, calculated using X-Pert high score and Scherrer formula.

Sample	2θ (degree)	(h k l)	d-spacing (Å)	FWHM (θ)	Crystallite size (Å)
ZnS	28.90	111	3.0868	4.33	18.63
	48.41	220	1.8788	5.78	14.65
	56.48	311	1.6279	5.84	14.90
Co(0.01):ZnS	28.83	111	3.0948	4.31	18.72
	48.32	220	1.8819	5.58	15.17
	56.36	311	1.6312	6.00	14.50
Co(0.05):ZnS	28.80	111	3.0974	4.28	18.85
	48.40	220	1.8791	5.72	14.80
	56.43	311	1.6293	5.90	14.75

Table S2. BET result comparison of pure and Co doped ZnS samples.

Sample	BET surface area ($m^2 g^{-1}$)	Average pore diameter (nm)	Total pore volume at p/p_0=0.99 ($cm^3 g^{-1}$)
ZnS	30.89	5.615	0.043
Co(0.01):ZnS	73.20	3.839	0.070
Co(0.05):ZnS	99.30	3.241	0.080

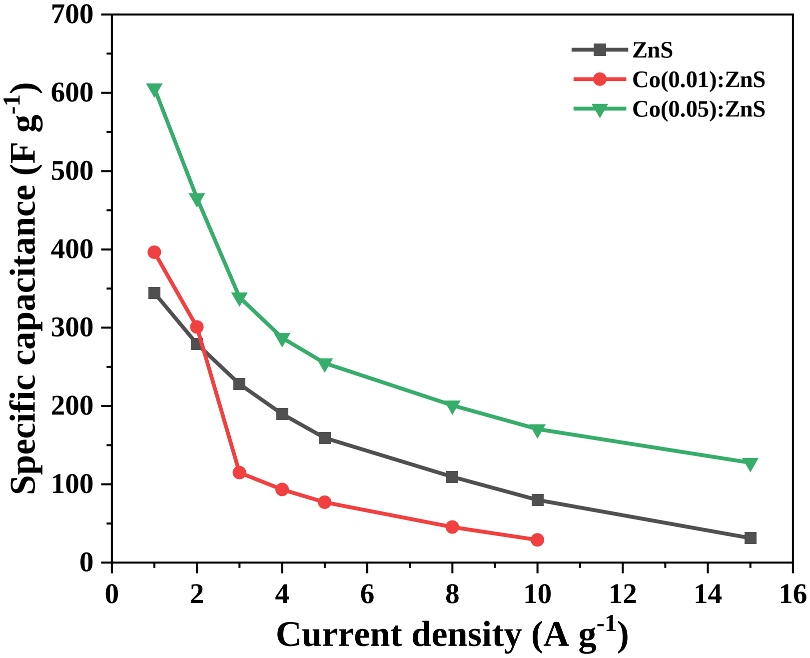

Figure S1. Specific capacitance vs current density (from CP) plot for pure and Co doped ZnS samples.

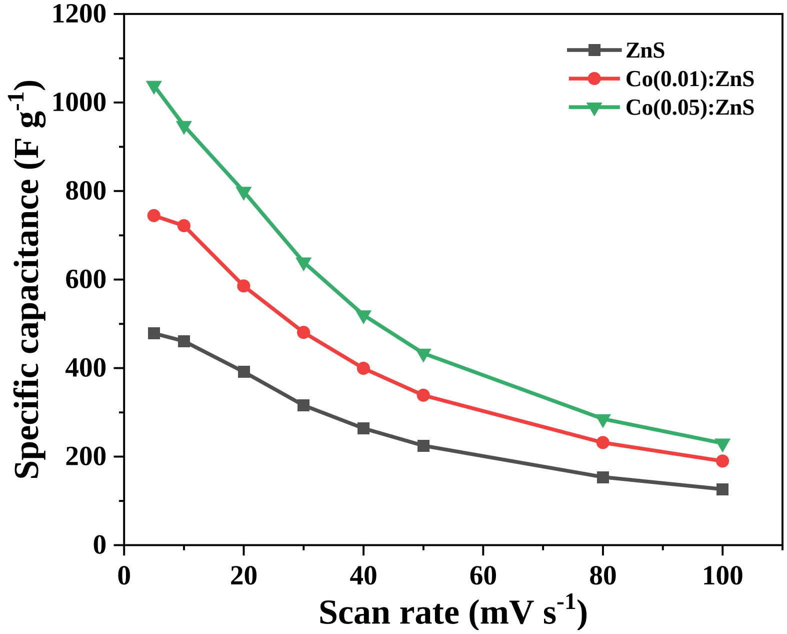

Figure S2. Specific capacitance vs scan rate (from CV) plot for pure and Co doped ZnS samples.

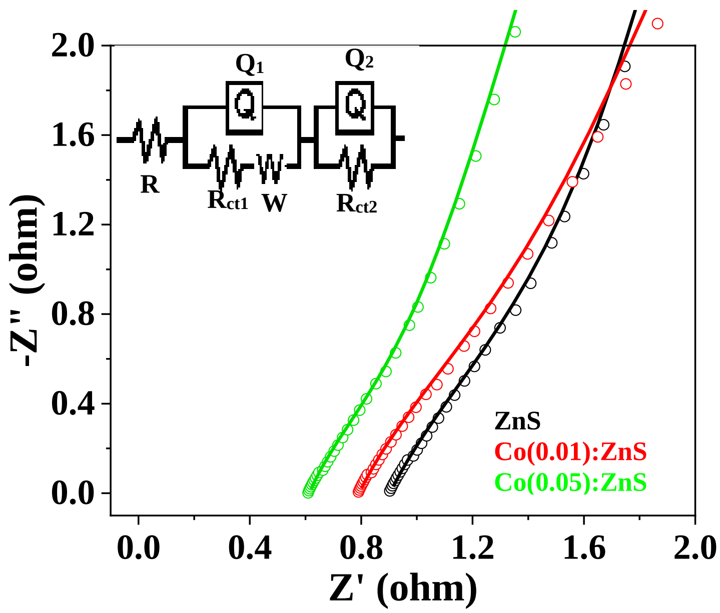

Figure S3. Zoomed region of Nyquist plot. The inset shows corresponding equivalent circuit for fitted curve. All the EIS curves are taken at its corresponding Open Circuit Voltage (OCV) value.

Table S3. Compares the solution and charge-transfer resistance of pure and Co doped ZnS which is obtained from the EIS analysis.

Sample	**R_s (ohm)**	**R_{ct1} (ohm)**	**R_{ct2} (ohm)**
ZnS	0.9093	0.6062	228
Co(0.01):ZnS	0.7925	0.6883	93.23
Co(0.05):ZnS	0.6137	0.5978	126.9

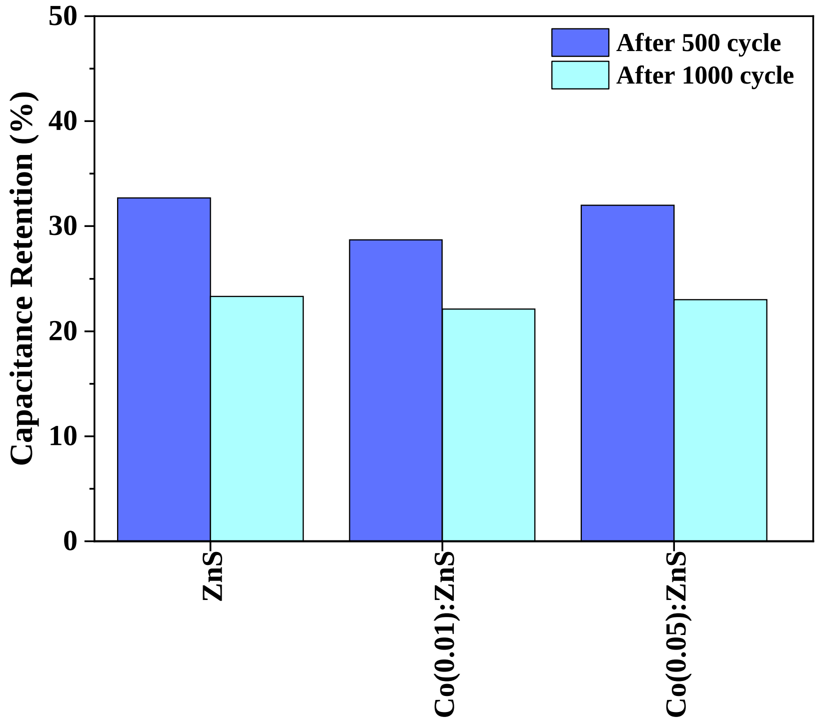

Figure S4. The bar chart which compares the capacitance retention value of pure and Co doped ZnS samples after 500 and 1000 GCD cycles at a current density of 2 A g^{-1}.

Table. S4. Comparison table of electrochemical performance of Co doped ZnS with other ZnS based materials.

Material	**Specific Capacitance ($F g^{-1}$ /$C g^{-1}$)**	**Scan rate ($mV s^{-1}$) / Current density ($A g^{-1}$)**	**References**
Ni-ZnS thin films	134 $C g^{-1}$	10 $mV s^{-1}$	1
ZnS nanoflakes @NF	659 $C g^{-1}$	2 $A g^{-1}$	2
$MgCo_2O_4$@ZnS	910 $F g^{-1}$	1 $A g^{-1}$	3
grahitic-C_3N_4/ZnS	497.7 $F g^{-1}$	1 $A g^{-1}$	4
ZnS NPs	824 $F g^{-1}$	1 $A g^{-1}$	5
ZnS/G-60	197.1 $F g^{-1}$	5 $mV s^{-1}$	6
ZnS@CNT	347.3 $F g^{-1}$	0.5 $A g^{-1}$	7
T-NT/ZnS flower like	226 $F g^{-1}$	20 $mV s^{-1}$	8
ZnS-CT	747 $F g^{-1}$	5 $mV s^{-1}$	9
$Zn_{0.76}Co_{0.24}S$/CFP	300 $F g^{-1}$	1 $A g^{-1}$	10
ZnS nanowires @NF	781 $F g^{-1}$	0.5 $A g^{-1}$	11
$Cu_5Sn_2S_7$/ZnS	200 $F g^{-1}$	1 $A g^{-1}$	12
ZnO@ZnS	603.8 $F g^{-1}$	2 $A g^{-1}$	13
Ni-ZnS microsphere	261.5 $F g^{-1}$	5 $mV s^{-1}$	14
ZnS microsphere	216.2 $F g^{-1}$	5 $mV s^{-1}$	14
ZnS	478.5 $F g^{-1}$	5 $mV s^{-1}$	This work
Co(0.01):ZnS	744.3 $F g^{-1}$	5 $mV s^{-1}$	This work
Co(0.05):ZnS	***1038.5 $F g^{-1}$***	***5 $mV s^{-1}$***	***This work***

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