Supporting Information

Dual Electrocatalytic Heterostructures for Efficient Immobilization and Conversion of Polysulfides in Li-S Batteries

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Table S1 The specific surface areas of different samples.

Sample	Specific surface area (m^2 g^{-1})
Co-Zn/Zn-C-700	13
Co-Zn/Zn-C-800	131
Co-Zn/Zn-C-900	676
Co-Zn/Zn-C-800-1	137
Co-Zn/Zn-C-800-3	76

Table S2 The real contents of Zn and Co in different samples achieved by ICP.

Sample	Co (wt%)	Zn (wt%)
Co-Zn/Zn-C-700	0.99	23.6
Co-Zn/Zn-C-800	1.76	14.2
Co-Zn/Zn-C-900	2.79	2.08

Table S3 Comparison of electrochemical performances among Co-Zn/Zn-C-800/S electrode and the literature reported sulfur cathodes.[1-11]

Sample	Rate	Cycle number	Reversible capacity (mAh g^{-1})	Ref.
CoP@HPCN/S	0.2 C	300	630	1
S/PCMSs	0.5 C	700	489	2
CNT@TiO_{2-x}-S	1 C	500	590	3
S@TiO_2@HCNBs	0.5 C	600	508	4
CF/FeP@C@S	1 C	200	500	5
CNT/CdS-QDs/S	0.5 C	150	820.6	6
CGPE	1 C	200	580	7
S-SAV@NG	0.5 C	400	551	8
B/2D MOF-Co	1 C	600	450	9
Sph-Ox-S	0.2 C	300	700	10
V_2O_5-S-CNG	0.5 C	150	713.3	11
Co-Zn/Zn-C-800/S	1 C	500	590	This work

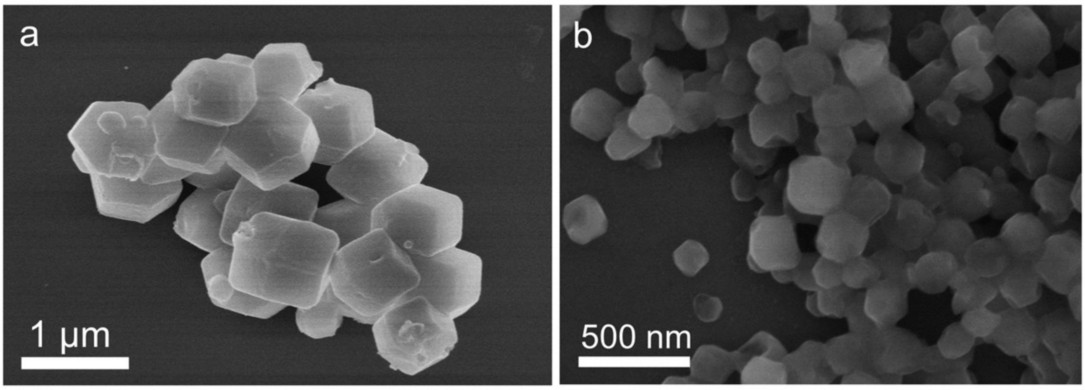

Fig. S1 SEM images of (a) Zn/Co-ZIF and (b)Zn/Co-ZIF@PZS.

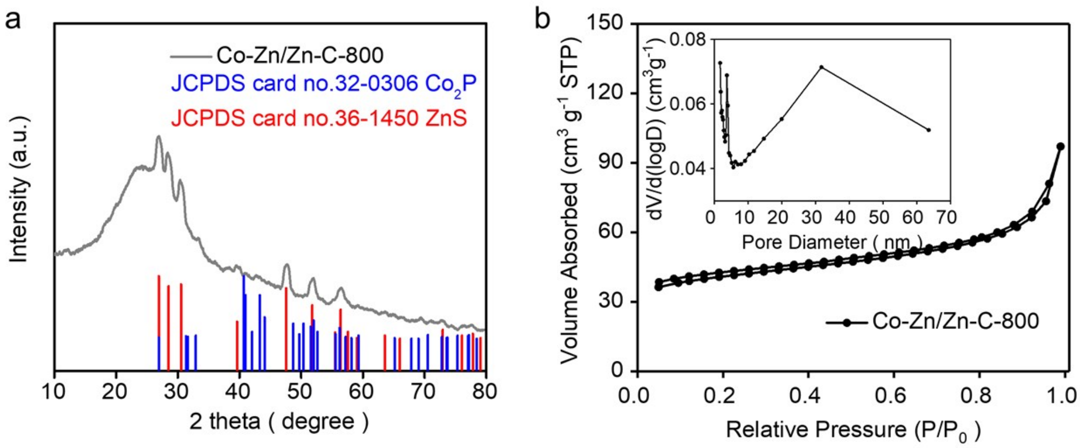

Fig. S2 (a) XRD pattern and (b) N_2 adsorption-desorption isotherm of the Co-Zn/Zn-C-800. The inset is the pore size distribution.

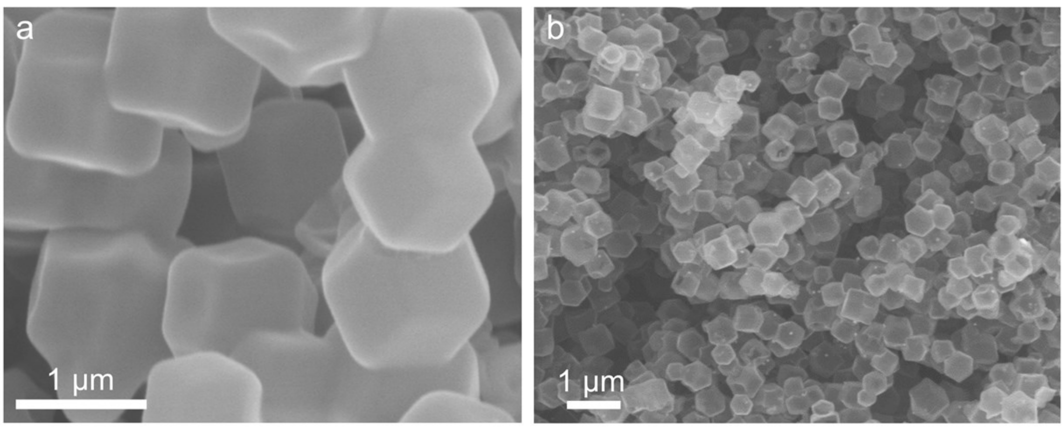

Fig. S3 SEM images of (a) Co-Zn/Zn-C-700 and (b) Co-Zn/Zn-C-900.

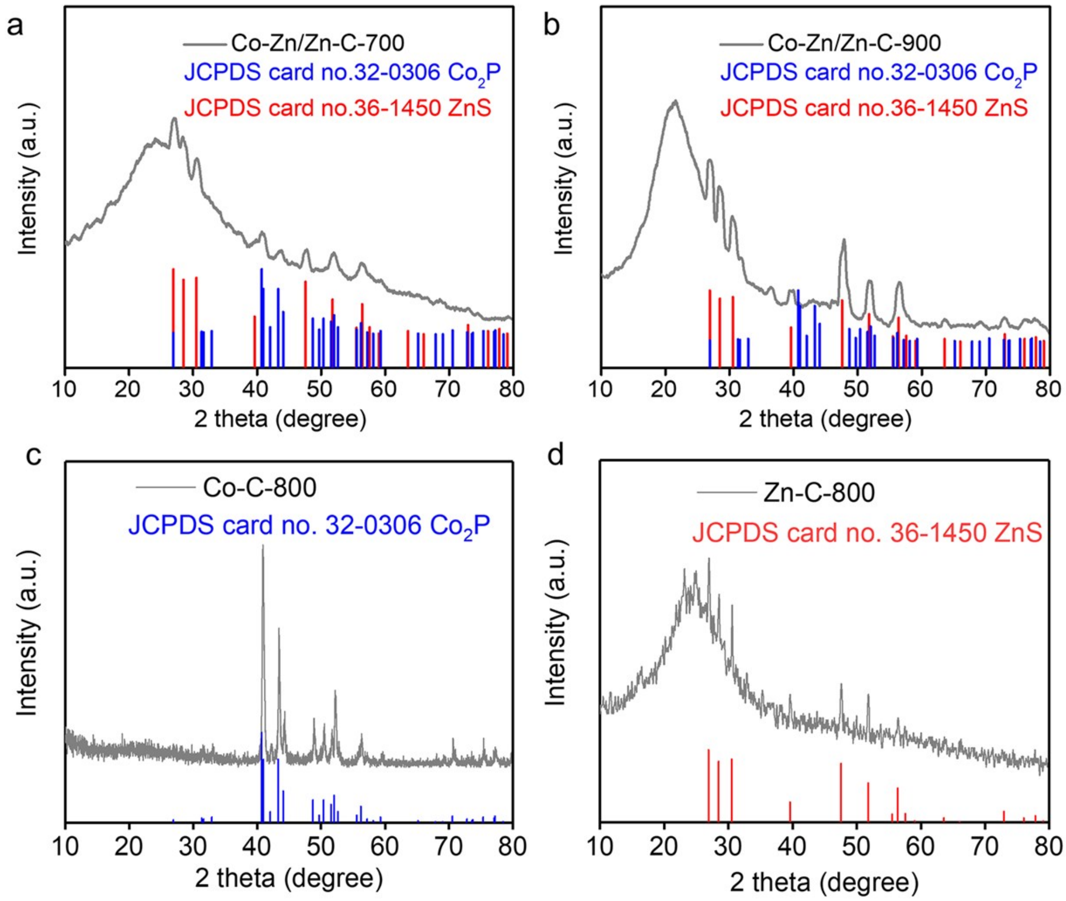

Fig. S4 XRD patterns of (a) Co-Zn/Zn-C-700, (b) Co-Zn/Zn-C-900, (c) Co-C-800 and (d) Zn-C-800.

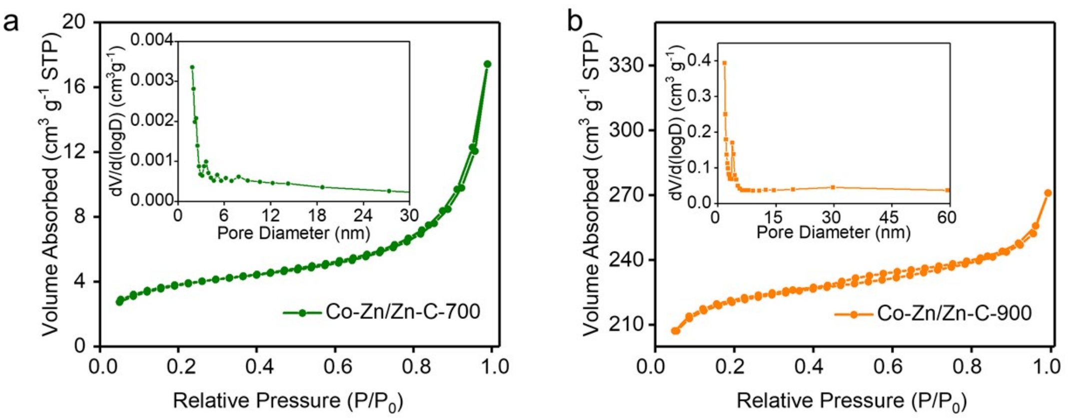

Fig. S5 N_2 adsorption-desorption isotherms of (a) Co-Zn/Zn-C-700 and (b) Co-Zn/Zn-C-900. The inset is pore size distribution.

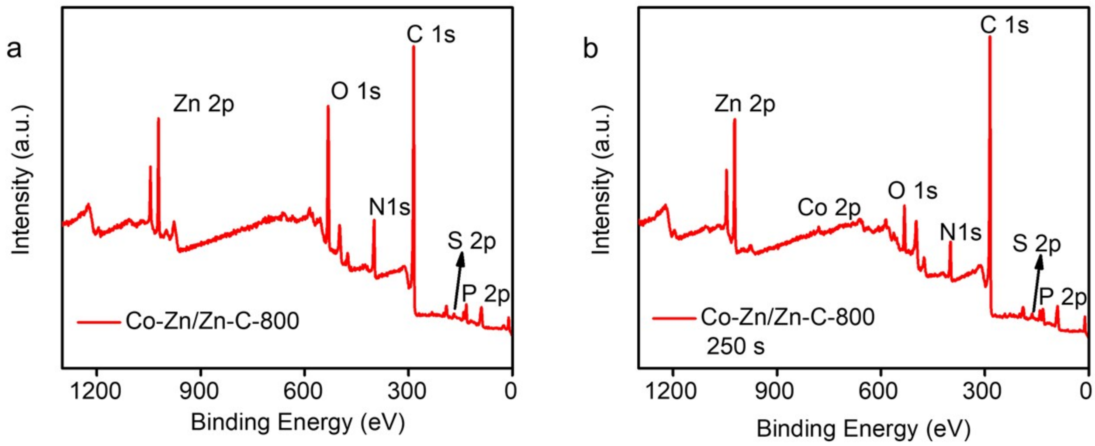

Fig. S6 Full XPS spectra of Co-Zn/Zn-C-800 (a) before (b) after 250 s etching.

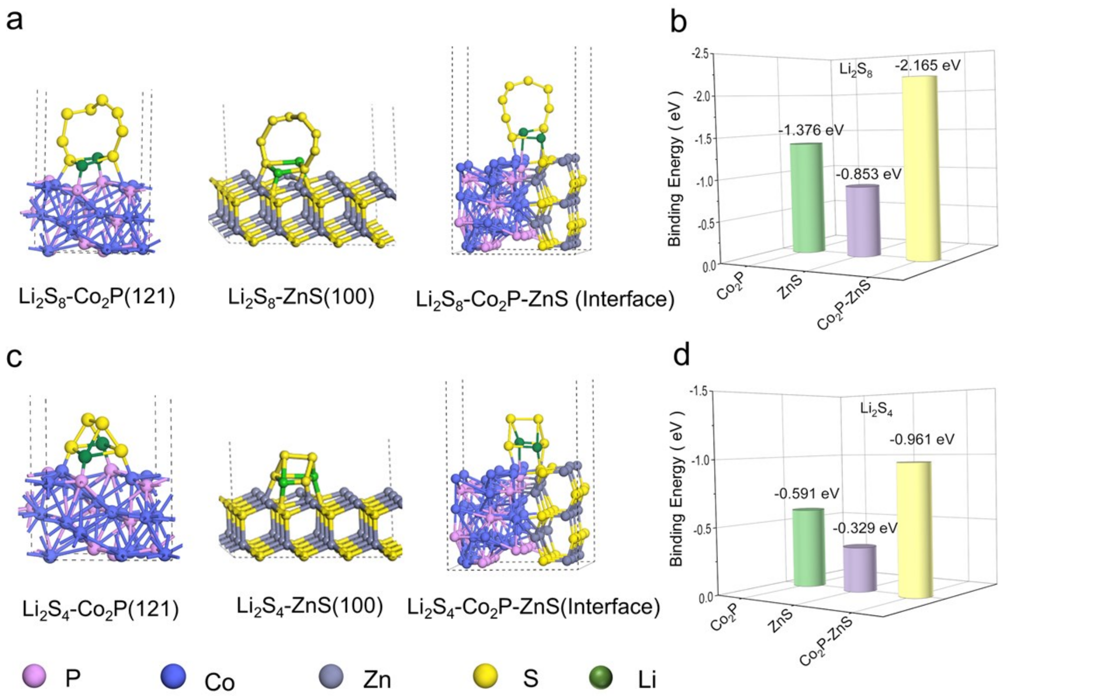

Fig. S7 (a and c) The stable adsorption configurations of Li_2S_n (n = 8 and 4) clusters on Co_2P (121) plane, ZnS (100) plane and Co_2P-ZnS heterostructure interface, together with (b and d) the comparison of calculated adsorption energies. Pink, purple, gray, yellow and green balls represent P, Co, Zn, S and Li atoms, respectively.

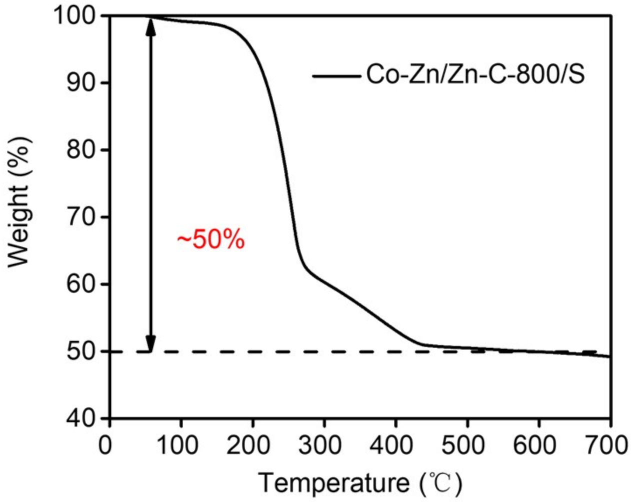

Fig. S8 TGA curve of Co-Zn/Zn-C-800/S achieved under N_2 atmosphere at heating rate of 10 ℃ min^{-1}.

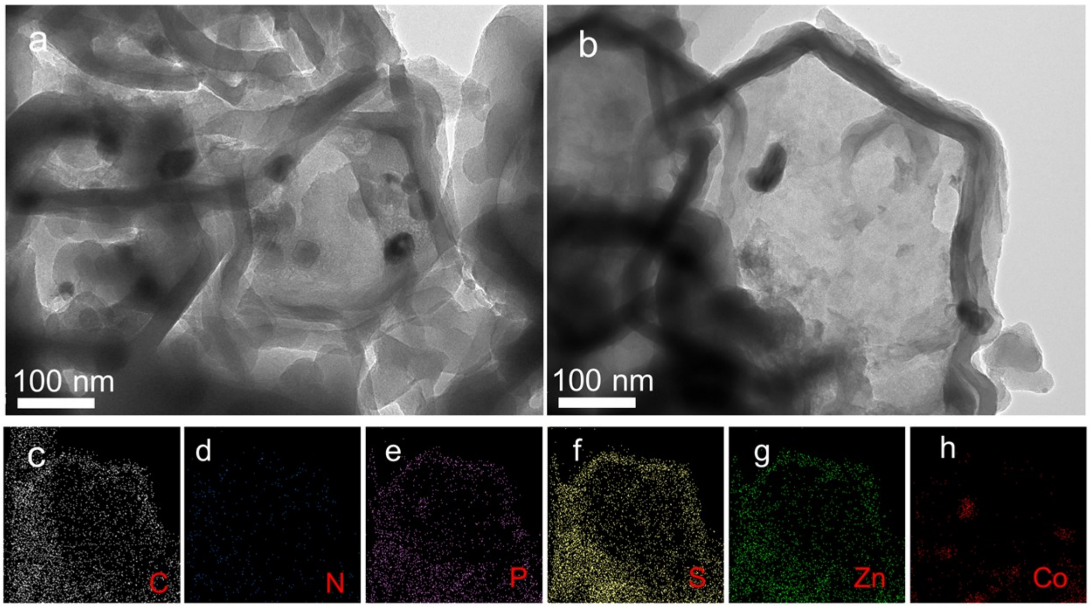

Fig. S9 (a) TEM image, (b) HRTEM image and the corresponding elemental mapping analysis of (c-h) of Co-Zn/Zn-C-800/S.

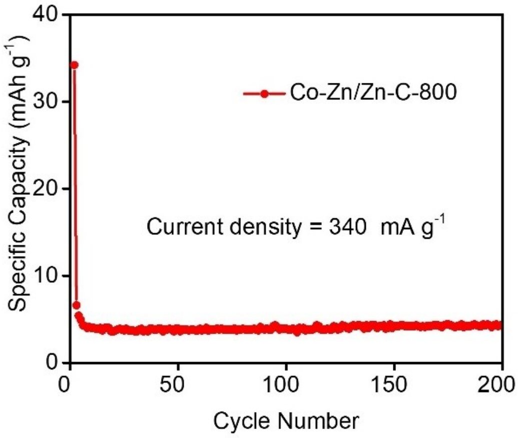

Fig. S10 Stability test of Co-Zn/Zn-C-800 | Li control cell at 340 mA g^{-1}.

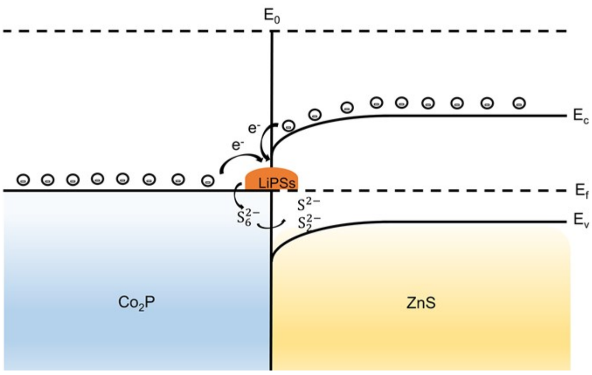

Fig. S11 Schematic illustration of the interface contact and the possible catalytic mechanism of Co_2P-ZnS heterostructure.

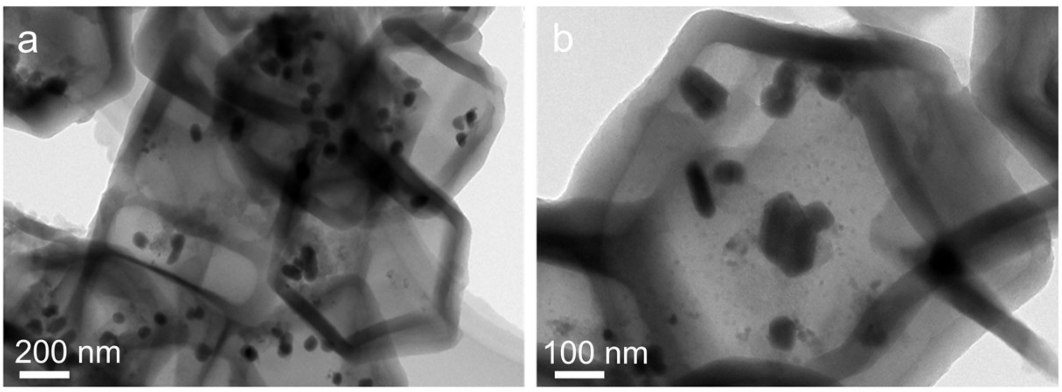

Fig. S12 TEM images of Co-Zn/Zn-C-800/S after 500 cycles at 1 C.

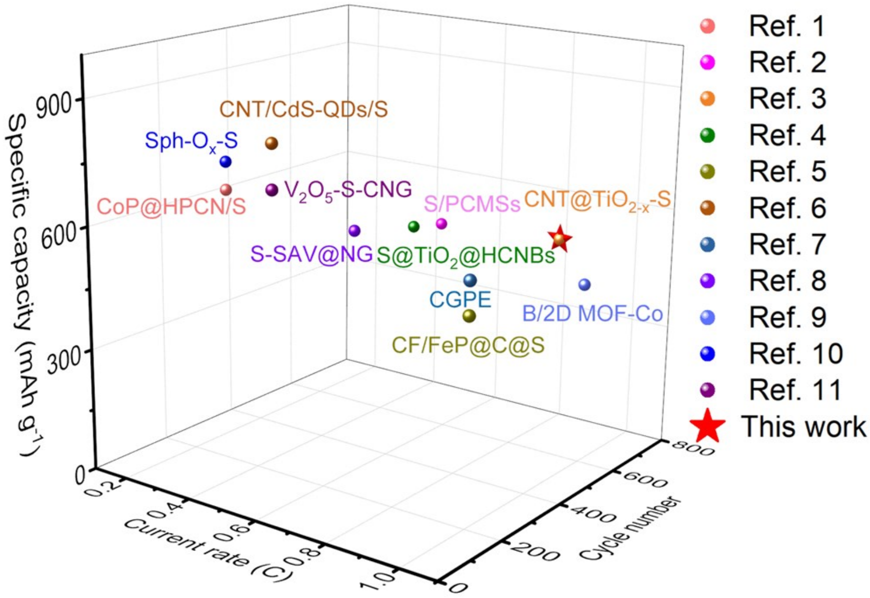

Fig. S13 Comparison of electrochemical performances among Co-Zn/Zn-C-800/S electrode and the literature reported sulfur cathodes.

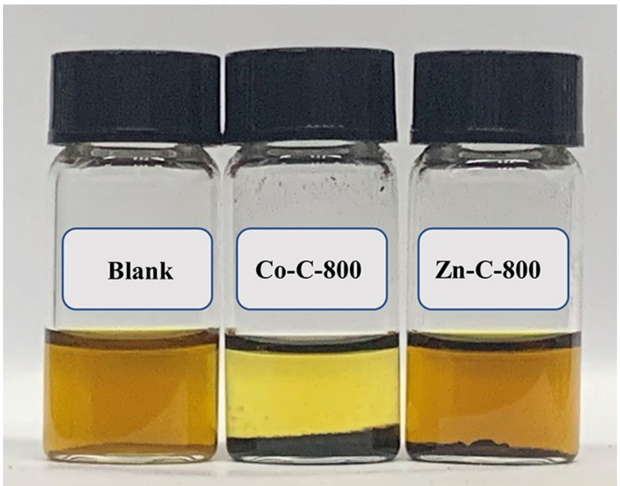

Fig. S14 Optical image of blank Li_2S_6 solution and after adsorbing with Co-C-800 and Zn-C-800, respectively.

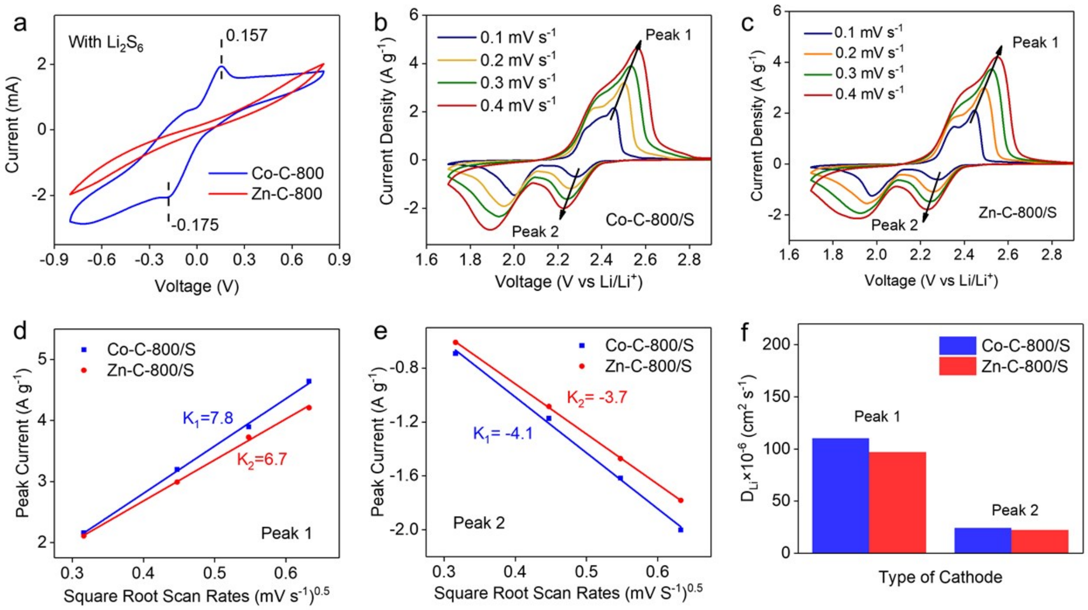

Fig. S15 (a) CV curves of Li_2S_6 symmetric cells from -0.8 to 0.8 V at 10 mV s^{-1} of Co-C-800 and Zn-C-800. (b and c) CV curves of different electrodes at various scanning rates; (d-f) The kinetic plots and diffusion coefficient (D_{Li^+}) of Li^+ ion corresponding peak 1 and 2 on Co-C-800/S and Zn-C-800/S cathodes.

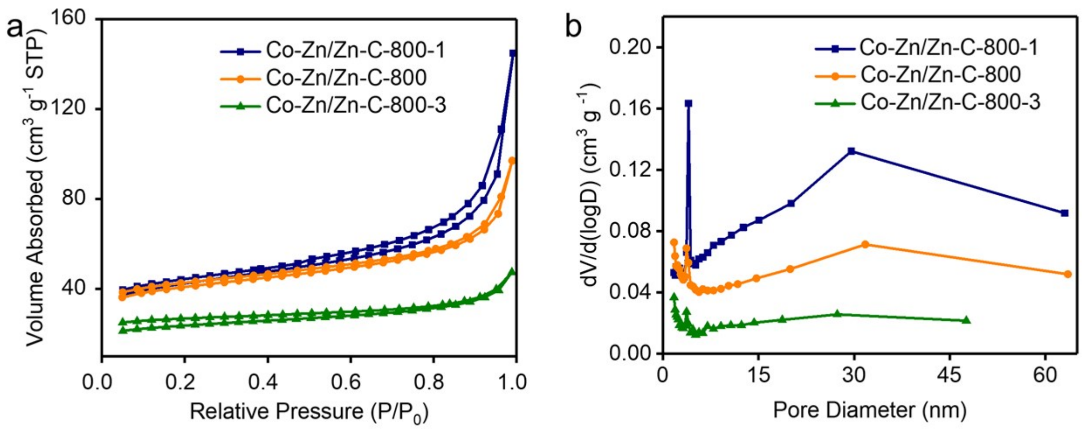

Fig. S16 (a) N_2 adsorption-desorption isotherms and (b) pore size distributions.

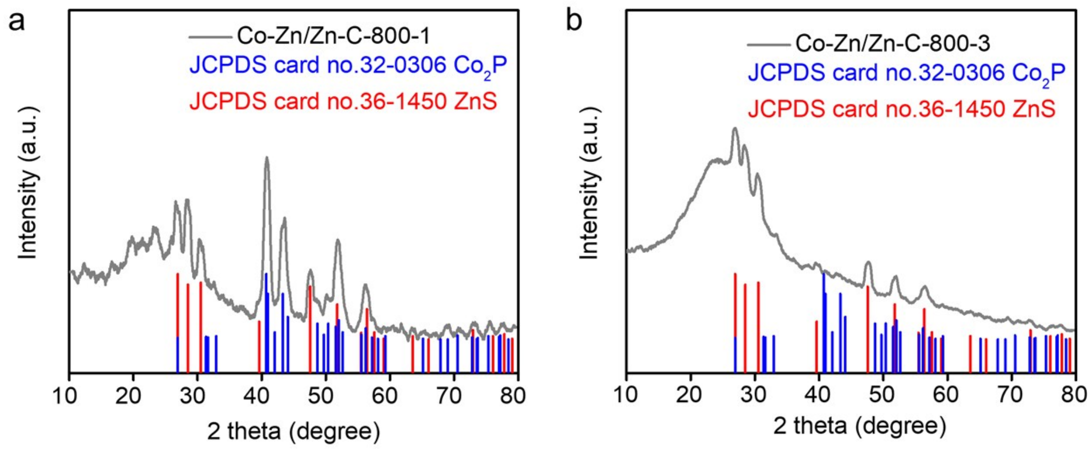

Fig. S17 XRD patterns of (a) Co-Zn/Zn-C-800-1 and (b) Co-Zn/Zn-C-800-3.

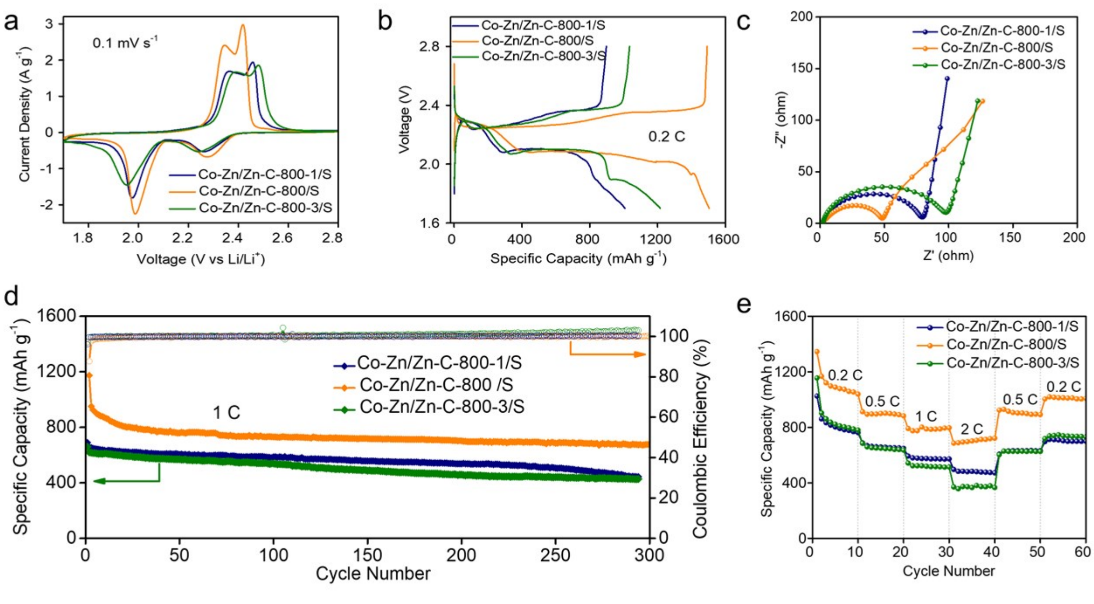

Fig. S18 (a) Galvanostatic charge–discharge curves, (b) CV curves, (c) EIS spectra, (d) cycling performance at 1 C, and (e) rate performance of different samples.

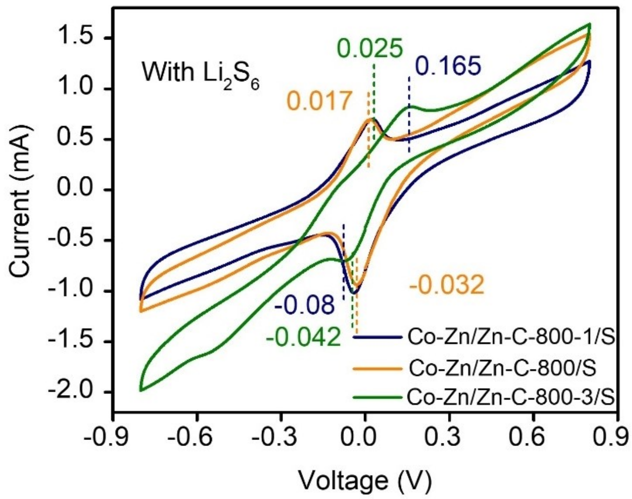

Fig. S19 CV curves of Li_2S_6 symmetric cells from -0.8 to 0.8 V at 10 mV s^{-1}.

Supporting References:

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