Supporting information

Revealing the effect of polyethylenimine on zinc metal anodes in alkaline electrolyte solution for zinc-air batteries: mechanism studies of dendrite suppression and corrosion inhibition

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Figure S1. (A) Scheme of *in operando* OM configuration, (B) the cathodic voltammetry scan curve (scan rate = 10 mV/s), and (C) *in operando* OM images of zinc-anode/electrolyte interface at the selected potentials (a)-(f).



Figure S2. (a) Chronoamperogram of the potentiostatic zinc plating at applied potentials of -1.7 V and -1.8 V for 1200 s, and corresponded SEM images of zinc deposits, (b) -1.7 V and (c) -1.8 V.



Figure S3. *In operando* TXM images of zinc electrodeposits during potentiostatic plating of (a) -1.7 V and (b) -1.8 V for 360 s.



Figure S4. TXM mosaic images after 360 s of zinc plating at the applied potentials of (a) -1.7 V and (b) -1.8 V.



Figure S5. (a) Equivalent circuit model for the fitting of the EIS plots, and (b) the fitting curves of EIS plots of zinc anodes in 6 M KOH solution with different PEI concentrations.

Sample	$R_{\Omega}(\Omega)$	$R_{\rm ct}(\Omega)$	CPE (µF)
PEI 0 ppm	0.81	11.78	79.30
PEI 10 ppm	0.80	76.82	76.82
PEI 30 ppm	0.76	90.54	47.95
PEI 50 ppm	0.78	135.42	45.51

Table S1. Electrochemical impedance parameters of zinc anodes in alkaline solution with different PEI concentrations.



Figure S6. Cathodic polarization curves of zinc anodes in 6 M KOH solution with the addition of 0, 30 and 50 ppm of PEI.