Supporting Information

A Self-Preserving Pitted Texture Enables Reversible Topographic Evolution and Cycling on Zn Metal Anodes

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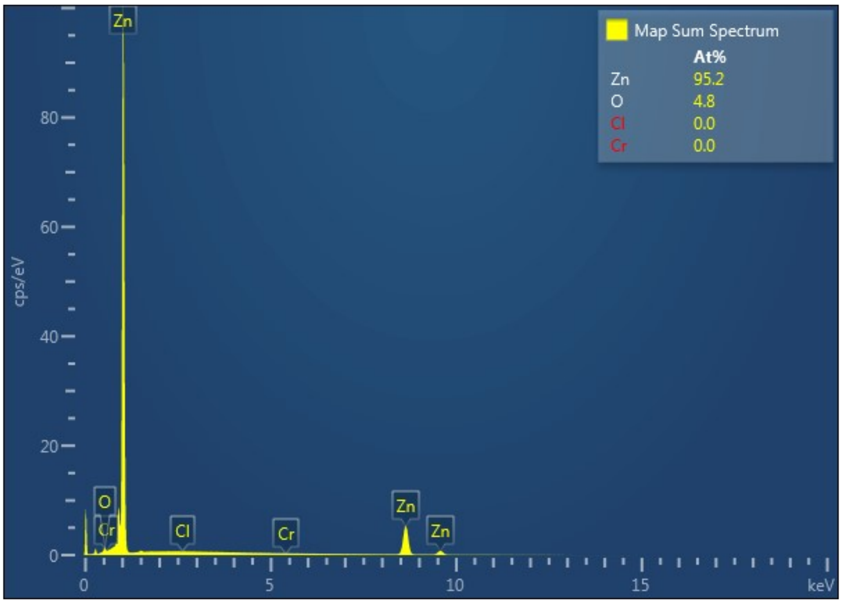

Fig. S1 EDS spectrum of the pitted Zn.

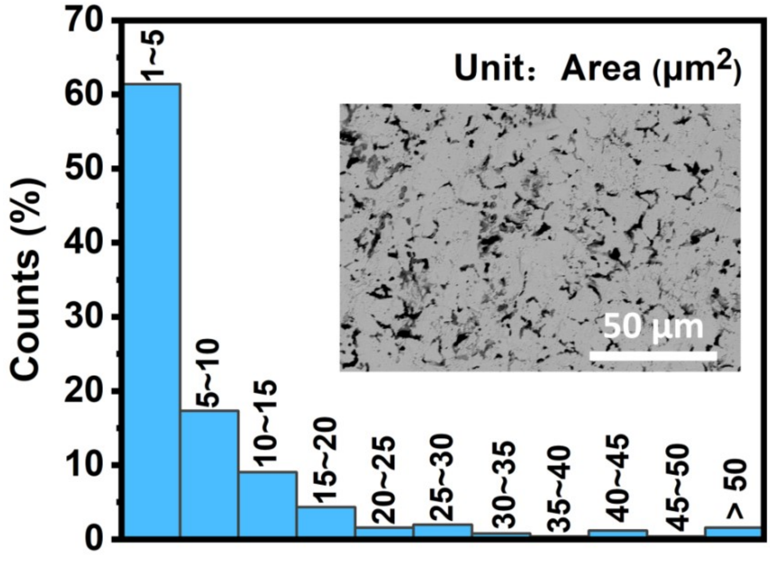

Fig. S2 Size distribution of the micro-pits on the pitted Zn surface derived from digital image analyses based on the SEM image.

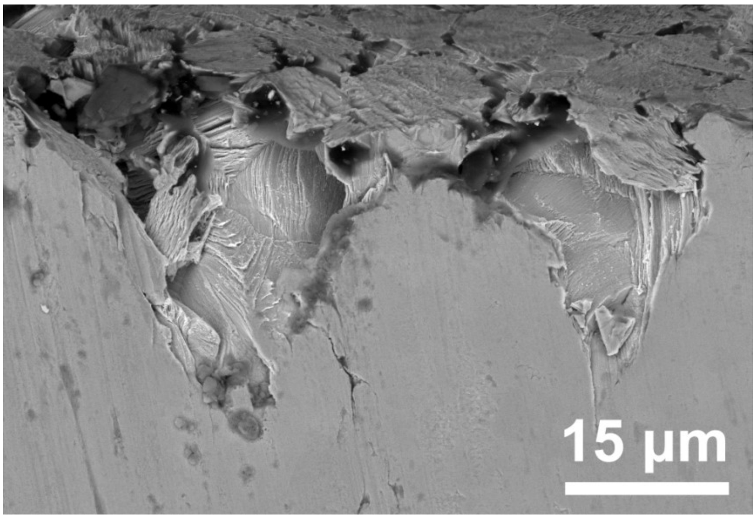

Fig. S3 Cross-sectional SEM image of the pitted Zn.

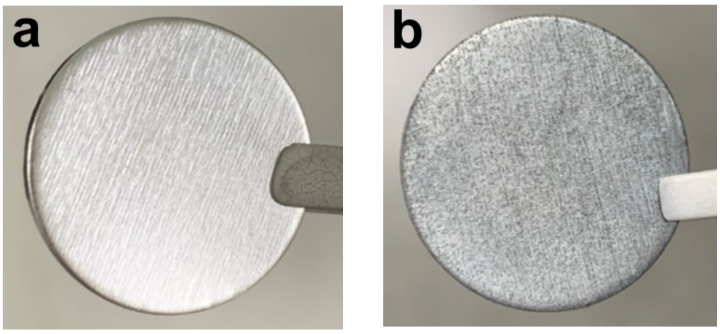

Fig. S4 Digital images of the (a) pristine Zn and (b) pitted Zn.

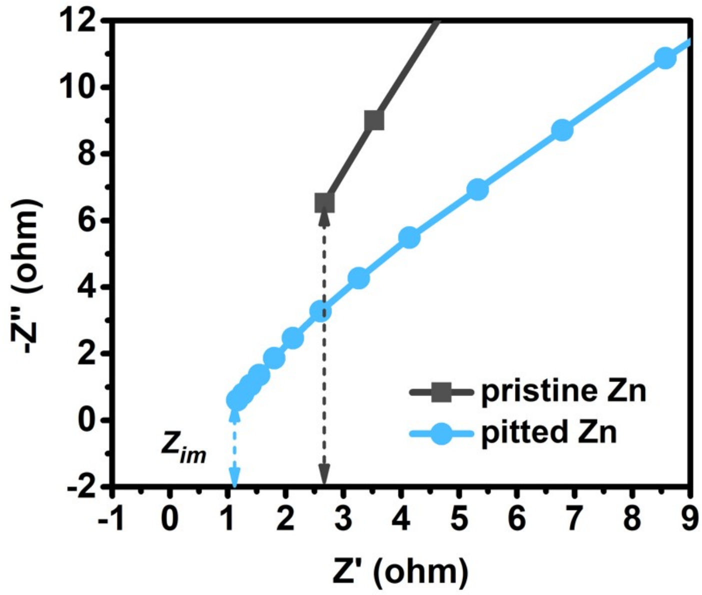

Fig. S5 Imaginary parts of the impedance from the Nyquist plots in Fig. 2h.

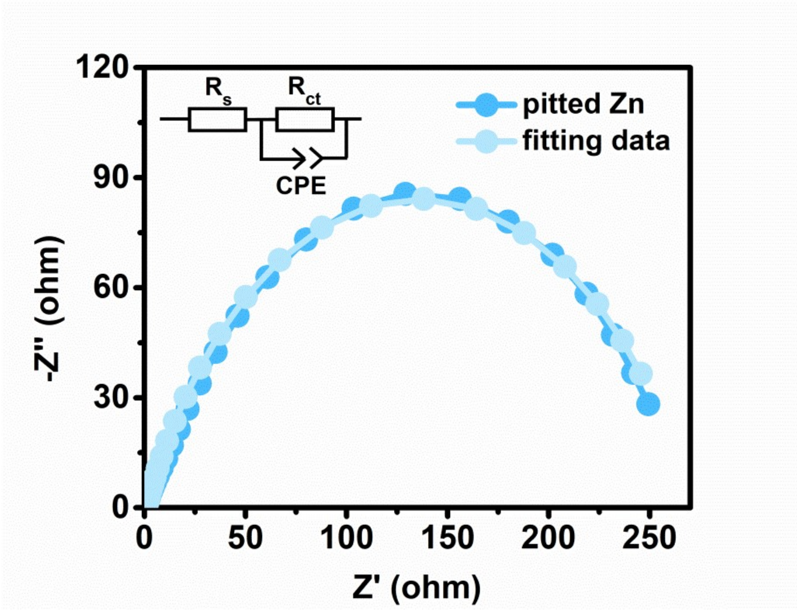

Fig. S6 Nyquist plot and fitted plot with the corresponding equivalent circuit model of the pitted Zn.

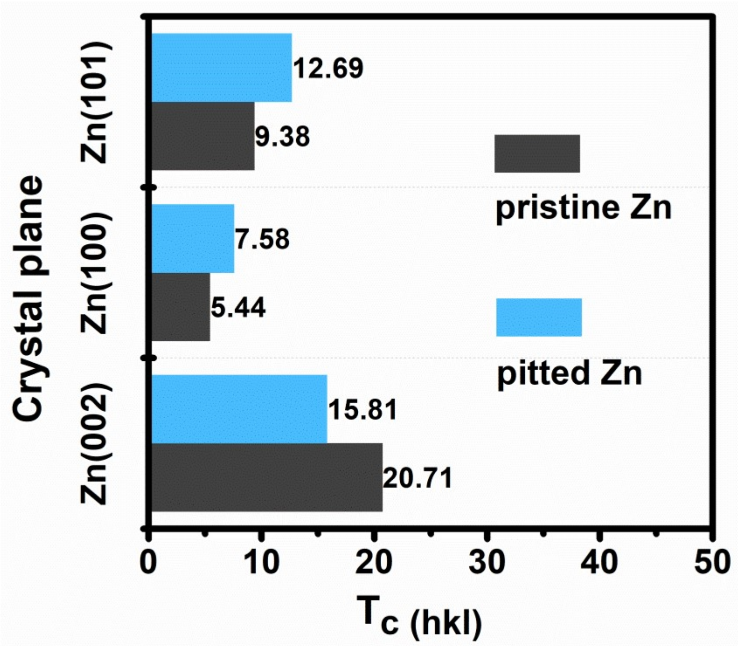

Fig. S7 T_c value of Zn (002), Zn (100), and Zn (101) lattice planes of the pristine Zn and pitted Zn electrodes.

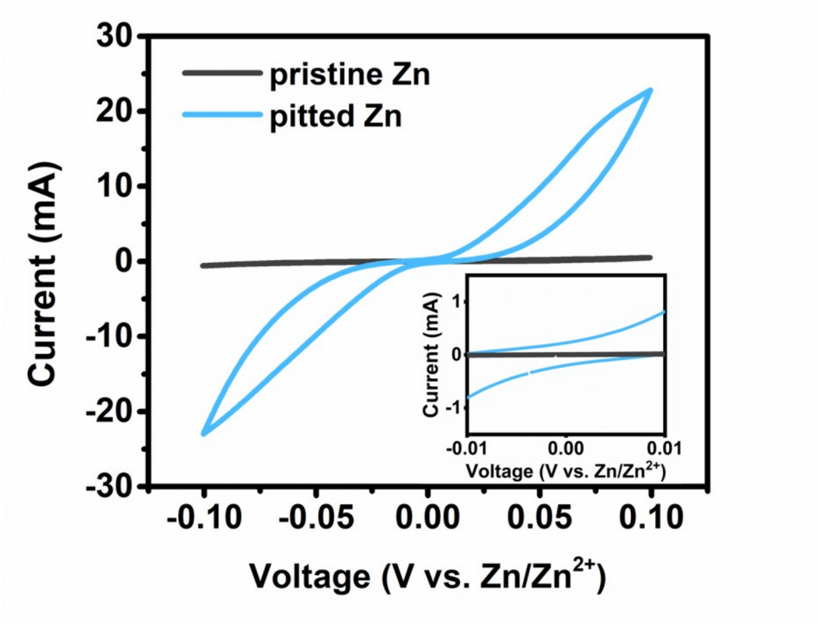

Fig. S8 CV curves of the pristine Zn and pitted Zn symmetric cells.

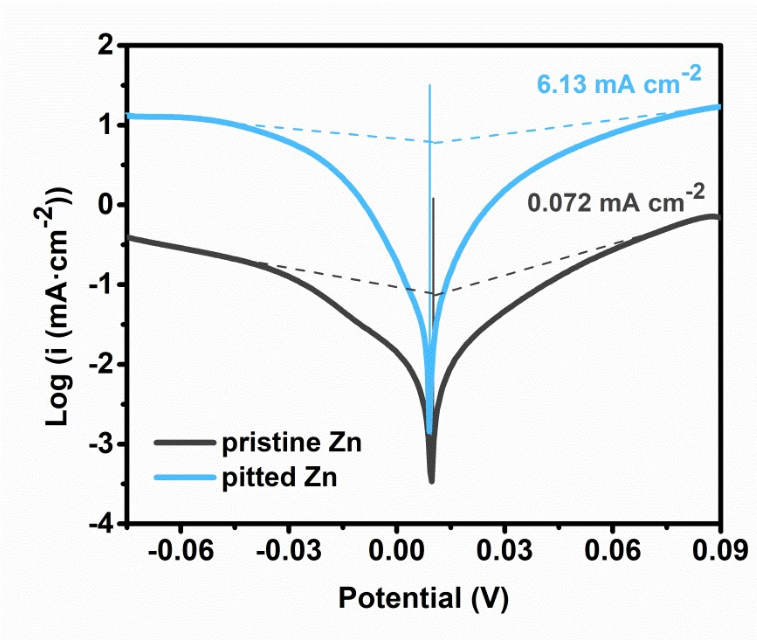

Fig. S9 Linear polarization curves of the pristine Zn and pitted Zn symmetric cells.

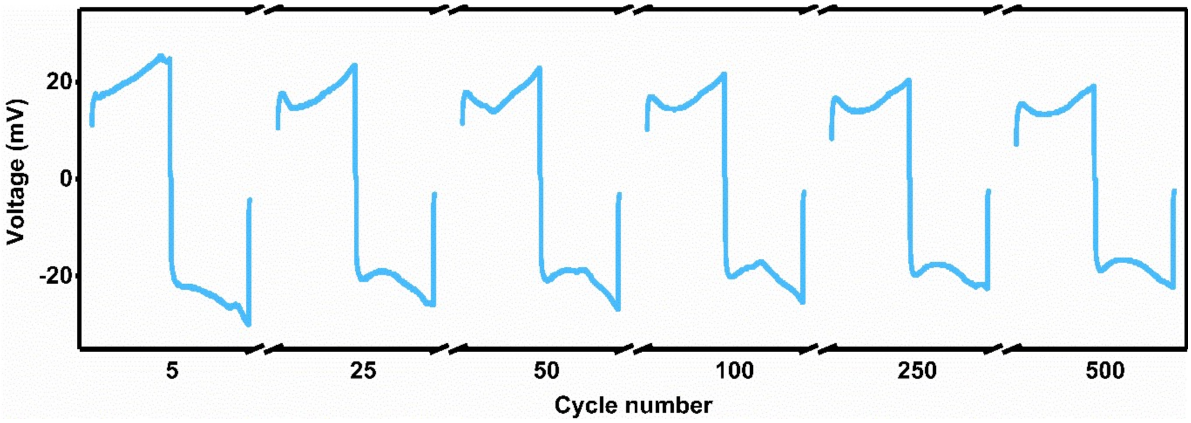

Fig. S10 Voltage file of the pitted Zn at different cycles under 1.0 mA cm^{-2}/1.0 mAh cm^{-2}.

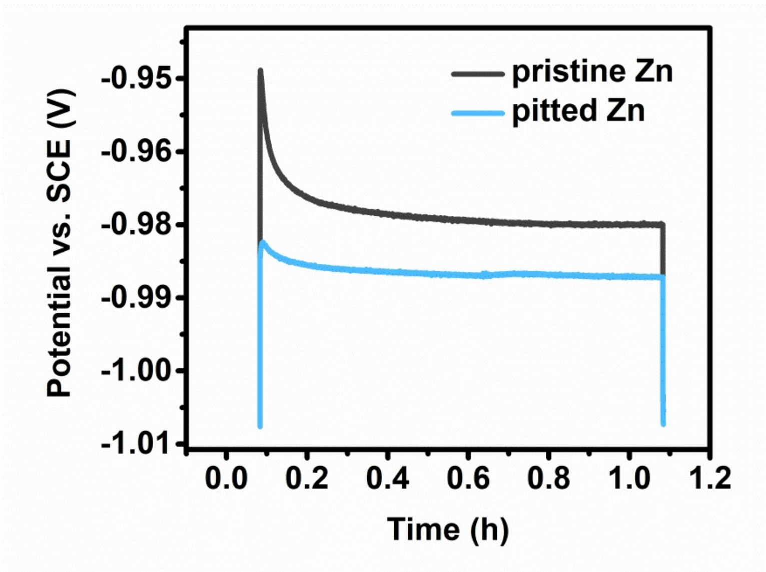

Fig. S11 CP curve of the pitted Zn during the initial stripping process at 1.0 mA cm^{-2}.

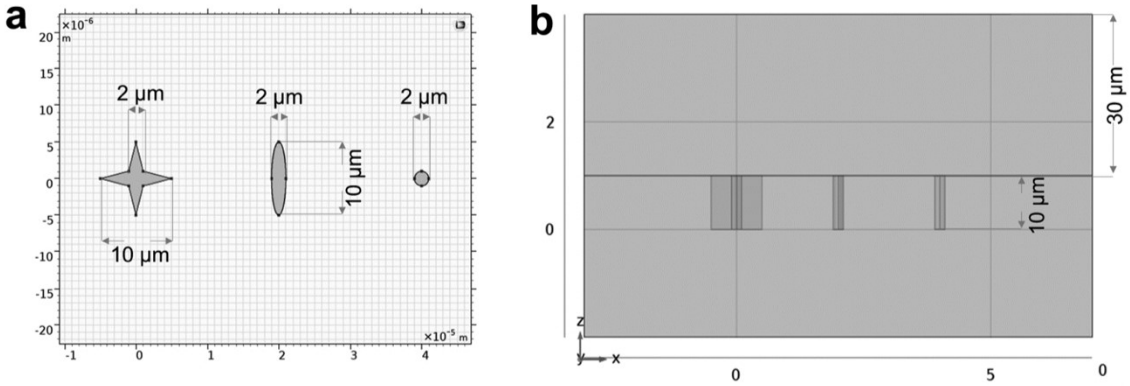

Fig. S12 Finite element method models of the pitted Zn. (a) Top view; (b) Side view.

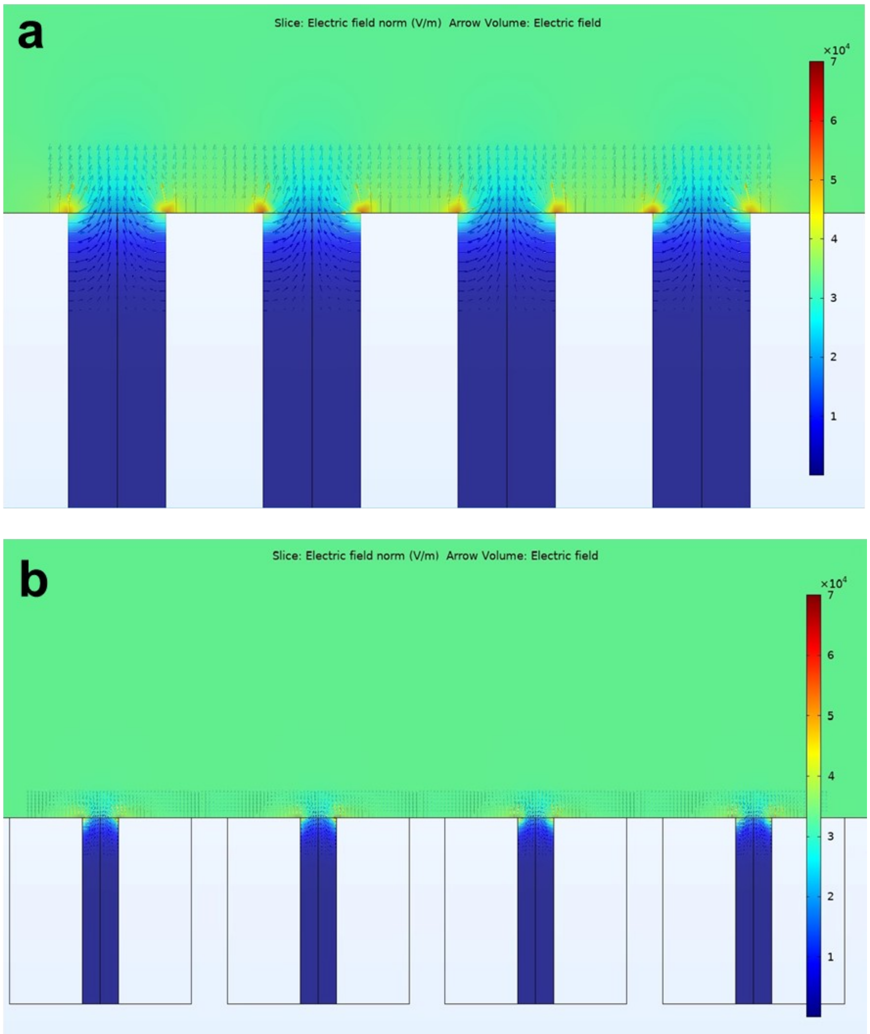

Fig. S13 Electric field distribution on the pitted Zn surface. (a) Ellipse-shaped micro-pits; (b) Star-shaped micro-pits.

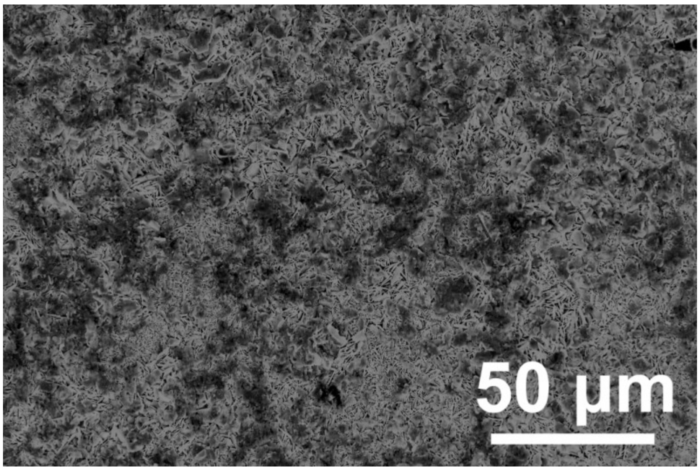

Fig. S14 SEM image of the pitted Zn after plating at 1.0 mA cm^{-2} for 5 h.

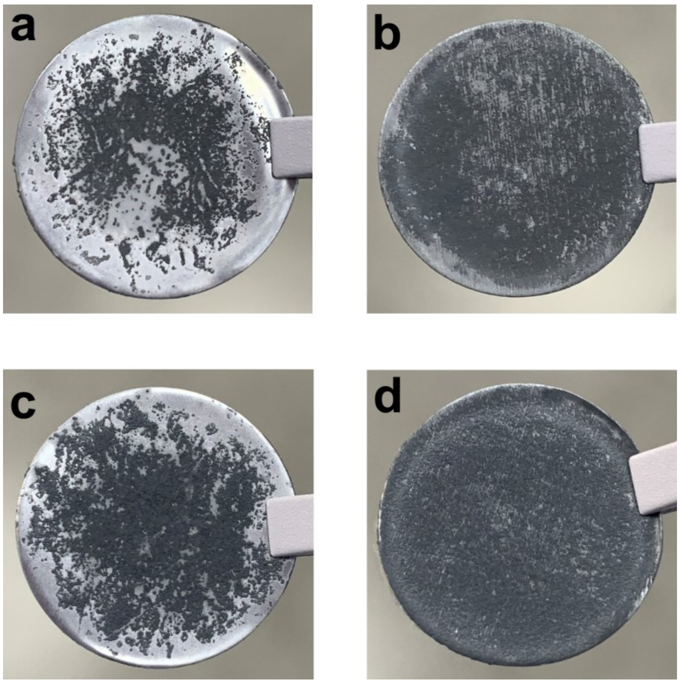

Fig. S15 Digital photos of the (a, c) pristine Zn, (b, d) pitted Zn after deposition at 1.0 mA cm^{-2} for (a, b) 5 h and (c, d) 10 h, respectively.

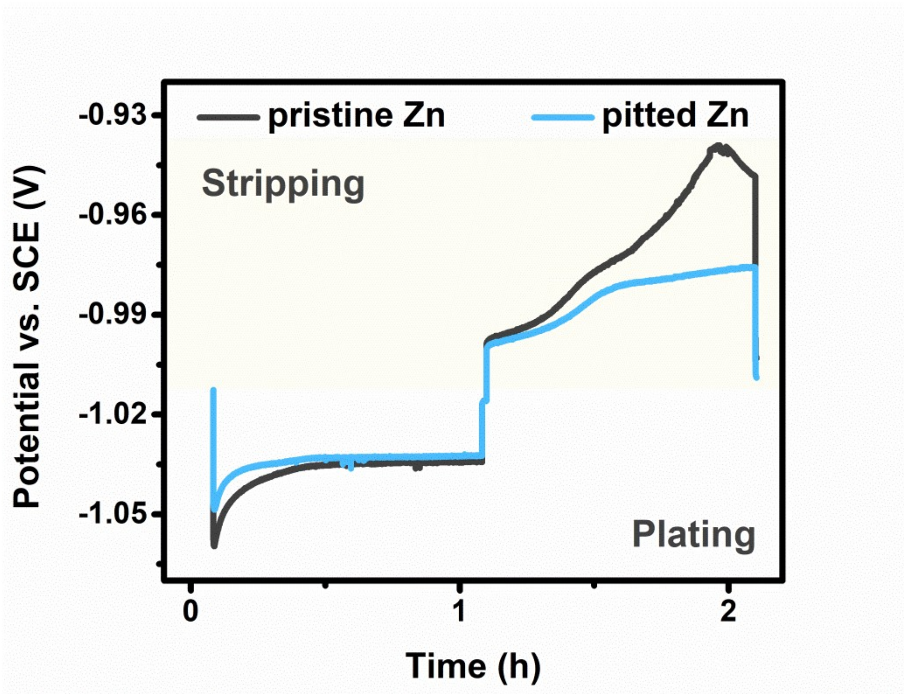

Fig. S16 CP curve of the pristine Zn and pitted Zn electrodes during a plating-stripping process.

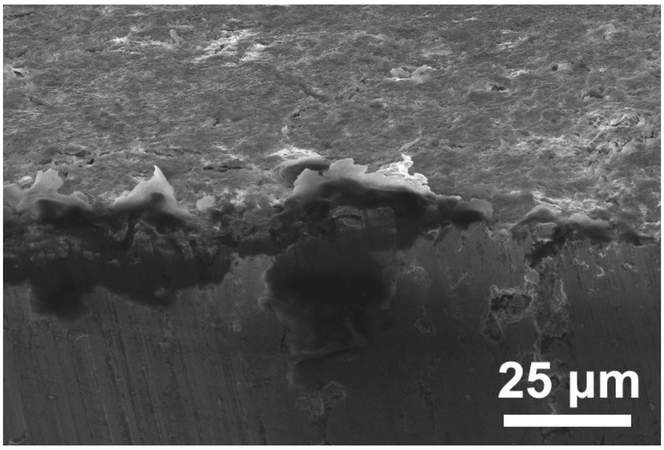

Fig. S17 Cross-sectional SEM image of the pitted Zn after a plating-stripping process.

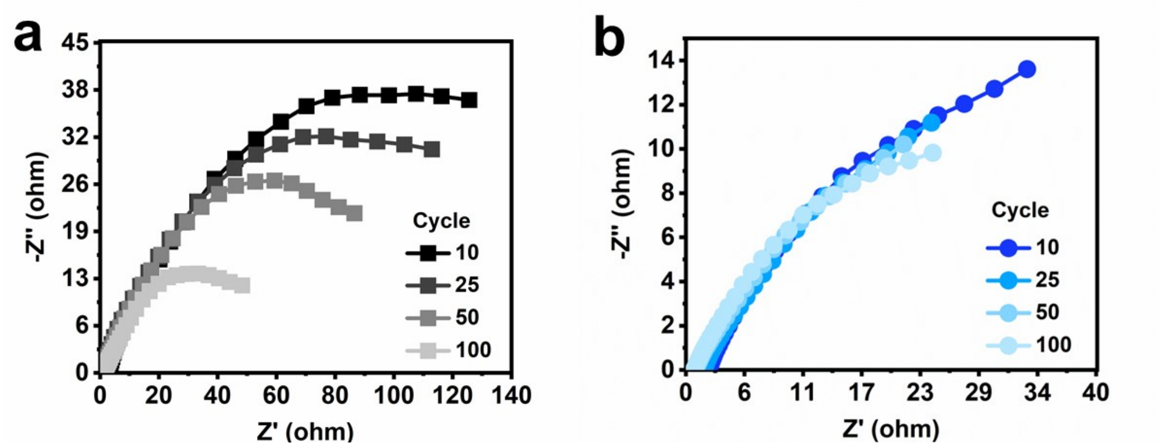

Fig. S18 Nyquist plots of the (a) pristine Zn and (b) pitted Zn symmetric cells at different cycles under 1.0 mA cm^{-2}/1.0 mAh cm^{-2}.

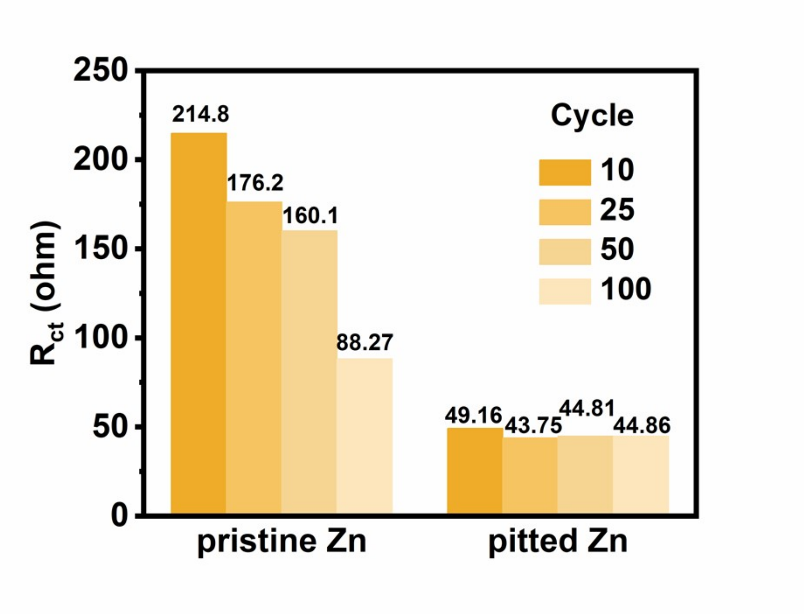

Fig. S19 R_{ct} of the pristine Zn and pitted Zn symmetric cells at different cycles at 1.0 mA cm^{-2}/1.0 mAh cm^{-2}.

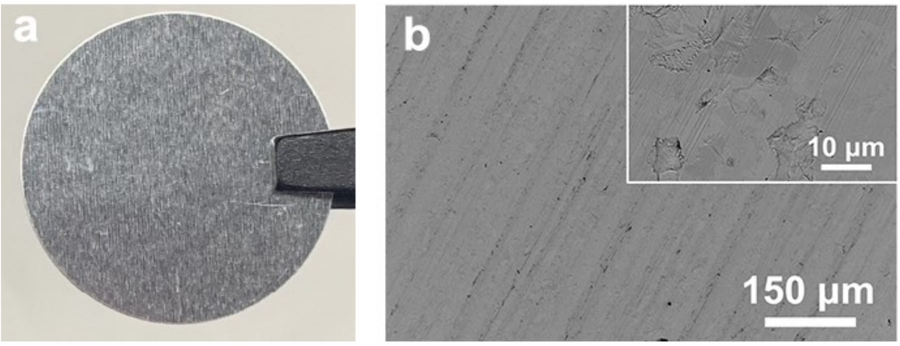

Fig. S20 (a) Digital photo and (b) SEM image of the electrode etched by 0.1 M $CrCl_3 \cdot 6H_2O$ for 5 minutes.

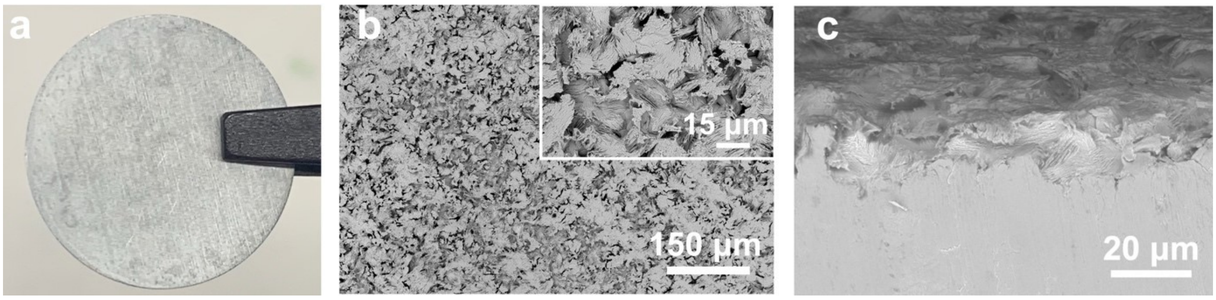

Fig. S21 (a) Digital photo and (b, c) SEM image of the electrode etched by 2.0 M $CrCl_3·6H_2O$ for 5 minutes.

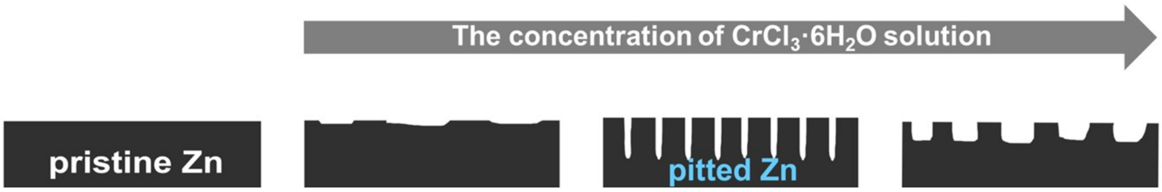

Fig. S22 Schematic diagrams of the electrode surfaces etched by different concentrations of $CrCl_3{\cdot}6H_2O$ solution.

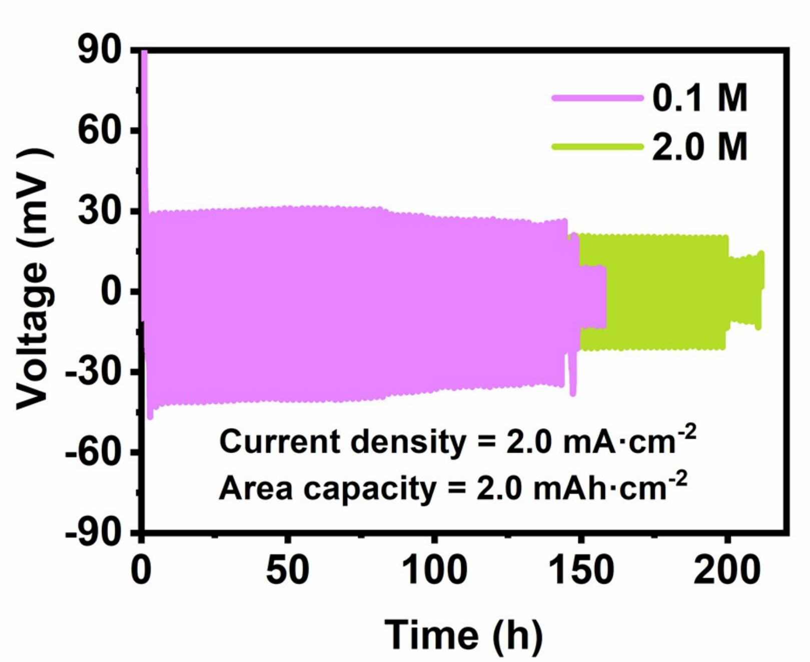

Fig. S23 Cycling performance of the electrode etched by 0.1 M and 2.0 M $CrCl_3 \cdot 6H_2O$ solution.

Table S1. Resistance results of pristine Zn and pitted Zn symmetric cells fitting by the equivalent circuit.

Symmetric Cells	pristine Zn	pitted Zn
R_s (Ω)	0.43	0.75
R_{ct} (Ω)	991.1	270.0

Table S2. The intensity obtained from as-measured XRD patterns of the electrodes ($I_{(hkl)}$) and the standard intensity ($I_{0(hkl)}$).

Intensity		(002)	(100)	(101)	(102)	(103)	(110)	(004)
Zn	I_0	53.0	40	100	28	25.0	21.0	2.0
pristine Zn	I	264601	52431	226190	75801	97227	20655	15915
pitted Zn	I	157946	57176	239278	85791	109835	21235	7169

Table S3. Comparison in cycling performance of the pitted Zn electrode with that of Zn metal electrodes in recent publications under the same conditions (1.0 mA cm^{-2}/1.0 mAh cm^{-2}).

Electrode	Lifespan (h)	Voltage hysteresis (mV)	Ref.
pitted Zn	**1000**	**41**	**This work**
Indium-based Zn	300	55	1
Zn|In	500	240	2
Zn@ZnF_2	800	71.5	3
$Ti_3C_2T_x$ MXene@Zn	300	75	4
Zn (002)	500	76	5
CNT scaffold-stabilized Zn	400	100	6
TiO_2@Zn	150	114.2	7

Table S4. R_{ct} of pristine Zn and pitted Zn symmetric cells at different cycles fitting by the equivalent circuit.

R_{ct} (Ω)	pristine Zn	pitted Zn
Cycle 10	214.8	49.16
Cycle 25	176.2	43.75
Cycle 50	160.1	44.81
Cycle 100	88.27	44.86

References

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