

A hybrid polymer protective layer with uniform Li^+ flux and self-adaption enabling dendrite-free Li metal anode

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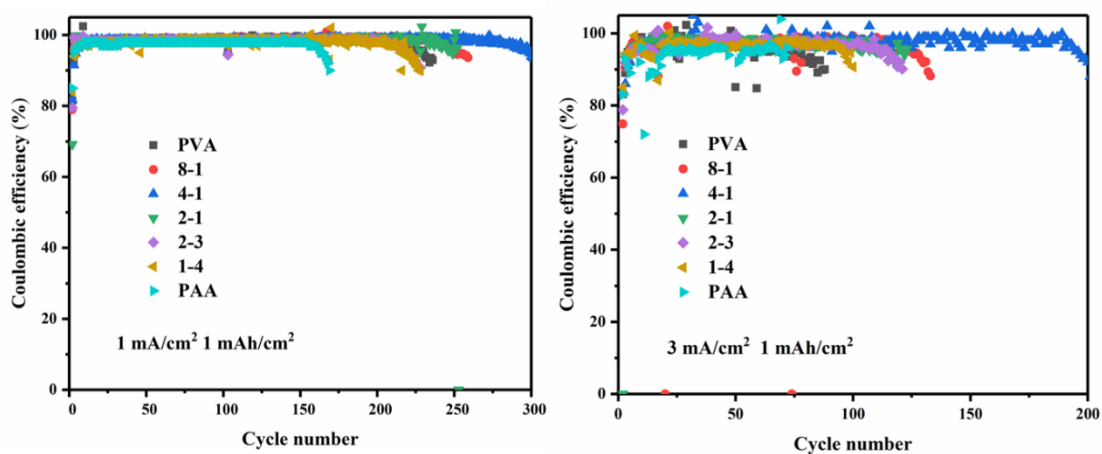


Fig. S1. CE test of Cu foil coated with PVA-PAA film of different weight proportion in (a) 1 mA cm^{-2} and 1 mAh cm^{-2} ; (b) 3 mA cm^{-2} and 1 mAh cm^{-2} .

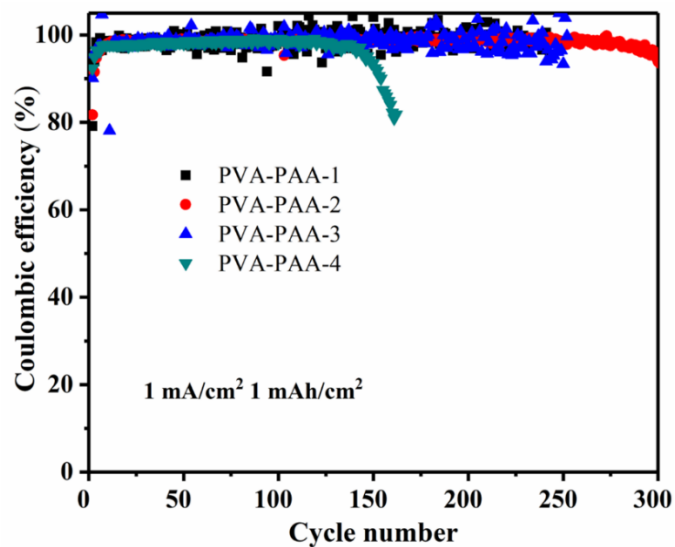


Fig. S2. CE test of Cu foil coated with PVA-PAA film of difference thickness under 1 mA cm⁻² and 1 mAh cm⁻².

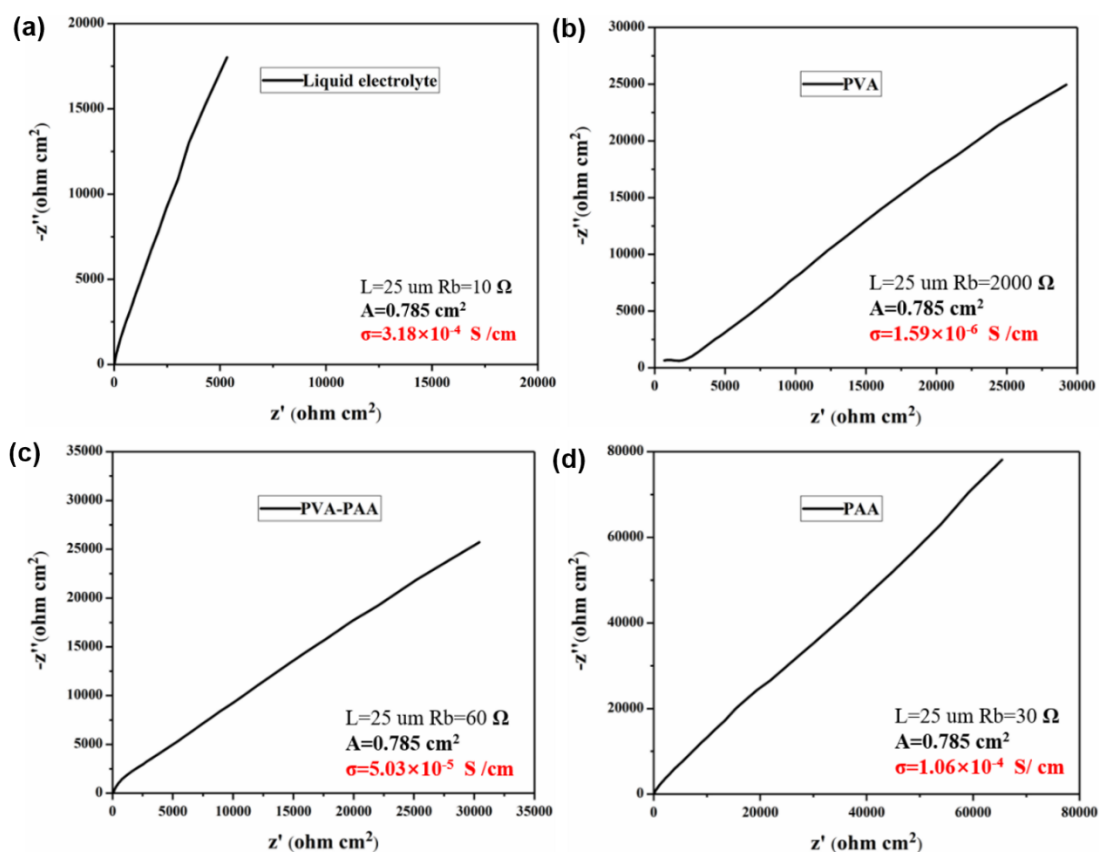


Fig. S3. Impedance spectra and Ionic conductivities of (a) the liquid electrolyte, (b) PVA, (c) PVA-PAA, and (d) PAA film.

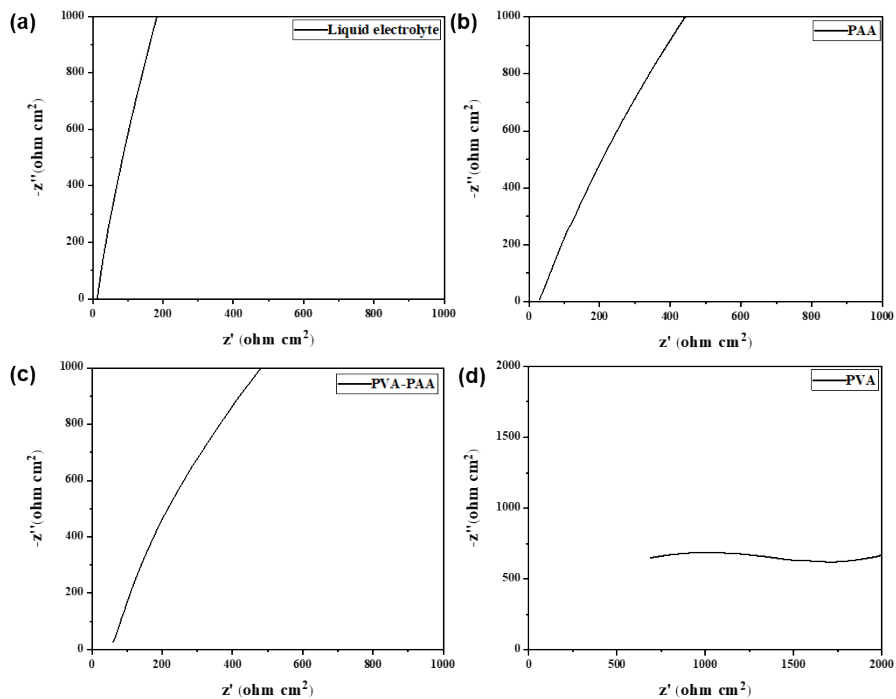


Fig. S4. Enlarge impedance spectra and Ionic conductivities of (a) the liquid electrolyte, (b) PVA, (c) PVA-PAA, and (d) PAA film.

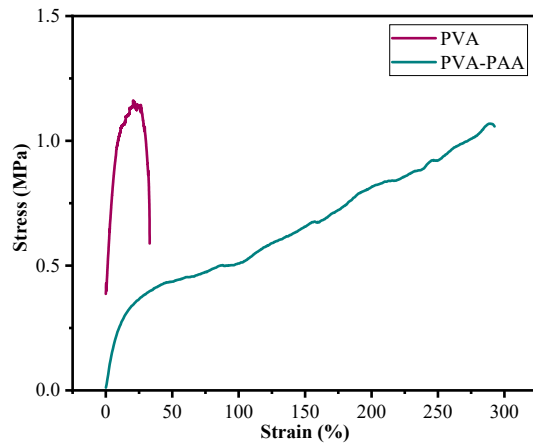


Fig. S5. Stress-strain profile of the PVA-PAA composite and PAA film.

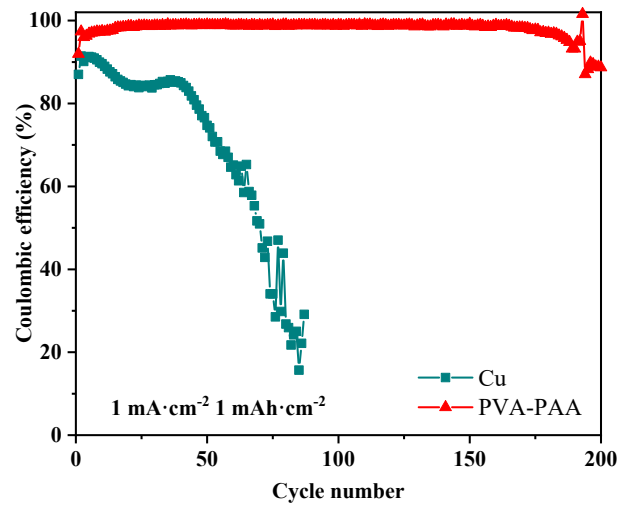


Fig. S6. CE test of Cu foil coated with PVA-PAA film and bare Cu foil under 1 mA cm^{-2} and 1 mAh cm^{-2} .

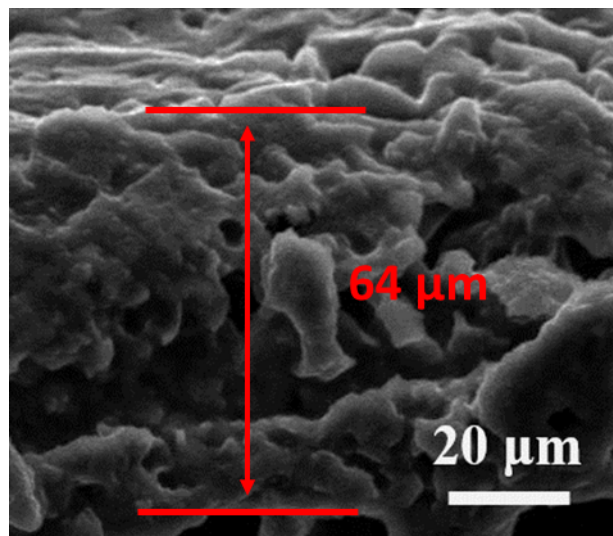


Fig. S7. Cross-sectional morphology of Li deposited on Cu foil, after depositing 5 mAh cm^{-2} of Li with a current density of 0.5 mA cm^{-2} .

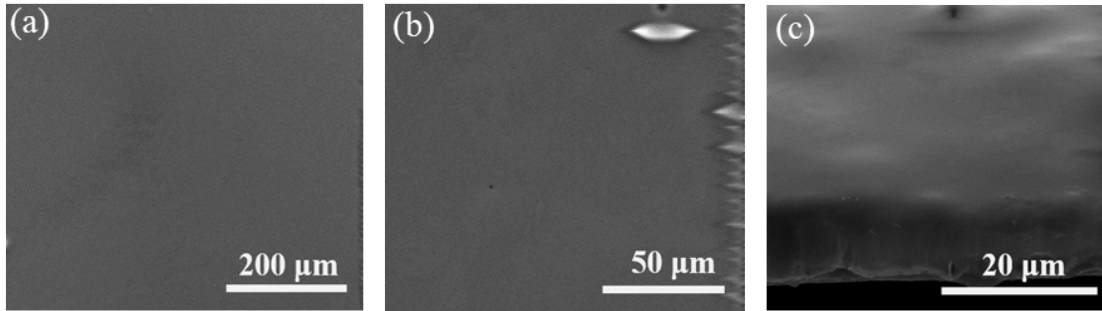


Fig. S8. (a-b) Surface and (c) cross-sectional SEM images of Li dissolution on Cu foil.

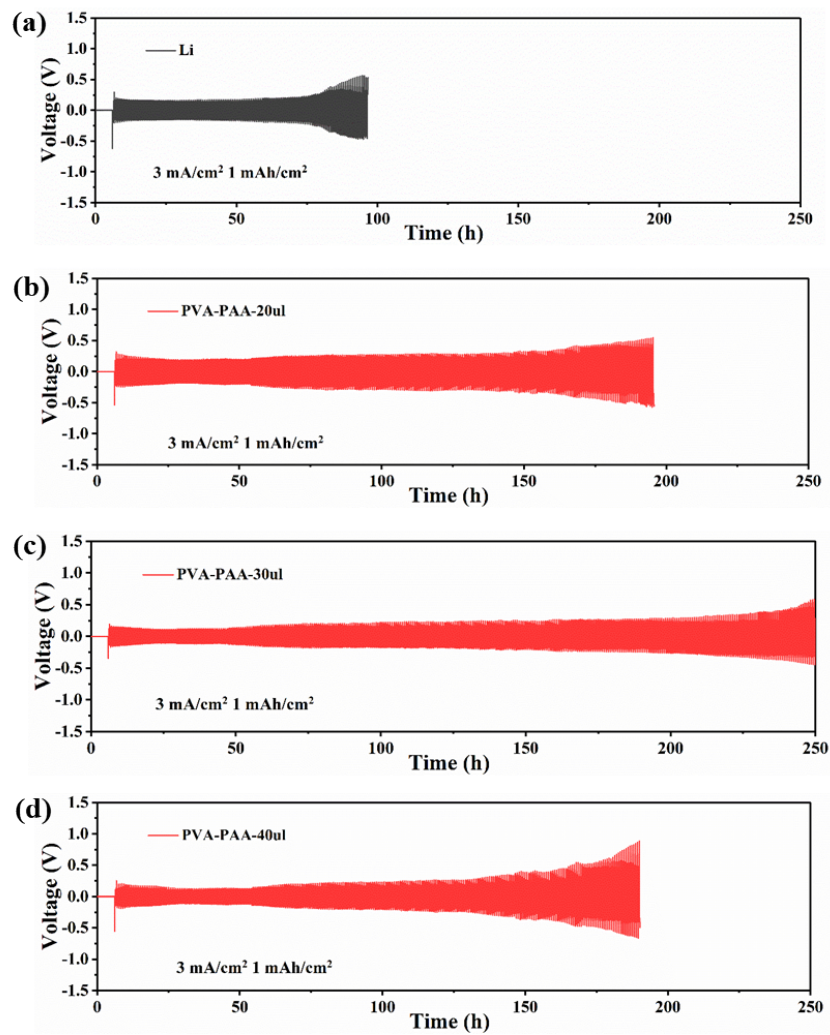


Fig. S9. Cycling performances of symmetric cells of Li foil coated with PVA-PAA layer of different thickness at 3 mA cm⁻² and 1 mAh cm⁻².

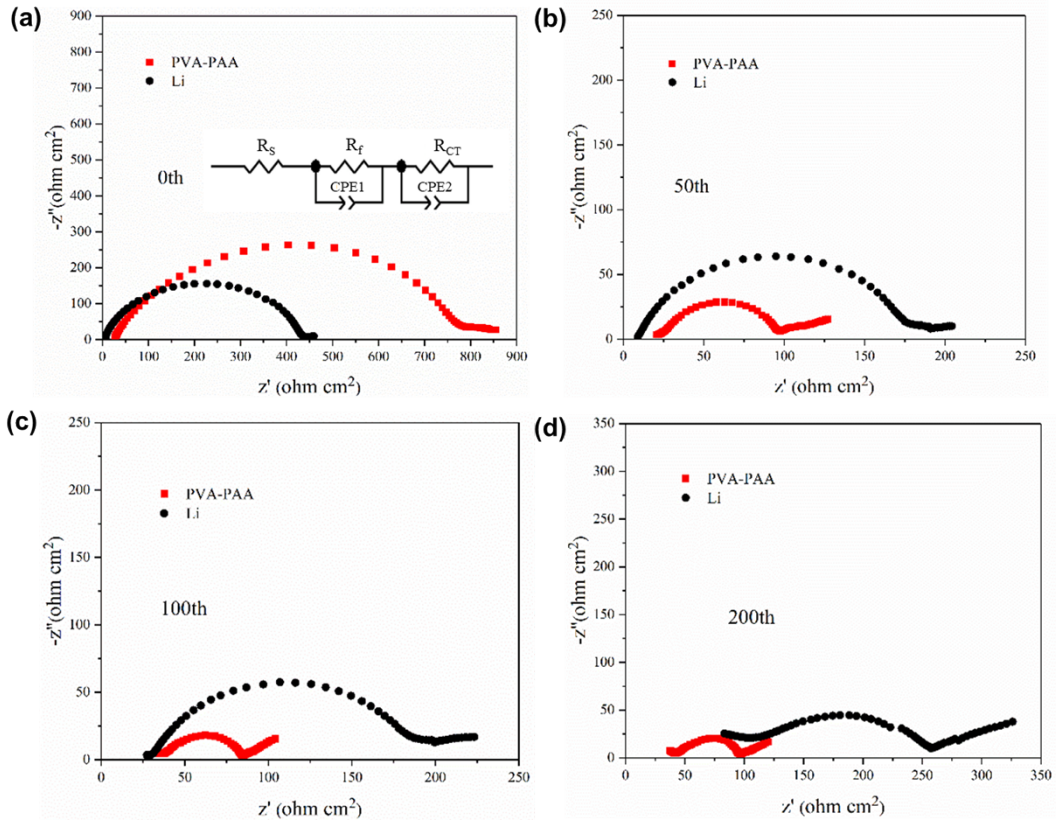


Fig. S10. Nyquist plots of symmetric cell of Li foil with and without coating at (a) 0th, (b) 50th, (c) 100th and (d) 200th cycles at 1 mA cm^{-2} and 1 mAh cm^{-2} . The inset is the equivalent circuit.

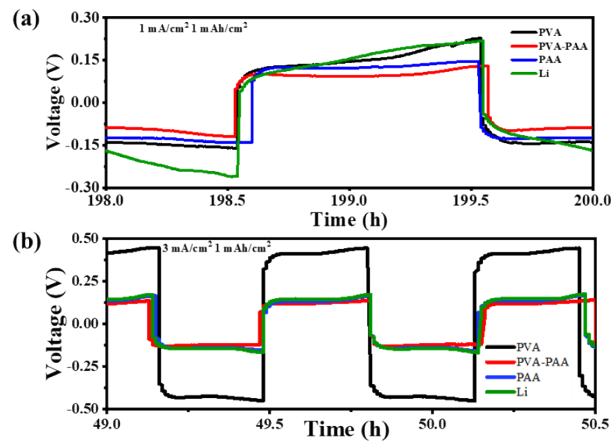


Fig. S11. Cycling performances of four symmetric cells at the selected period at (a) $1 \text{ mA cm}^{-2} / 1 \text{ mAh cm}^{-2}$, and (b) $3 \text{ mA cm}^{-2} / 1 \text{ mAh cm}^{-2}$.

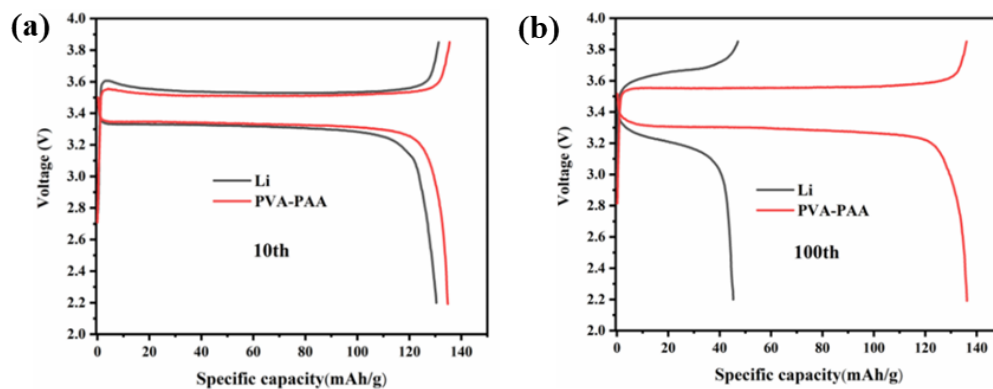


Fig. S12. Galvano-charge/discharge curves of PVA-PAA coated Li|LFP and Li|LFP cell.

Table S1. Impedances from Nyquist plots of symmetric cell of Li foil with and without coating at 0th, 50th, 100th and 200th cycles 1 mA cm^{-2} and 1 mAh cm^{-2} .

	Cycle Number	0	50 th	100 th	200 th
$R_{overall}(\Omega)$	Li	415.2	175.1	190.0	253.7
	PVA-PAA	762.4	95.1	88.1	93.2