

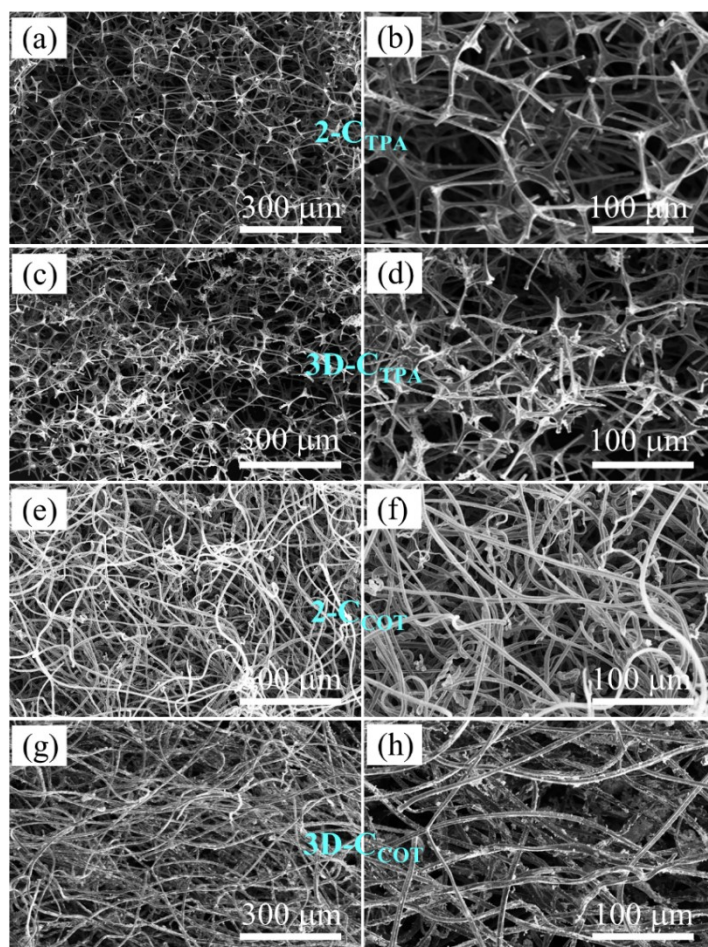
## Supporting Information

### **Bottom-up deposition lithium into 3D lithiophobic-lithiophilic host for long-life lithium metal anodes**

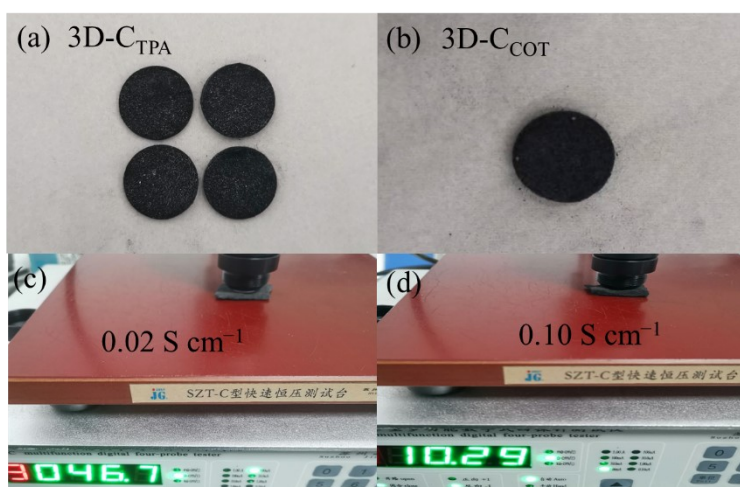
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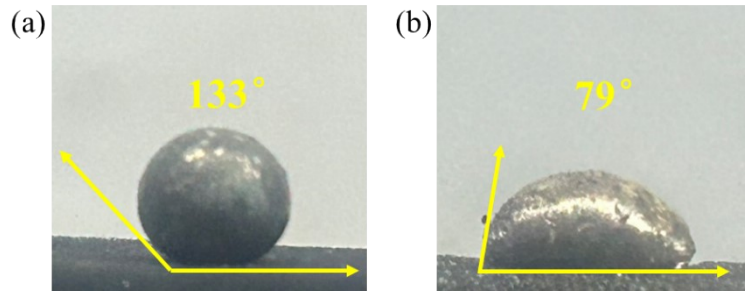
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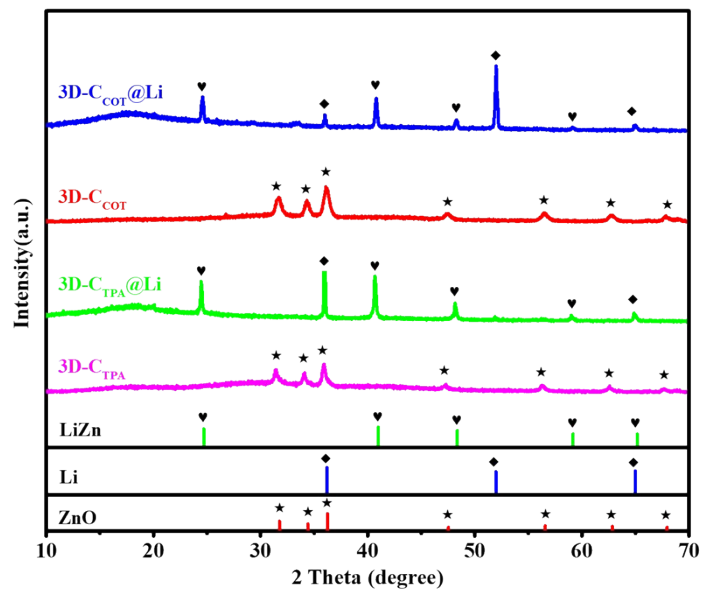
**Fig. S1.** SEM images of the (a, b) 2-C<sub>TPA</sub>, (c, d) 3D-C<sub>TPA</sub>, (e, f) 2-C<sub>COT</sub>, and (g, h) 3D-C<sub>COT</sub> skeletons.



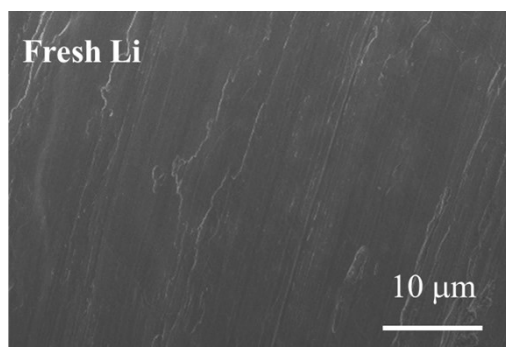
**Fig. S2.** Photographs of (a) 3D-C<sub>TPA</sub> and (b) 3D-C<sub>COT</sub> skeletons; Corresponding conductivities of (c) 3D-C<sub>TPA</sub> and (d) 3D-C<sub>COT</sub> skeletons.



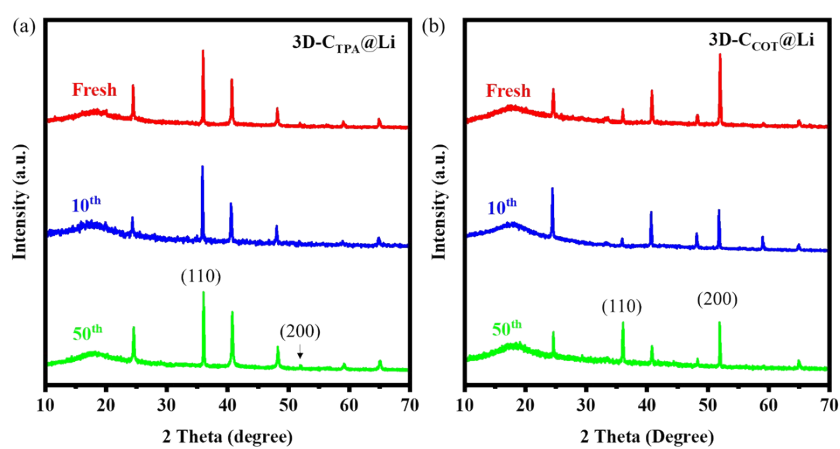
**Fig. S3.** Optical images of lithium droplet on (a) 2-C<sub>TPA</sub> skeleton and (b) 3D-C<sub>TPA</sub> skeleton substrates.



**Fig. S4.** XRD pattern of 3D-C<sub>TPA</sub> skeleton, 3D-C<sub>TPA</sub>@Li anode, 3D-C<sub>COT</sub> skeleton, and 3D-C<sub>COT</sub>@Li anode.



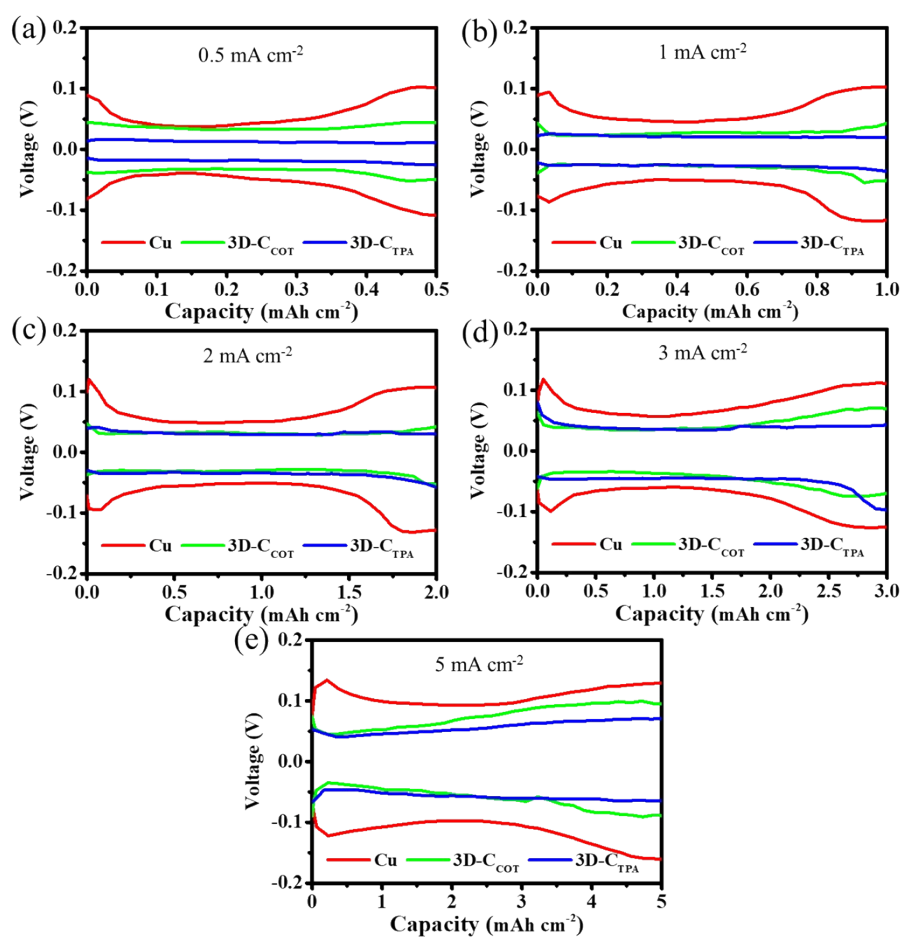
**Fig. S5.** Top-view SEM image of the fresh bare Li anode.



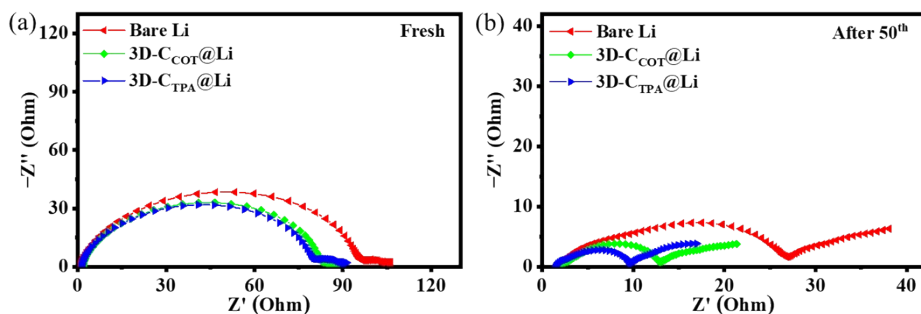
**Fig. S6** The XRD patterns of the symmetrical cells with (a) 3D-C<sub>TPA</sub>@Li anode and (b) 3D-C<sub>COT</sub>@Li anode cycled at a current density of 1 mA·cm<sup>-2</sup> and a capacity of 1 mAh·cm<sup>-2</sup>.

**Table S1** The heights of the Li(110) peak and Li(200) peak in the corresponding XRD patterns of Fig. S6.

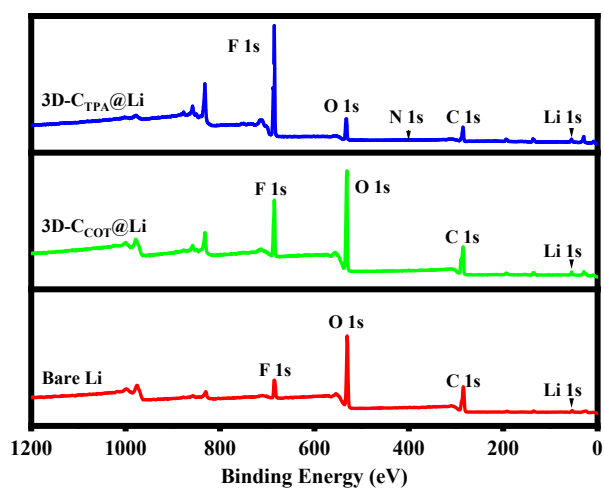
		Li(110)	Li(200)
3D-C <sub>TPA</sub> @Li	Fresh	1332	74
	10 <sup>th</sup>	420	25
	50 <sup>th</sup>	1203	67
3D-C <sub>COT</sub> @Li	Fresh	232	1270
	10 <sup>th</sup>	211	1134
	50 <sup>th</sup>	495	560



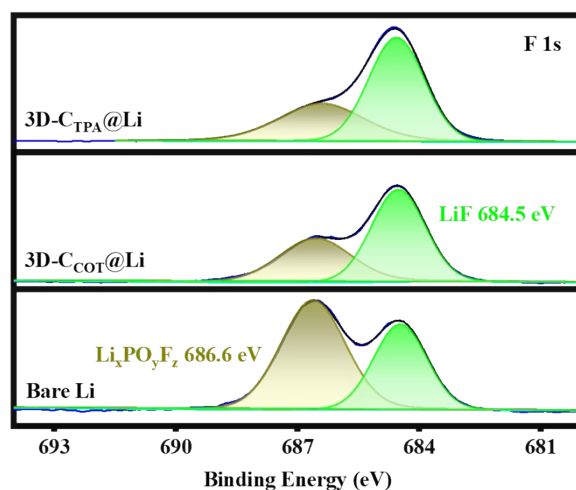
**Fig. S7.** Corresponding voltage-capacity profiles at current densities of (a) 0.5 mA cm<sup>-2</sup>, (b) 1 mA cm<sup>-2</sup>, (c) 2 mA cm<sup>-2</sup>, (d) 3 mA cm<sup>-2</sup>, and (e) 5 mA cm<sup>-2</sup> in Fig. 2i.



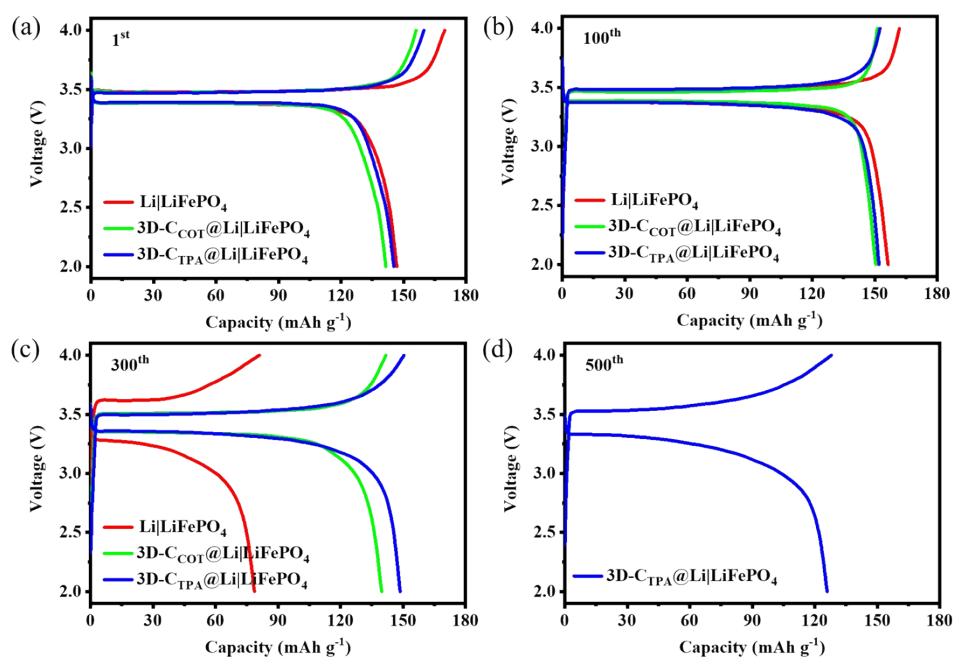
**Fig. S8.** EIS of the 3D-C<sub>TPA</sub>@Li, 3D-C<sub>COT</sub>@Li, and bare Li anodes (d) before and (e) after 50 cycles.



**Fig. S9.** XPS survey spectra of bare Li, 3D-C<sub>COT</sub>@Li, and 3D-C<sub>TPA</sub>@Li anode after 50 cycles.



**Fig. S10.** High-resolution XPS plots of the F1s of bare Li, 3D-C<sub>COT</sub>@Li, and 3D-C<sub>TPA</sub>@Li anode after 50 cycles.



**Fig. S11.** Corresponding voltage–capacity profiles of these cells at selected cycles in Fig. 5a.