Supplementary Materials

Stable ultrathin lithium metal anode enabled by self-adapting electrochemical regulating strategy

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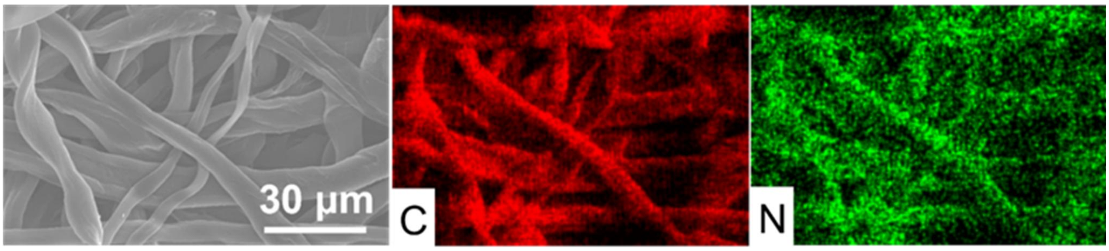
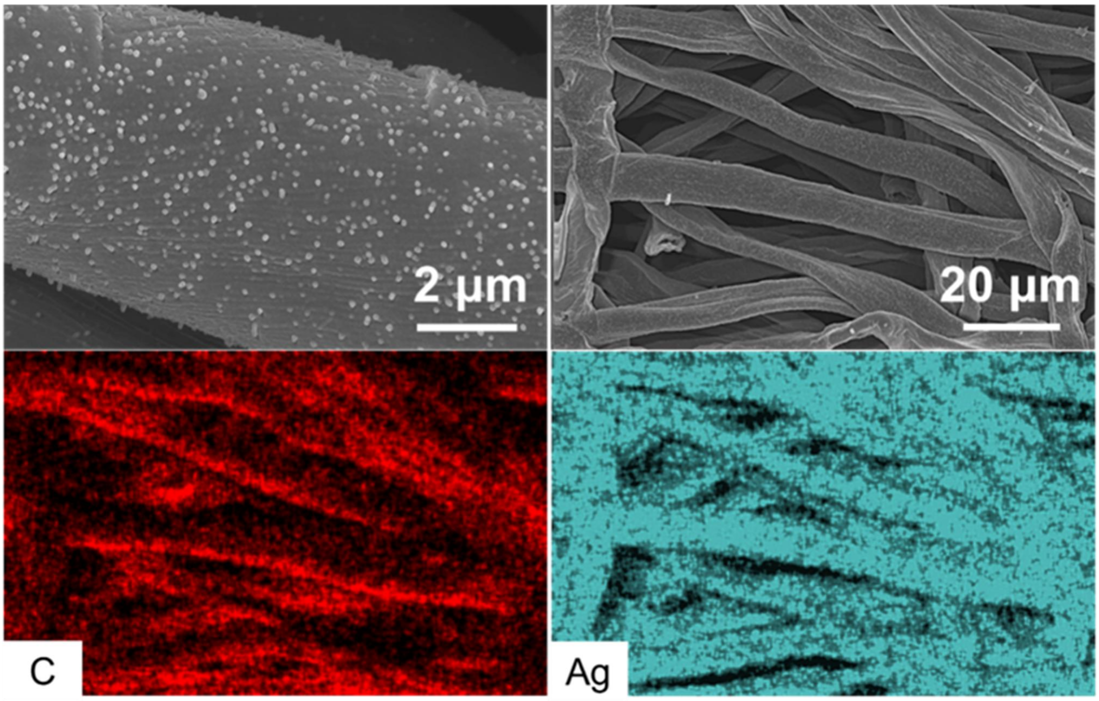
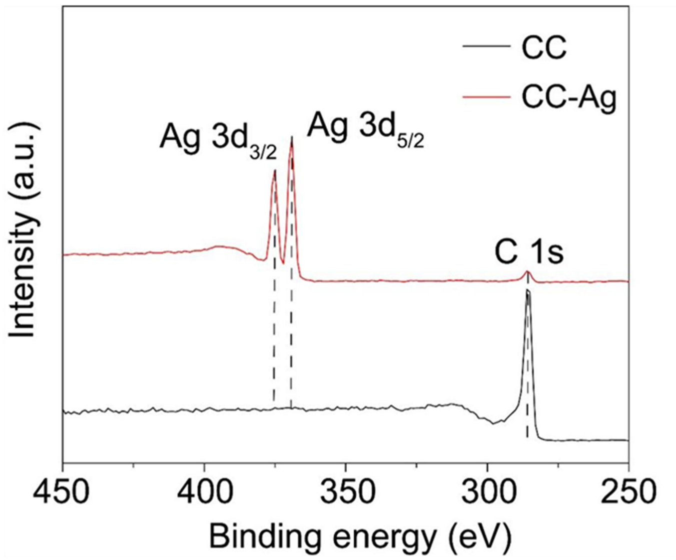


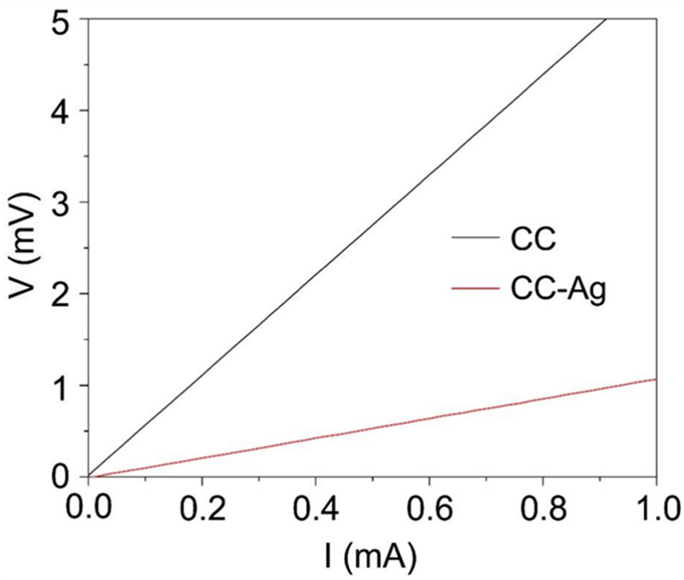
Supplementary Figure 1. Elemental mapping images of the conductive carbon cotton (CC).



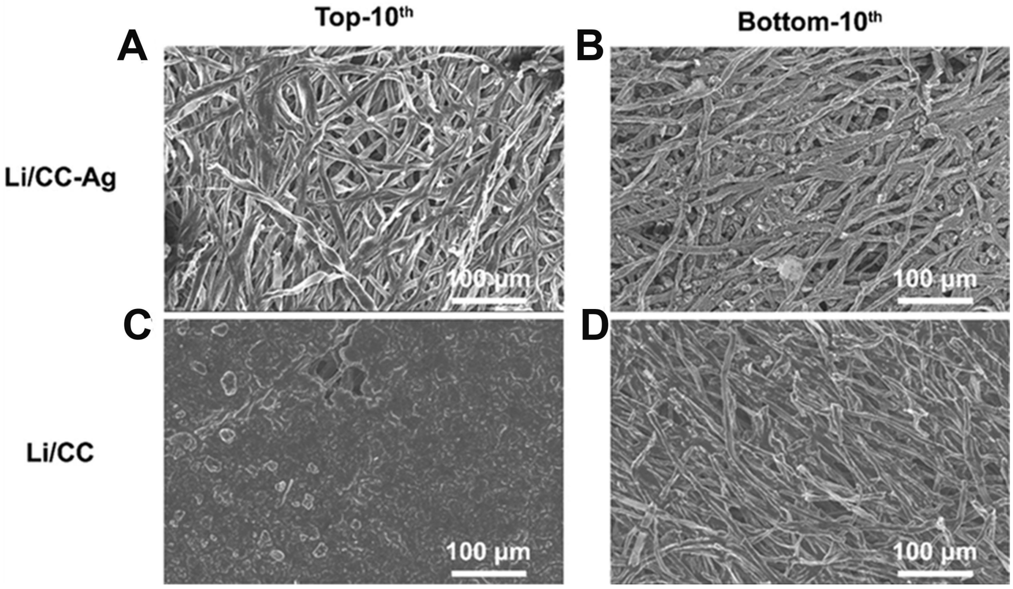
Supplementary Figure 2. SEM image of CC-Ag and its corresponding EDS element mapping images.



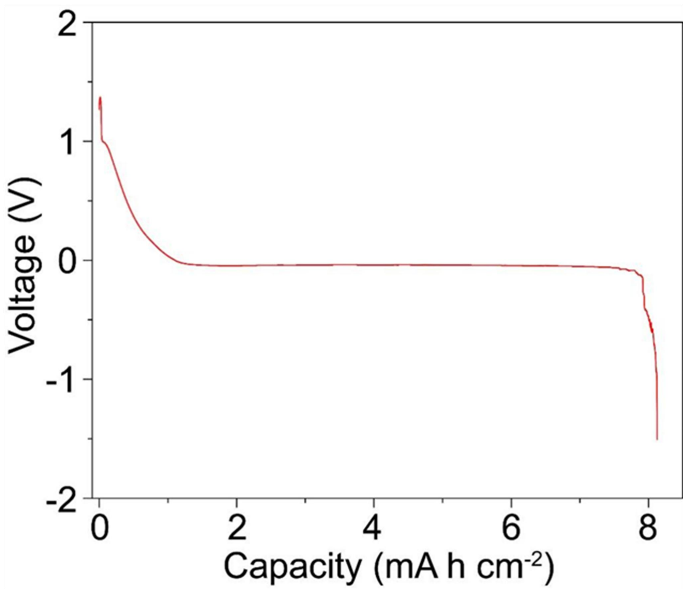
Supplementary Figure 3. XPS spectrum of the CC-Ag and CC.



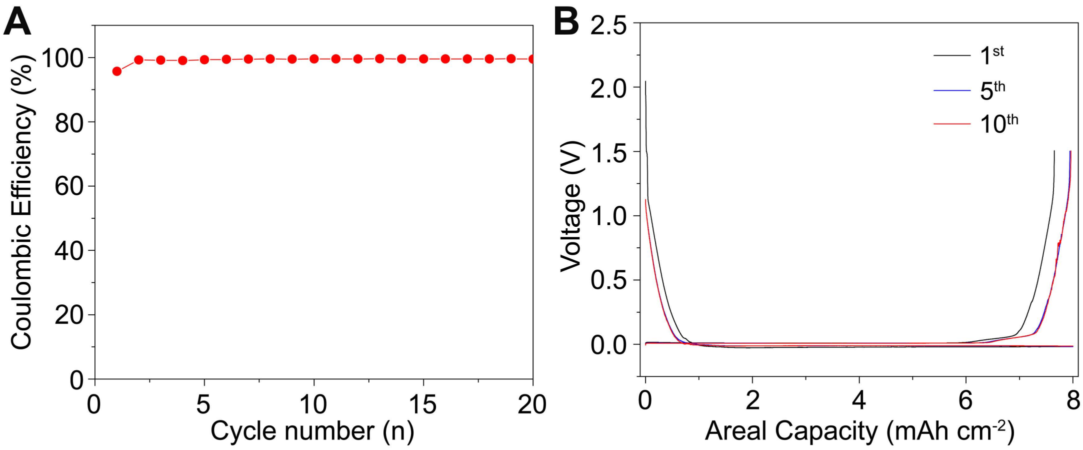
Supplementary Figure 4. I-V curves of CC-Ag and CC.



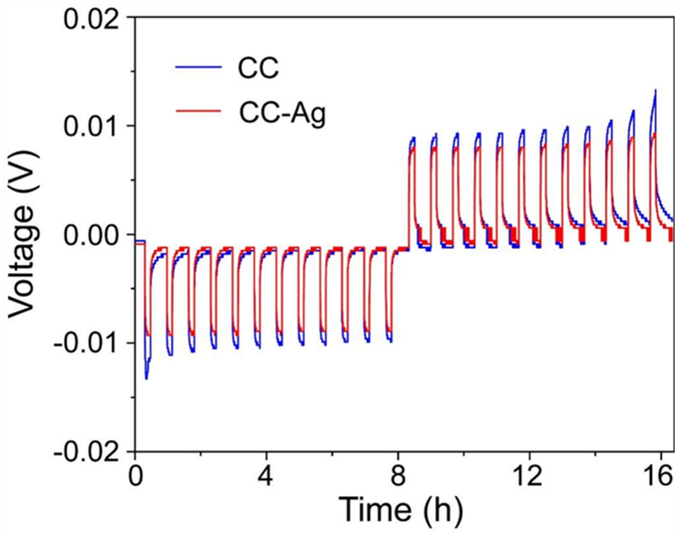
Supplementary Figure 5. Top (A) and bottom (B) SEM images of Li/CC-Ag anode after 10 cycles; Top (C) and bottom (D) SEM images of Li/CC anode after 10 cycles.



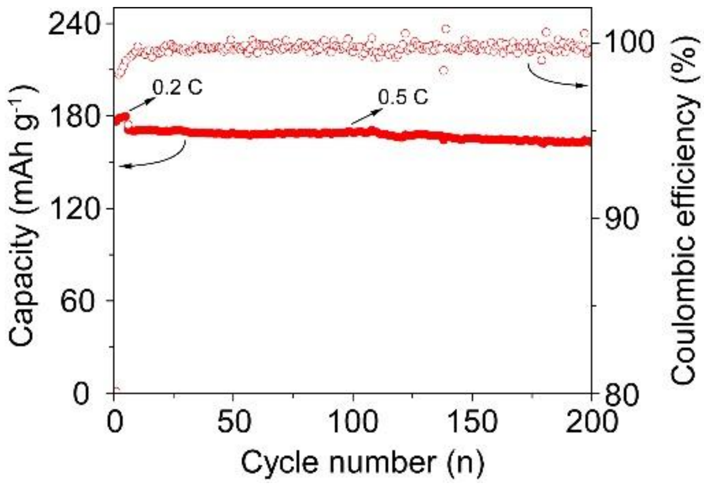
Supplementary Figure 6. Voltage-capacity curve of ultrathin lithium.



Supplementary Figure 7. Coulombic efficiency of Li plating/stripping on CC-Ag with an areal capacity 8 mA·h·cm^{-2} at the current density of 0.5 mA·cm^{-2} (A) and Charge/discharge voltage profiles (B).



Supplementary Figure 8. GITT test of Li/CC-Ag and Li/CC symmetric cells.



Supplementary Figure 9. Cycling performance of the $LiNi_{0.6}Mn_{0.2}Co_{0.2}O_2$ (NCM622) full cell of Li/CC-Ag at 0.5 C.

In this test, NCM622, polyvinylidene fluoride (PVDF), and super P in a mass ratio of 8:1:1 was grinded to prepare the cathode slurry. Full cells were assembled using NCM622 as the cathode and Li/CC-Ag as the anode. The electrolyte was a 1 M solution of lithium hexafluorophosphate ($LiPF_6$) in a solvent blend of ethylene carbonate (EC), dimethyl carbonate (DMC), and diethyl carbonate (DEC) in a volume ratio of 1:1:1, further supplemented with 2% vinylene carbonate (VC).

Supplementary Table 1. Comparison between this work and previous works

Host	Symmetric cell			Full cell		Ref.
	Current density ($mA·cm^{-2}$)	**Capacity ($mA·h·cm^{-2}$)**	**Cycle time (h)**	**Current rate (C)**	**Cycle number/ Retention rate**	
CC-Ag	**0.5**	**2**	**> 2,000**	**0.5**	**250 (92.0%)**	**This work**
OC/Fe_2O_3	1.0	1.0	1,000	1.0	250 (83.7%)	[1]
GSZO-CF	1.0	1.0	760	1.0	200 (85.5%)	[2]
CP-LiGe	1.0	1.0	1,000	1.0	200 (93.0%)	[3]
3D P-CuZn	1.0	1.0	1,000	0.5	200 (80.0%)	[4]
G-ZGC	1.0	1.0	920	0.2	——	[5]
CNIP	1.0	0.5	900	1.0	300 (90.3%)	[6]

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