Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary material

Favorable lithium deposition behaviors on flexible carbon microtube skeleton enable a high-performance lithium metal anode

Changzhi Sun,[a,b] Tian Wu,[a,b] Jianing Wang,[a,b] WenWen Li,[a,b] Jun Jin,[a,b] Jianhua Yang[a] and Zhaoyin Wen[a,b*]

[a] CAS Key Laboratory of Materials for Energy Conversion, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, 200050, P. R. China

[b] University of Chinese Academy of Sciences, Beijing 100049, P. R. China

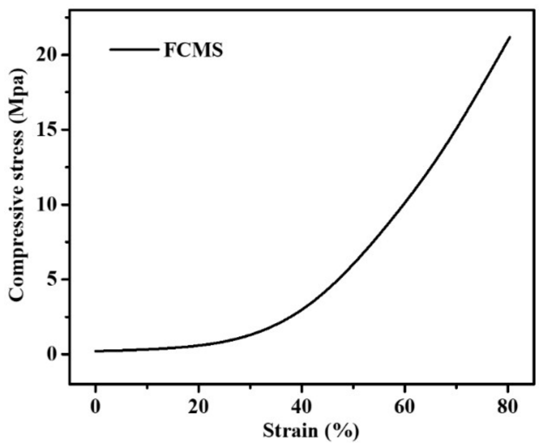

Fig. S1 Compressive stress-strain curve of the FCMS

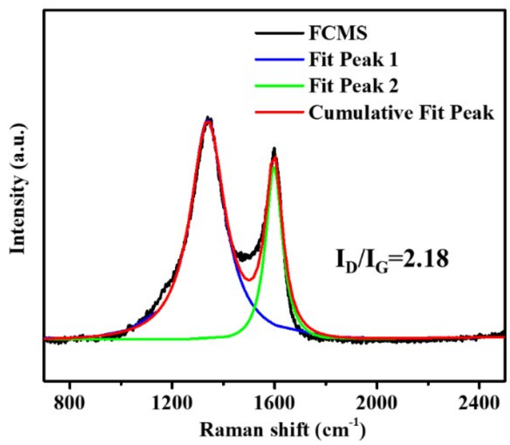

Fig. S2 Fitted Raman spectra of the FCMS

Table S1. Comparison of areal capacity and current density in Coulombic efficiency tests of various current collectors.

Current collectors	**Areal capacity ($mAh\ cm^{-2}$)**	**Current density ($mA\ cm^{-2}$)**	**Year**	**Ref**
3D Cu foil	2	0.5	2015	[1]
Au NPs coated hollow carbon	1	0.5	2016	[2]
Ag NPs coated CNF	1	0.5	2017	[3]
Graphitized CFs	8	0.5	2017	[4]
N-doped graphene modified porous Cu	1-4	0.5-1	2018	[5]
3D TiC/C Core/Shell Nanowire	1	1	2018	[6]
3D F-doped graphene	1	0.5-2	2018	[7]
3D nitrogen-enriched carbon sponge	1-3	0.5-1	2018	[8]
flexible carbon microtube skeleton	**10**	**1**	**our work**	

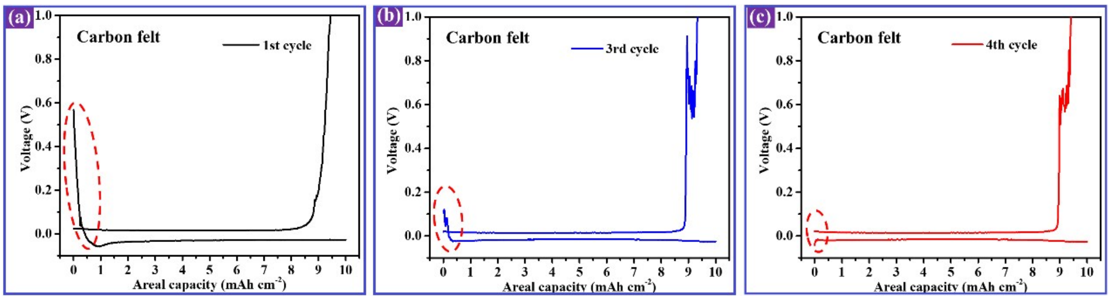

Fig. S3 Discharge/charge voltage profiles of carbon felt at 1 mA cm^{-2} for 10 mA h cm^{-2} (a) 1st cycle, (b) 3rd cycle and (c) 4th cycle.

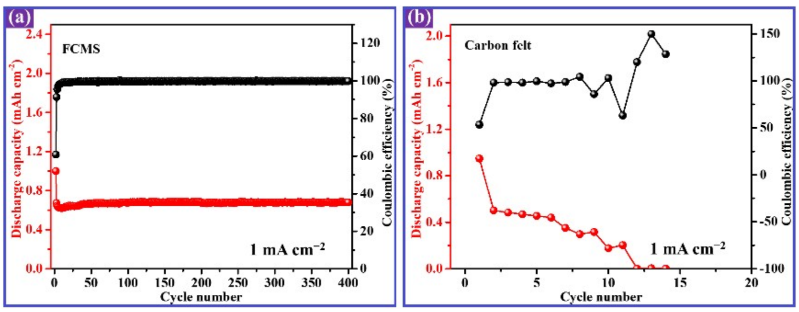

Fig. S4 Cycling performance of FCMS and carbon felt between 0 and 1 V at 1 mA cm^{-2}.

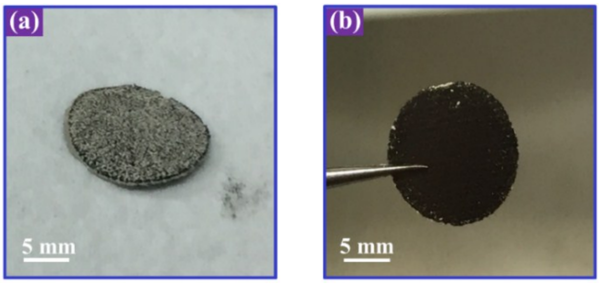

Fig. S5 Photograph of FCMS after plating □10 mAh cm^{-2} of Li at 1 mA cm^{-2} for 10th cycle, (a) the side facing separator and (b) the back of it.

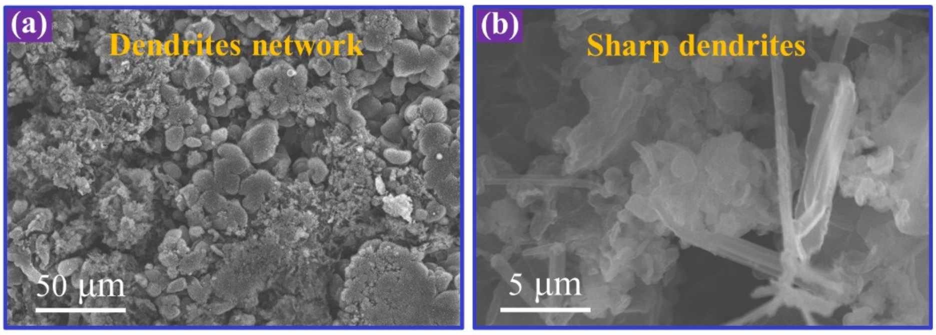

Fig. S6 (a) Cu foil after plating 10 mAh cm^{-2} of Li and (b) corresponding enlarged SEM image for 10th cycle at 1 mA cm^{-2}.

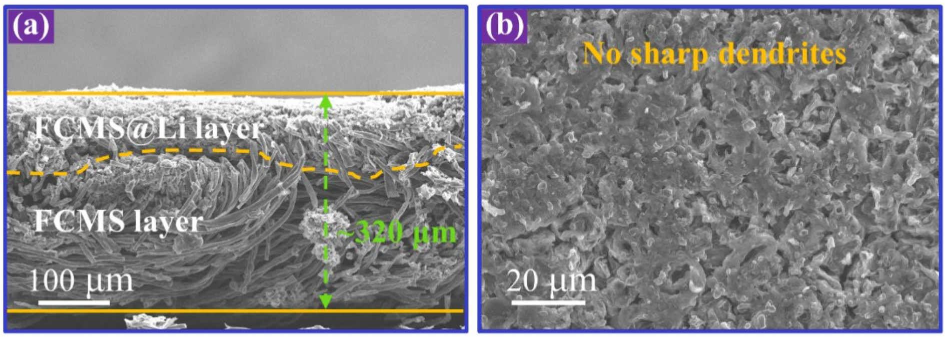

Fig. S7 (a) Cross-sectional SEM image of the FCMS@Li electrode after cycling for 1000 h in symmetric cell (1 mA cm^{-2} for 2 mAh cm^{-2}); (b) corresponding surface SEM image.

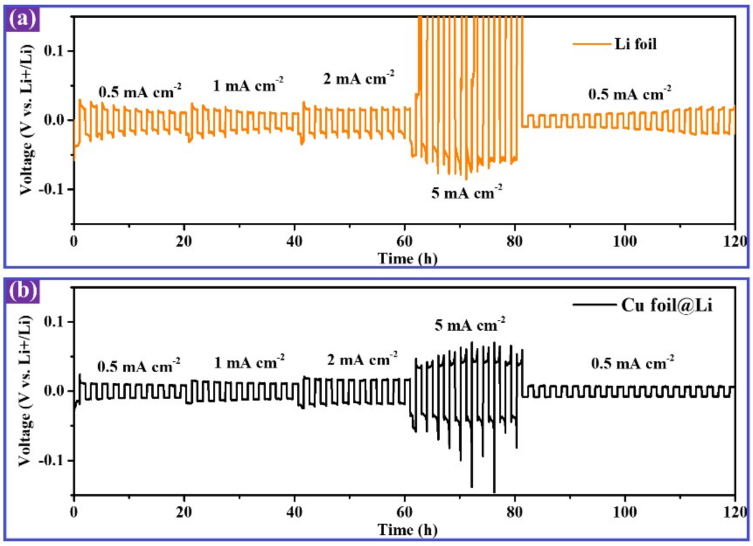

Fig. S8 Rate capability of (a) pristine Li symmetric cell and (b) Cu foil@Li symmetric cell at current densities of 0.5, 1, 2 and 5 mA cm^{-2} for 1 h.

Table S2. Comparison of galvanostatic cycling performance of symmetric Li cells with different composite Li anodes.

Ref	Electrolyte (1 M LiTFSI in DOL/DME)	Current density (mA cm^{-2})	Areal capacity (mAh cm^{-2})	Cycling performance
[1]	no additive	0.2	0.5	600 h
[2]	-	-	-	-
[3]	no additive	0.5	1	500 h
[4]	1 wt% $LiNO_3$	2	1	300 h
[5]	-	-	-	-
[6]	1 wt% $LiNO_3$	0.5-3	1	200 h
[7]	2 wt% $LiNO_3$	1	2	350 h
[8]	1 wt% $LiNO_3$	0.5	0.5	320 h
our work	**1wt% $LiNO_3$**	**1**	**2**	**1000 h**
		2	**2**	**450 h**

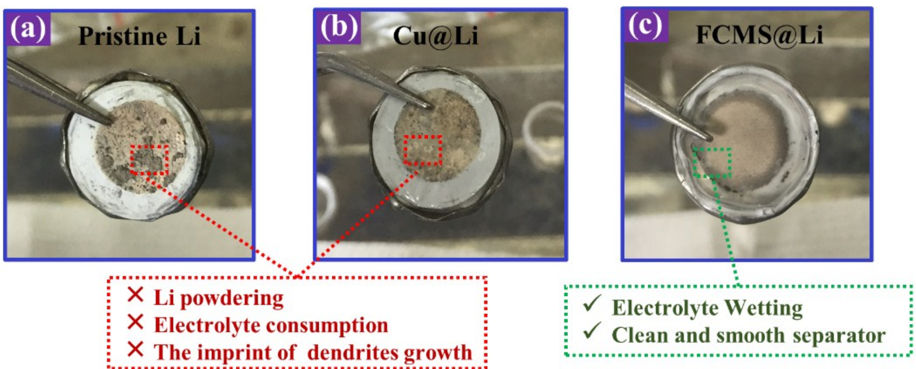

Fig. S9 Photographs of separators in disassembled (a) Li symmetric cell, (b) Cu foil@Li symmetric cell and (c) FCMS@Li symmetric cell after cycling for 500 h (1 mA cm^{-2} for 2 mAh cm^{-2}).

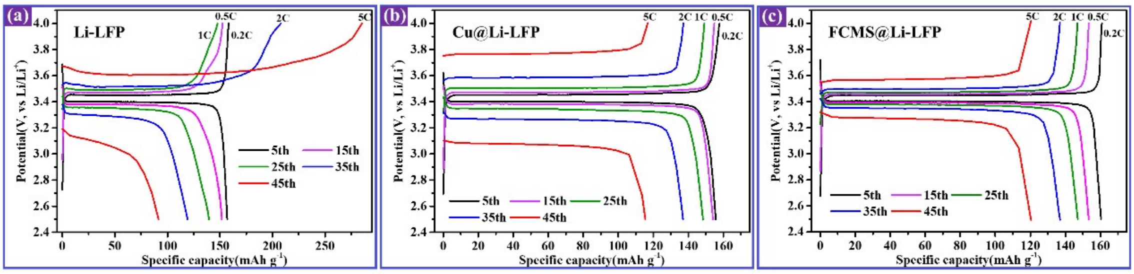

Fig. S10 Charge-discharge curves of full cells with (a) pristine Li, (b) Cu foil@Li and (c) FCMS@Li as anodes at 0.2 C, 0.5 C, 1 C, 2 C and 5 C.

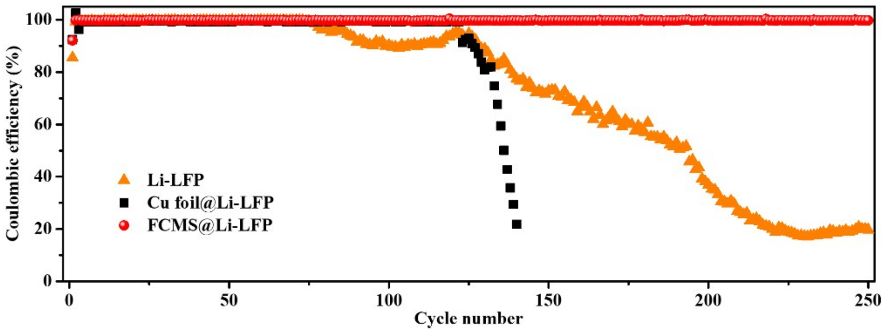

Fig. S11 Coulombic efficiencies of three types of full cells.

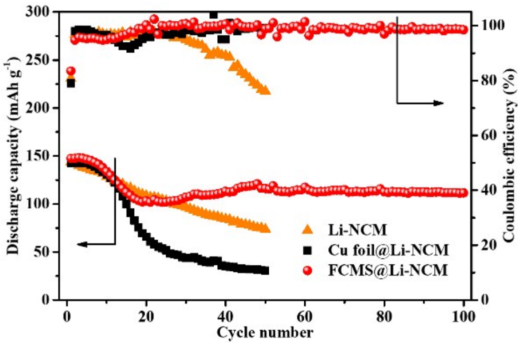

Fig. S12 Cycling performance of cells with NCM523 cathode and different Li anodes at 0.5 C in a common carbonate-based electrolyte.

References

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