Supporting Information for *Acta Phys. -Chim. Sin.* doi: 10.3866/PKU.WHXB202008088

细菌纤维素衍生的三维碳集流体用于无枝晶的锂金属负极

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Bacterial Cellulose-derived Three-dimensional Carbon Current Collectors for Dendrite-free Lithium Metal Anodes

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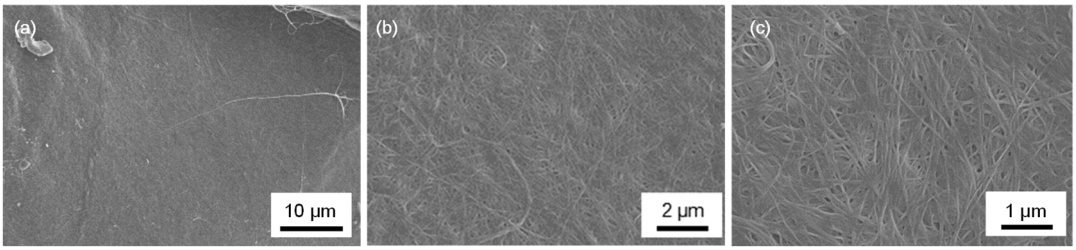

Fig. S1 SEM images of the pristine BC.

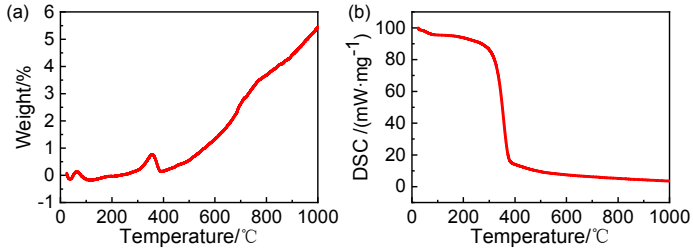

Fig. S2 (a) TGA and (b) DSC curves of BC under the protection of N_2.

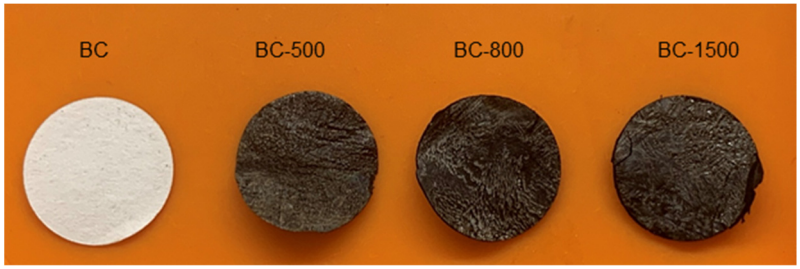

Fig. S3 Optical photos of BC, BC-500, BC-800 and BC-1500.

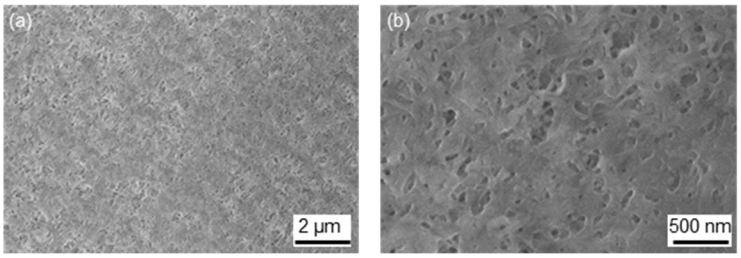

Fig. S4 SEM images of the BC-800 after Li ion deposition with the capacity of 1 mAh·cm^{-2}.

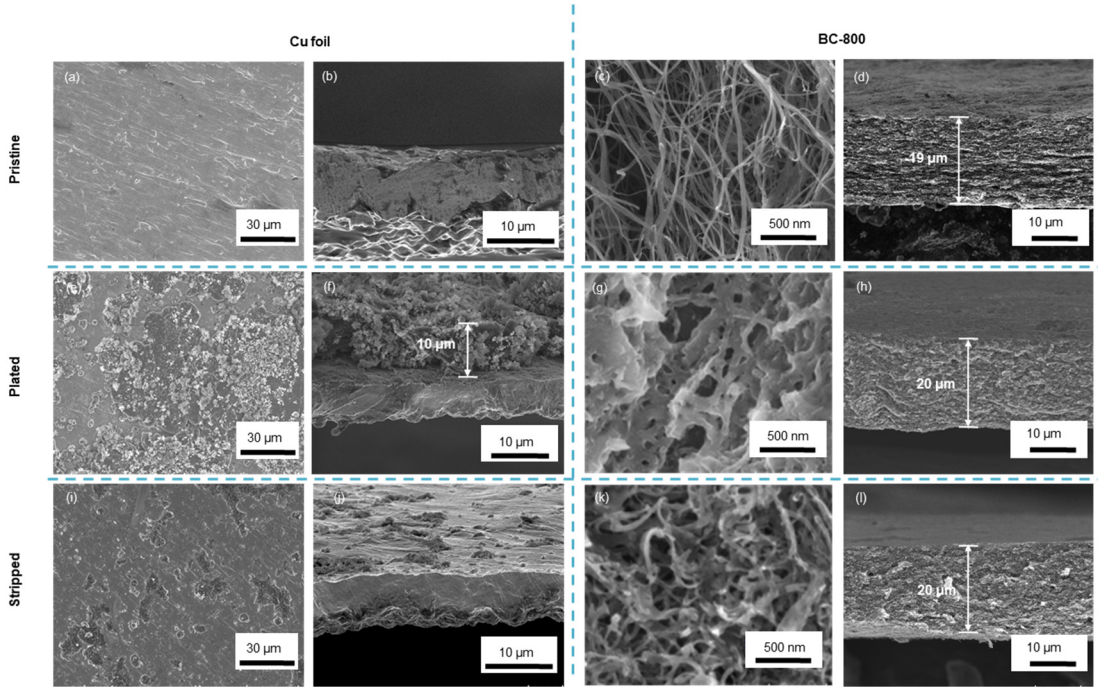

Fig. S5 SEM images of the morphologies of Cu foil and BC-800 after the deposition of Li of 4 mAh·cm^{-2}. (a, e, i) SEM images of the surface of pristine, Li plated and Li stripped Cu foils. (b, f, j) Cross-sectional SEM images of the pristine, Li plated and Li stripped Cu foils. (c, g, k) SEM images of the surface of pristine, Li plated and Li stripped BC-800. (d, h, l) Cross-sectional SEM images of the pristine, Li plated and Li stripped BC-800.

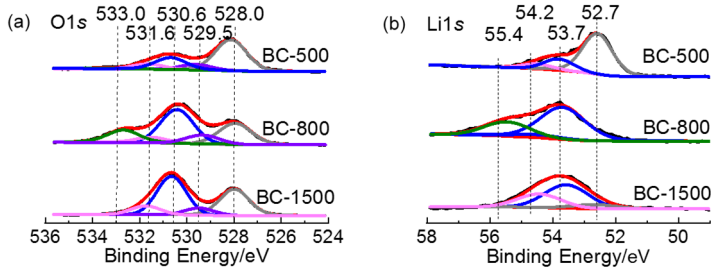

Fig. S6 High-resolution XPS (a) O 1*s* spectra and (b) Li 1*s* spectra of BC-500, BC-800 and BC-1500 after the cycling.

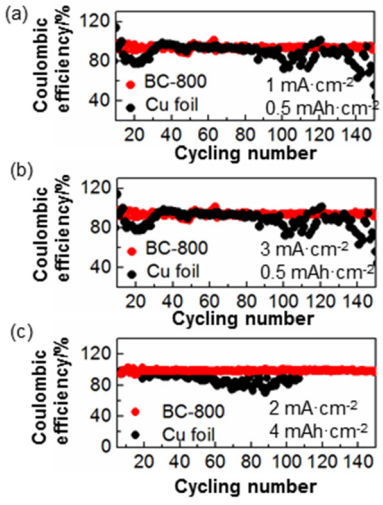

Fig. S7 Electrochemical cycling performance comparison of Cu foil and BC-800 at different rates and capacities.

(a) 1 mA·cm^{-2} and 0.5 mAh·cm^{-2}; (b) 3 mA·cm^{-2} and 0.5 mAh·cm^{-2}; (c) 2 mA·cm^{-2} and 4 mAh·cm^{-2}.

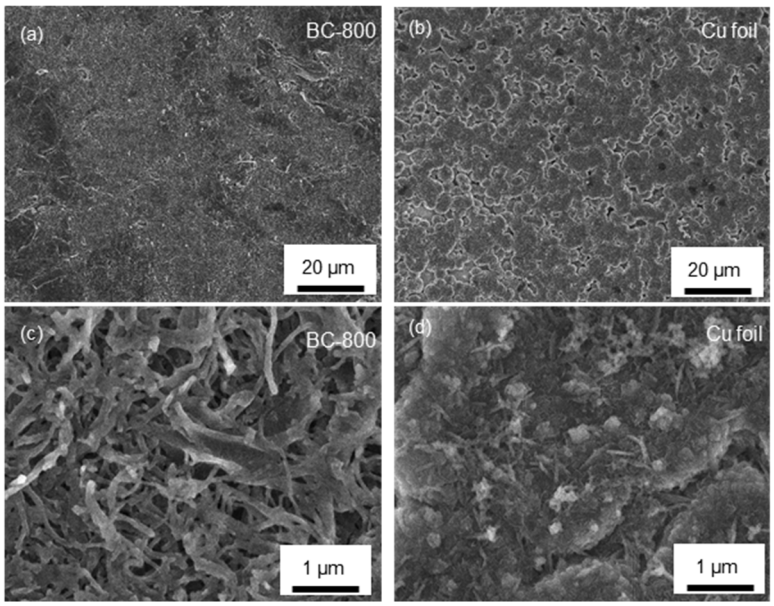

Fig. S8 (a, c) Surface morphologies of BC-800 after 50 cycle tests, and (b, d) the corresponding morphologies of Cu foil.

Table S1 Comparison of electrochemical performance of different 3D current collectors.

Materials	Current density ($mA \cdot cm^{-2}$)	Cycling capacity ($mAh \cdot cm^{-2}$)	Cycling life
Vertical rGO [1]	1	1	300
	5	5	150
Vertical graphene [2]	1	3	100
	3	1	140
rGO/Mexene [3]	0.5	0.5	140
	0.5	5	135
P-doping Cu wires [4]	1	1	150
	1	3	60
Cu_2S@Cu foam [5]	1	3	80
	3	1	100
Dealloying Cu [6]	1	1	200
N-doping carbon [7] fibers	2	2	300
	2	8	140
Al_2O_3@CNT [8]	1	2	80
N-doping graphene [9]	1	1	180
	1	2	50
Graphitic carbon [10]	2	4	100
	4	8	80
This work	3	1	150
	2	4	150

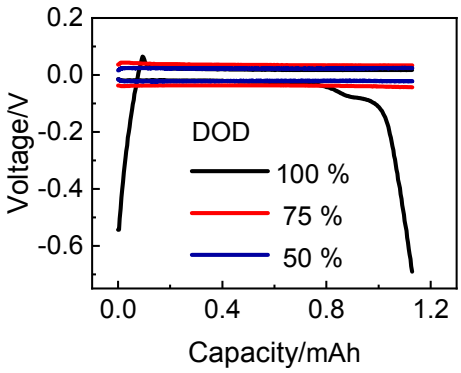

Fig. S9 Discharging/charging curves of 3D Li-BCs with different DOD in the symmetric cells at a current density of 1 mA·cm^{-2} and a capacity of 1 mAh·cm^{-2}.

References

(1) Chen, H.; Pei, A.; Wan, J.; Lin, D.; Vila, R.; Wang, H.; Mackanic, D.; Steinruck, H. G.; Huang, W.; Li, Y.; *et al*. *Joule* **2020,** *4*, 938. doi: 10.1016/j.joule.2020.03.008

(2) Huang, Z.; Kong, D.; Zhang, Y.; Deng, Y.; Zhou, G.; Zhang, C.; Kang, F.; Lv, W.; Yang, Q. H. *Research* **2020,** *2020*, 7163948. doi: 10.34133/2020/7163948

(3) Shi, H.; Zhang, C. J.; Lu, P.; Dong, Y.; Wen, P.; Wu, Z. S. *ACS Nano* **2019,** *13*, 14308. doi: 10.1021/acsnano.9b07710

(4) Zhang, C.; Lyu, R.; Lv, W.; Li, H.; Jiang, W.; Li, J.; Gu, S.; Zhou, G.; Huang, Z.; Zhang, Y.; *et al*. *Adv. Mater.* **2019,** *31*, 1904991. doi: 10.1002/adma.201904991

(5) Huang, Z.; Zhang, C.; Lv, W.; Zhou, G.; Zhang, Y.; Deng, Y.; Wu, H.; Kang, F.; Yang, Q. H. *J. Mater. Chem. A* **2019,** *7*, 727. doi: 10.1039/C8TA10341K

(6) Zhao, H.; Lei, D.; He, Y. B.; Yuan, Y.; Yun, Q.; Ni, B.; Lv, W.; Li, B.; Yang, Q. H.; Kang, F.; Lu, J. *Adv. Energy Mater.* **2018,** *8*. doi: 10.1002/aenm.201800266

(7) Liu, L.; Yin, Y. X.; Li, J. Y.; Wang, S. H.; Guo, Y. G.; Wan, L. J. *Adv. Mater.* **2018,** *30*, 1706216. doi: 10.1002/adma.201706216

(8) Zhang, Y.; Liu, B. Y.; Hitz, E.; Luo, W.; Yao, Y. G.; Li, Y. J.; Dai, J. Q.; Chen, C. J.; Wang, Y. B.; Yang, C. P.; *et al*. *Nano Res.* **2017,** *10*, 1356. doi: 10.1007/s12274-017-1461-2

(9) Zhang, R.; Chen, X. R.; Chen, X.; Cheng, X. B.; Zhang, X. Q.; Yan, C.; Zhang, Q. *Angew. Chem. Int. Ed.* **2017,** *56*, 7764. doi: 10.1002/anie.201702099

(10) Ye, H.; Xin, S.; Yin, Y. X.; Li, J. Y.; Guo, Y. G.; Wan, L. J. *J. Am. Chem. Soc.* **2017,** *139*, 5916. doi: 10.1021/jacs.7b01763