Supporting information

Flower-like SnS_2 composite with 3D pyrolyzed bacterial cellulose as anode for lithium ion batteries with Ultralong Cycle Life and Superior Rate Capability

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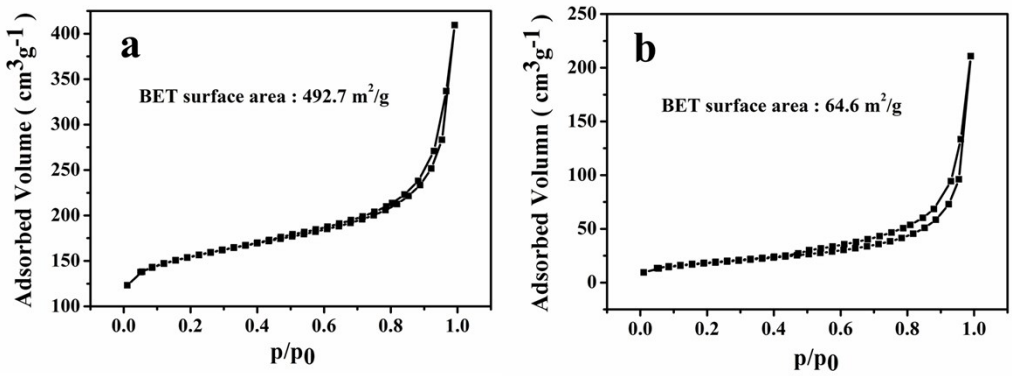

Figure S1. Nitrogen adsorption–desorption isotherms of the pBC (a) and as-prepared SnS_2 (b).

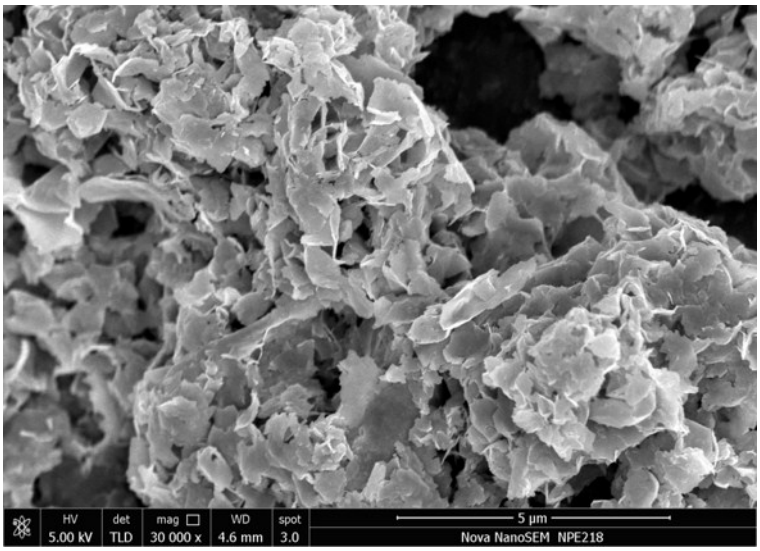

Figure S2. SEM image of pure SnS_2 without addition of pBC.

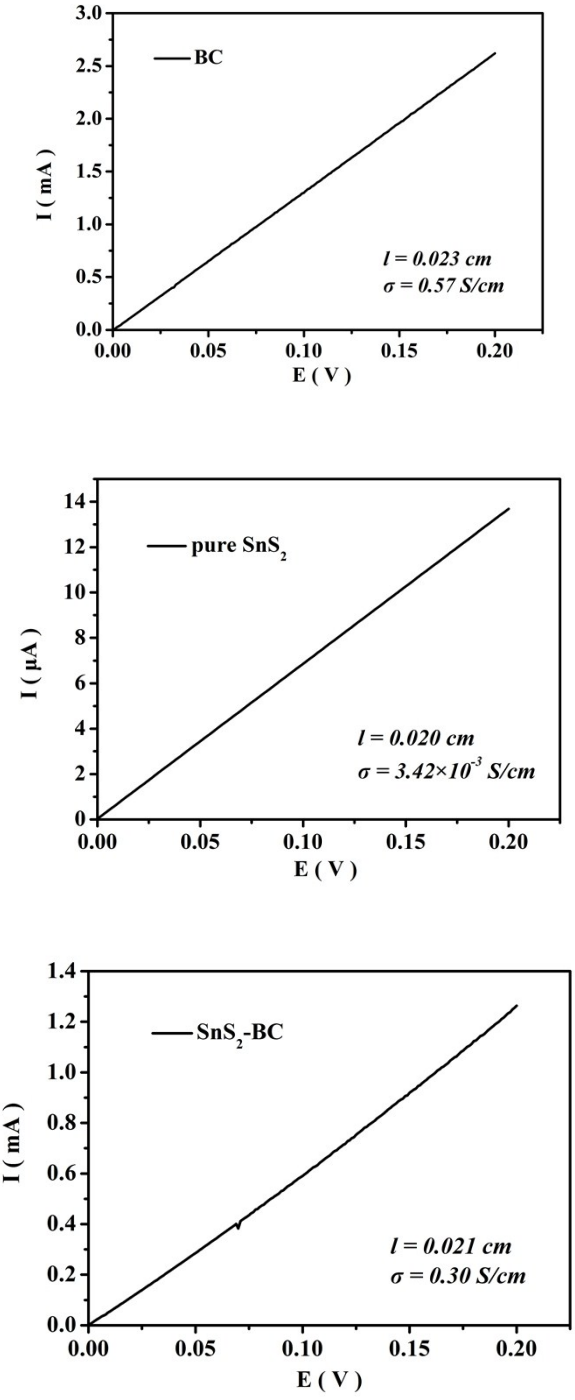

Figure S3. Electrical conductivity measurement of pure SnS_2 , pBC and as-prepared SnS_2-pBC.

S4: Caculation of relative content of SnS_2 and pBC:

To confirm the content of SnS_2, the as-prepared SnS_2-pBC was increased to 800 °C at a rate of 10 °C min^{-1} and kept for 2h in air. And XRD pattern of the calcined product was indexed to hexagonal SnO_2 (JCPDS 1-657, Figure S4). The total weight including the crucible before and after calcination are 35.7748 g and 35.7368 g, respectively. And the crucible is weighed as 35.6460 g. The detailed calculation are listed as follow:

$w(SnS_2\text{-pBC}) = w(\text{before calcination}) - w(\text{crucible}) = 0.1288$ g;

$w(SnO_2) = w(\text{after calcination}) - w(\text{crucible}) = 0.0908$ g;

$w(SnS_2) = w(SnO_2) \times M(SnS_2)/M(SnO_2) = 0.1102$ g;

$con(SnS_2) = w(SnS_2)/w(SnS_2\text{-pBC}) \times 100\% = 85.5\%$;

$con(pBC) = 1 - con(SnS_2) = 14.5\%$.

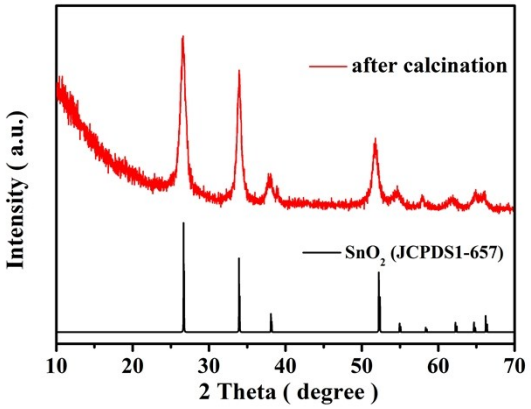

Figure S4. XRD pattern of after calcined SnS_2-pBC.

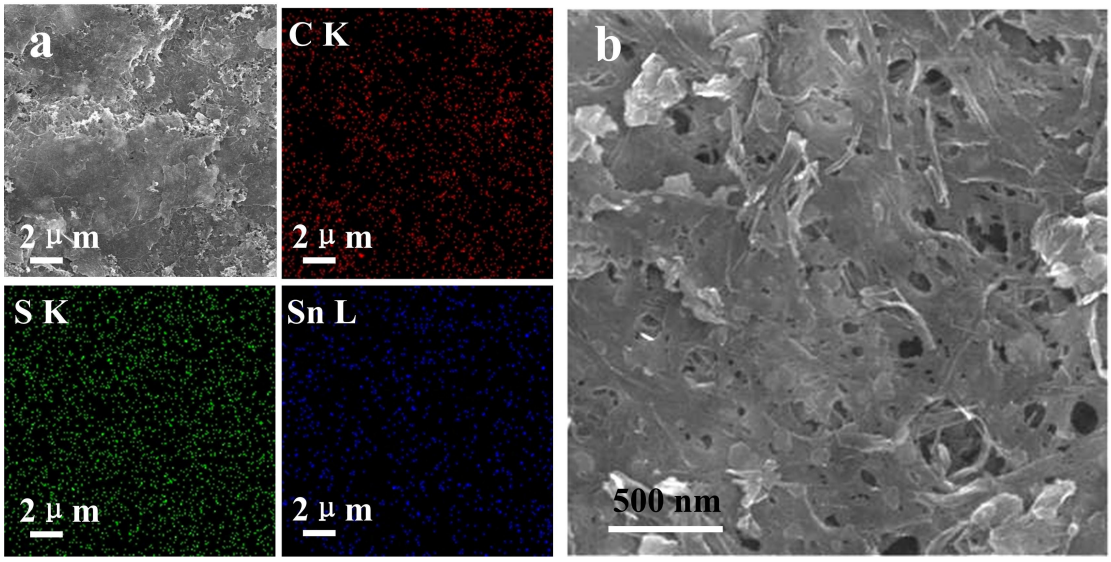

Figure S5. SEM and elements mapping of SnS_2-pBC electrodes before cycling.

Table S1 Reported electrochemical performance of SnS_2-based electrodes and our work.

Sample	Current (A/g)	Specific capacity (mAh/g)	Cycle number	Ref/Year
SnS_2-pBC	**0.5** **10** **20**	**609** **408.8** **300.7**	**200** **1500** **1500**	**This work**
graphene/ SnS_2/CC	0.5 2	638.1 419.4	150 50	［1］/ 2018
SnS_2/CN composite	0.1 1	444.7 350.8	100 100	［2］/ 2018
$SnP_{0.6}S_2$	0.5	404	200	［3］/ 2018
SnS_2@rGO	0.5 2	959.2 470.9	500 10	［4］/ 2018
CPN@SnS_2	0.3 1.5	699.2 530	100 10	［5］/ 2017
SnS_2/GNA SnS_2/GNA GNA GNA	0.1 10 0.1	1050 495 ～500	60 5 60	［6］/ 2018
Al_2O_3-coated SnS_2	0.1	351.1	50	［7］/2017
SnS_2 NP/GNs	0.1 10 20	～600 443 378	150 10 10	［8］/2017
SnS_2/NRGO	0.2	562	200	［9］/2016
SnS_2 nanoflower	0.1	431.8	50	［10］/2016

References

1. Wang M, Huang Y, Zhu Y, et al. Journal of Alloys and Compounds, 2018. DOI: 10.1016/j.jallcom.2018.09.378
2. Yin L, Cheng R, Song Q, et al. Electrochimica Acta, 2018. DOI: 10.1016/j.electacta.2018.10.020
3. Choi H, Lee S, Eom K S.. Applied Surface Science, 2018. DOI: 10.1016/j.apsusc.2018.09.241
4. Lu X, Liu D, Han T, et al. Journal of Alloys and Compounds, 2018, 765: 1061-1071.
5. Chen X, Huang Y, Zhang K, et al. Chemical Engineering Journal, 2017, 330: 470-479.
6. Zhang Y, Zhao C, Zeng Z, et al. Electrochimica Acta, 2018, 278: 156-164.
7. Guan D, Ma L, Pan D, et al.. Electrochimica Acta, 2017, 242: 117-124.

8. Wei W, Jia F F, Wang K F, et al. Chinese Chemical Letters, 2017, 28(2): 324-328.
9. Youn D H, Stauffer S K, Xiao P, et al. ACS nano, 2016, 10(12): 10778-10788.
10. Guan D, Li J, Gao X, et al. Journal of Alloys and Compounds, 2016, 658: 190-197.