Constructing a LiPON layer on a 3D lithium metal anode as an artificial solid electrolyte interphase with long-term stability

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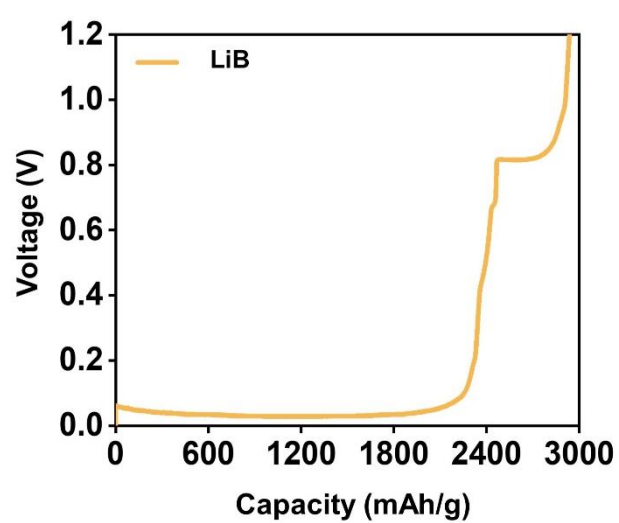[†] These authors contributed equally to this work.

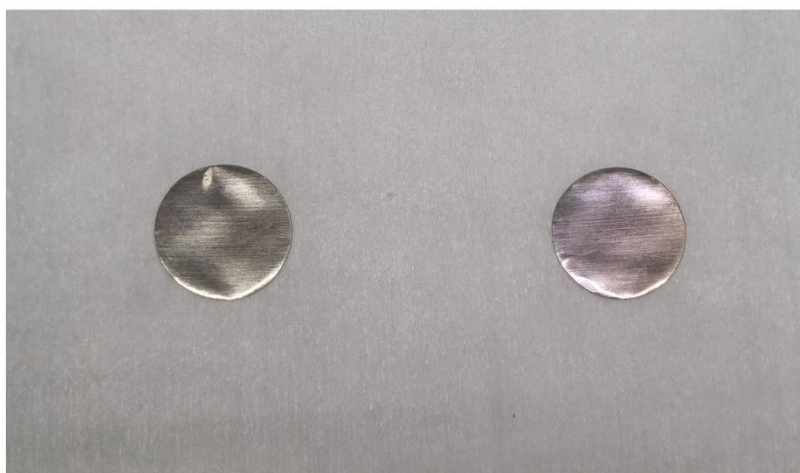**Figure S1**. Charge curve of the LiB anode.

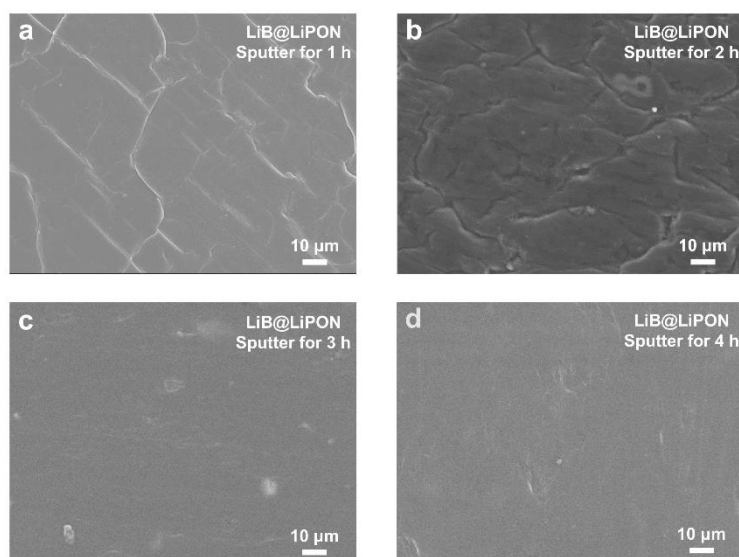**Figure S2**. Optical pictures of LiB (left) and LiB@LiPON (right) anode.

Figure S3. (a, b, c, d) SEM images of LiB@LiPON anode of 1 h-sputtering, 2 h-sputtering, 3 h-sputtering and 4 h-sputtering, respectively.
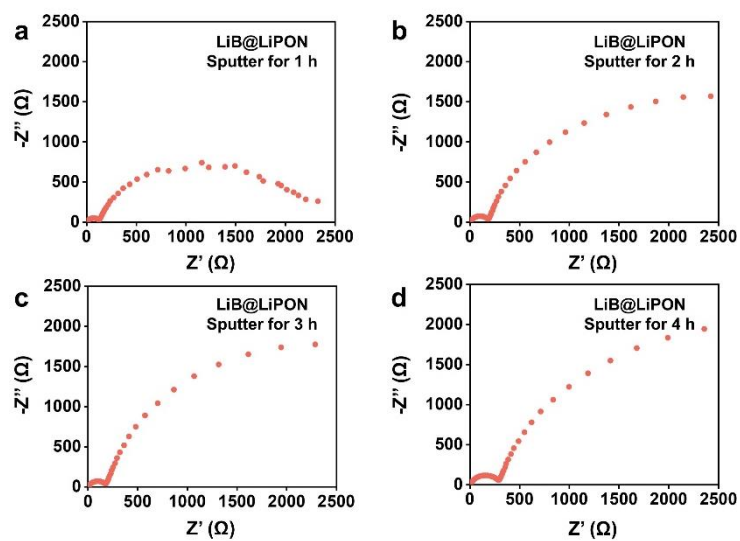
Figure S4. (a, b, c, d) EIS profiles of LiB@LiPON || LiB@LiPON symmetric batteries with 1 h-sputtering, 2 h-sputtering, 3 h-sputtering and 4 h-sputtering samples, respectively.
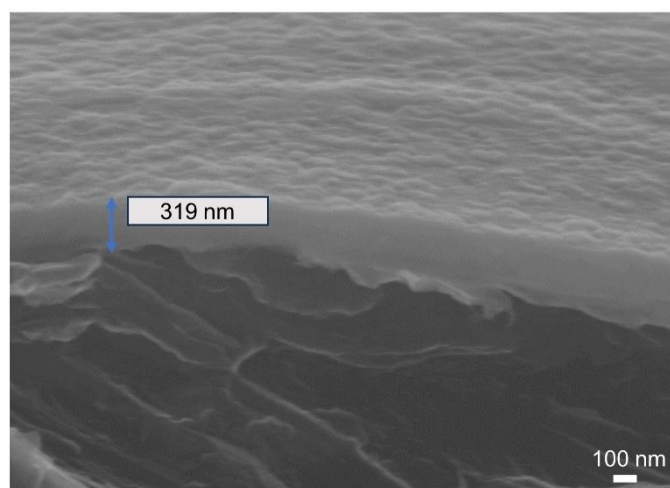

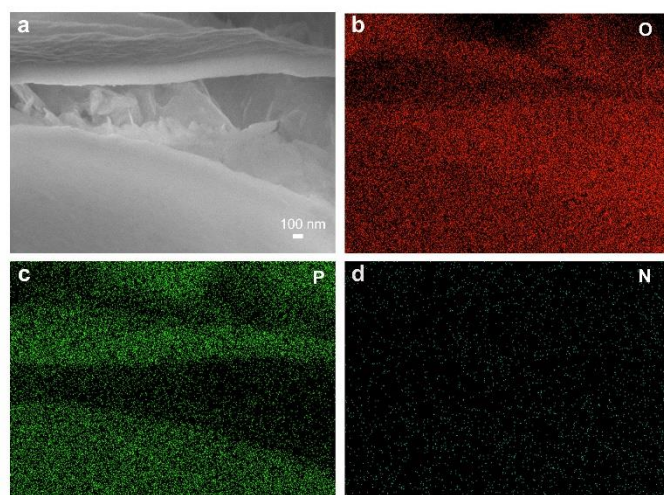**Figure S5**. Cross-section SEM image of LiB@LiPON anode before cycling;

Figure S6. (a) Cross-section view of LiB@LiPON anode after cycling; (b-d) SEM elemental mapping images of the corresponding elemental mapping images of N, O, P.
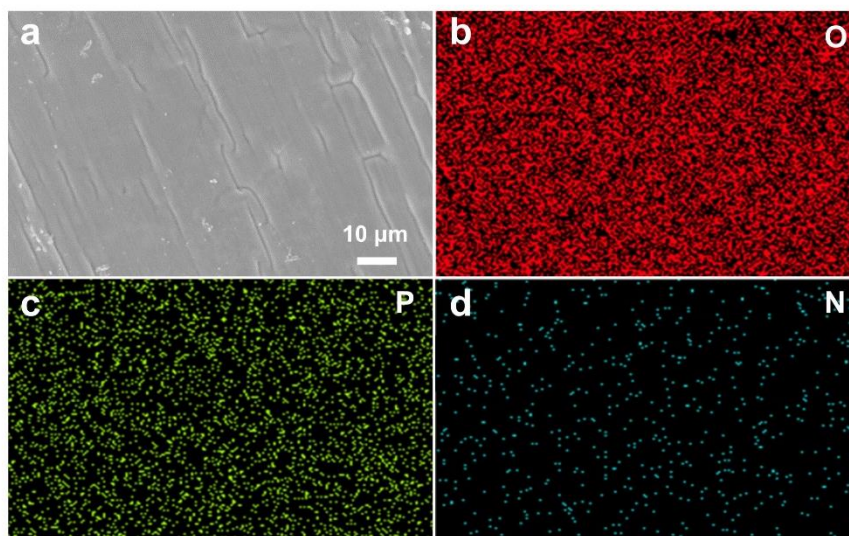
Figure S7. (a) Top-view SEM image of the cycled LiB@LiPON anode; (b-d) SEM elemental mapping images of Fig S6a.
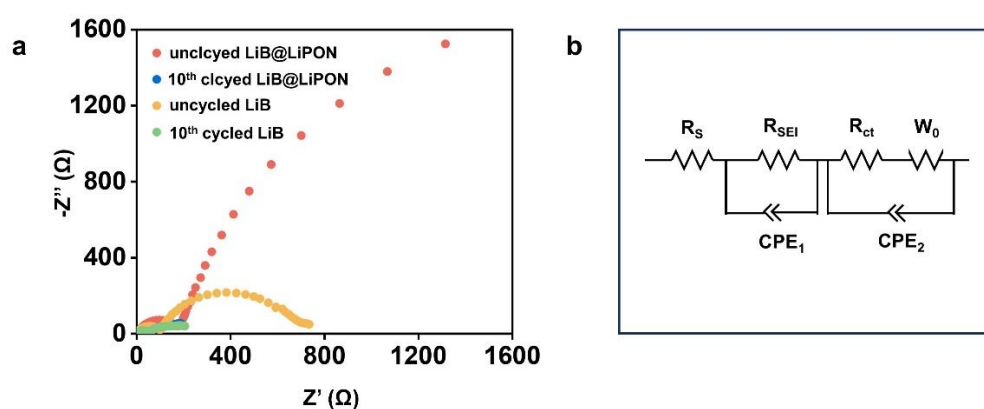

Figure S8. (a) overall view of high frequency area of EIS profile; (b) equivalent circuit model for fitting the impedance.
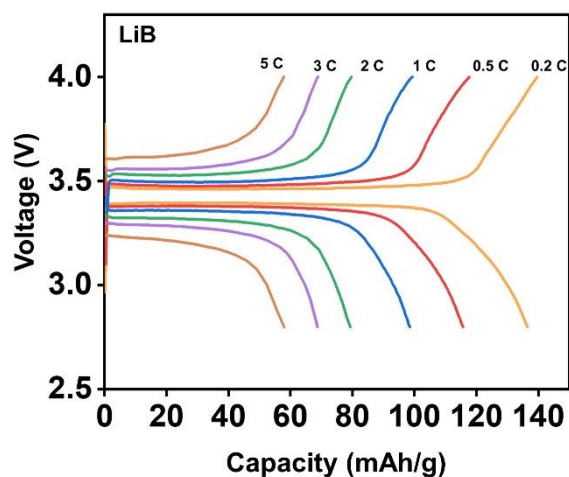
Figure S9. Charge-discharge curves of LiB || LFP at different current densities.
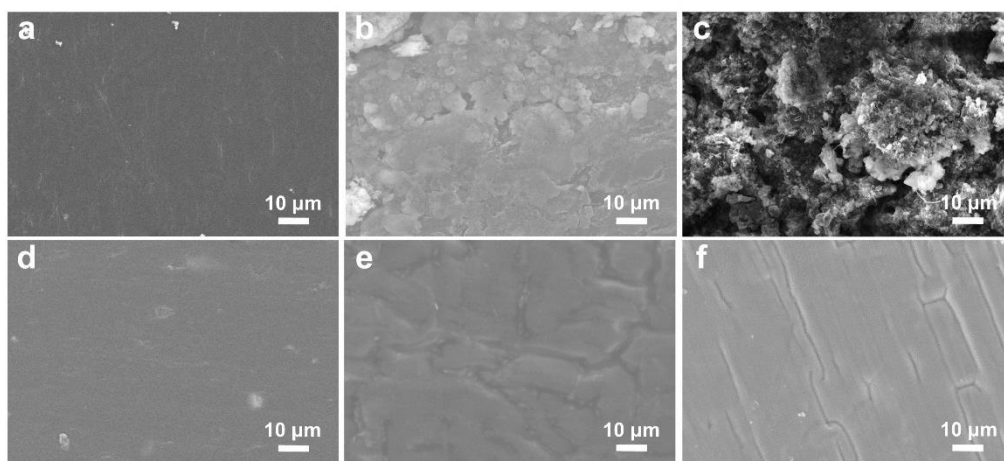

Figure S10. (a)Top-view SEM image of LiB anode before cycling; (b, c) top-view SEM images of LiB anode after 1st, 100th cycle, respectively; (d) top-view SEM image of LiB@LiPON anode before cycling; (e, f) top-view SEM images of LiB@LiPON anode after 1st, 100th cycle, respectively.

Table S1. some other work about electrochemical performance of using LiPON as an interface.

Anode	Preparation method	Coulombic efficiency	Capacity retention	Reference
Silicon	RF sputtering	67 % for first cycle	91 % for 150 cycles	[1]
Silicon	RF sputtering	97 % for 100 cycles	99 % for 100 cycles	[2]
Li	RF sputtering	Almost 100 % for 300 cycles	58 % for 300 cycles	[3]
Li	RF sputtering	<90% for 40 cycles	87.8 % for 40 cycles	[4]
Si-PAN	RF sputtering	<99 % for 100 cycles	85 % for 100 cycles	[5]
LiB	RF sputtering	99.84 % for 400 cycles	92.9% for 400 cycles	This work

Reference:

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