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Electronic Supplementary Information (ESI)

Surface Modification of Garnet Solid Electrolytes with Amorphous SnO_2 via Atomic Layer Deposition

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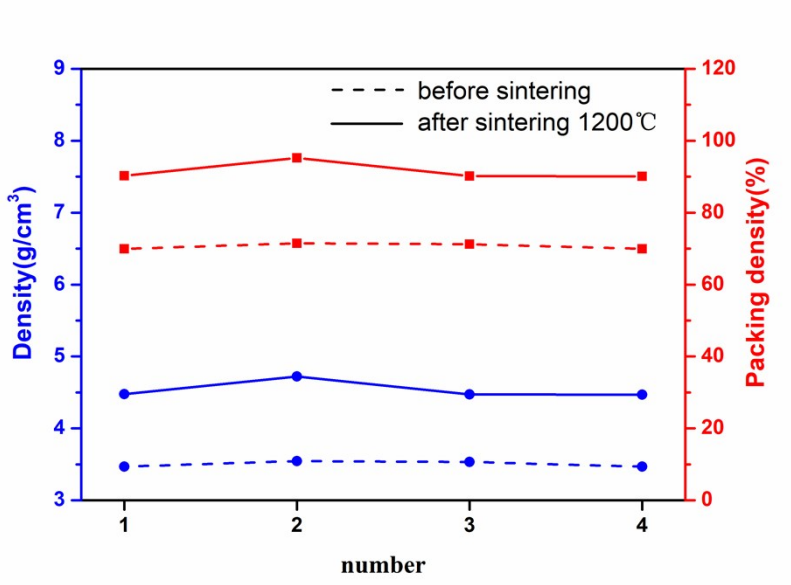


Fig. S1 Density and packing density of LLCZN before and after sintering.

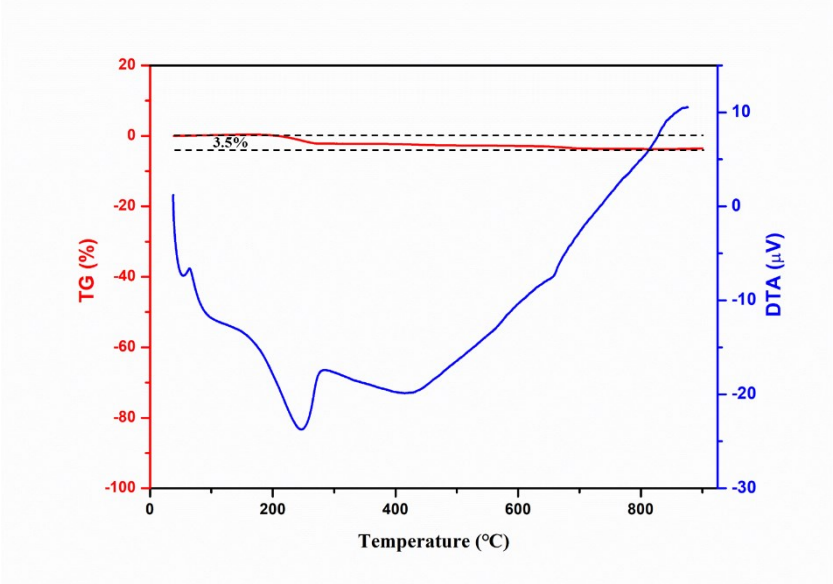


Fig. S2 TGA curve of the LLCZN powders with no obvious weight loss.

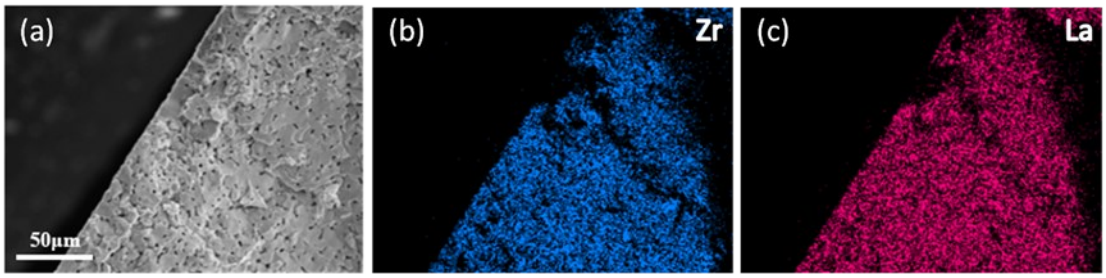
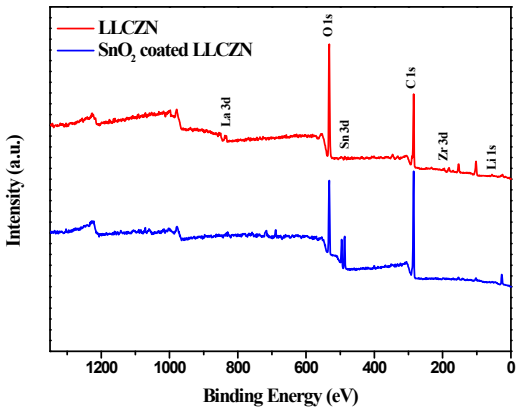


Fig. S3 (a) SEM image of the cross section of LLCZN pellets and (b,c) EDS mapping of La and Zr which are uniformly distributed.



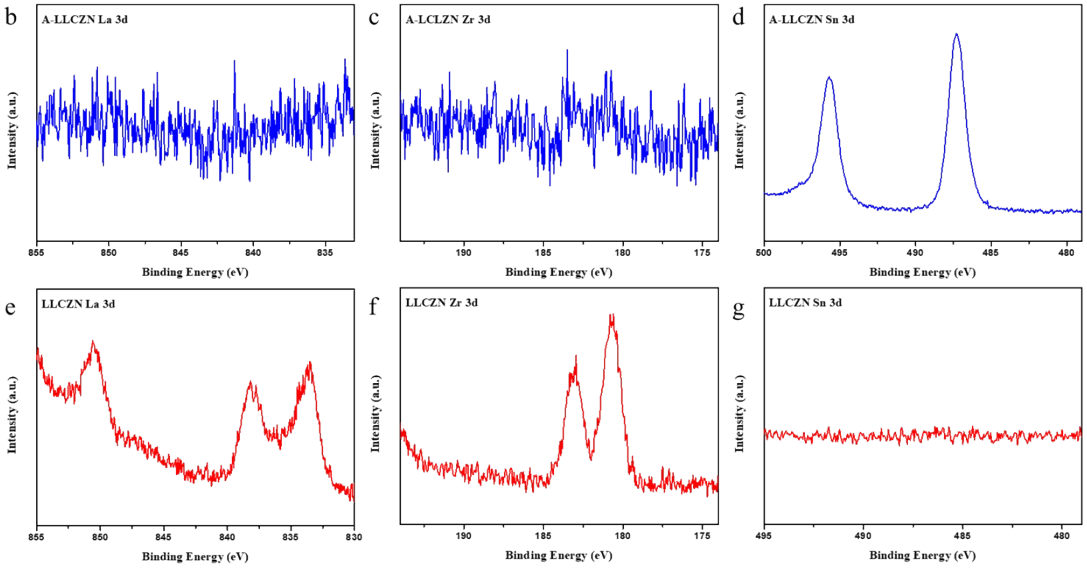


Fig. S4 XPS of LLCZN and SnO_2 coated LLCZN. (a) Full spectra of Li, C, O, Sn, La, and Zr; (b,c,d) spectral lined of La, Zr, and Sn of pristine LLCZN; (e,f,g) spectral lines of La, Zr, and Sn of SnO_2 coated LLCZN.

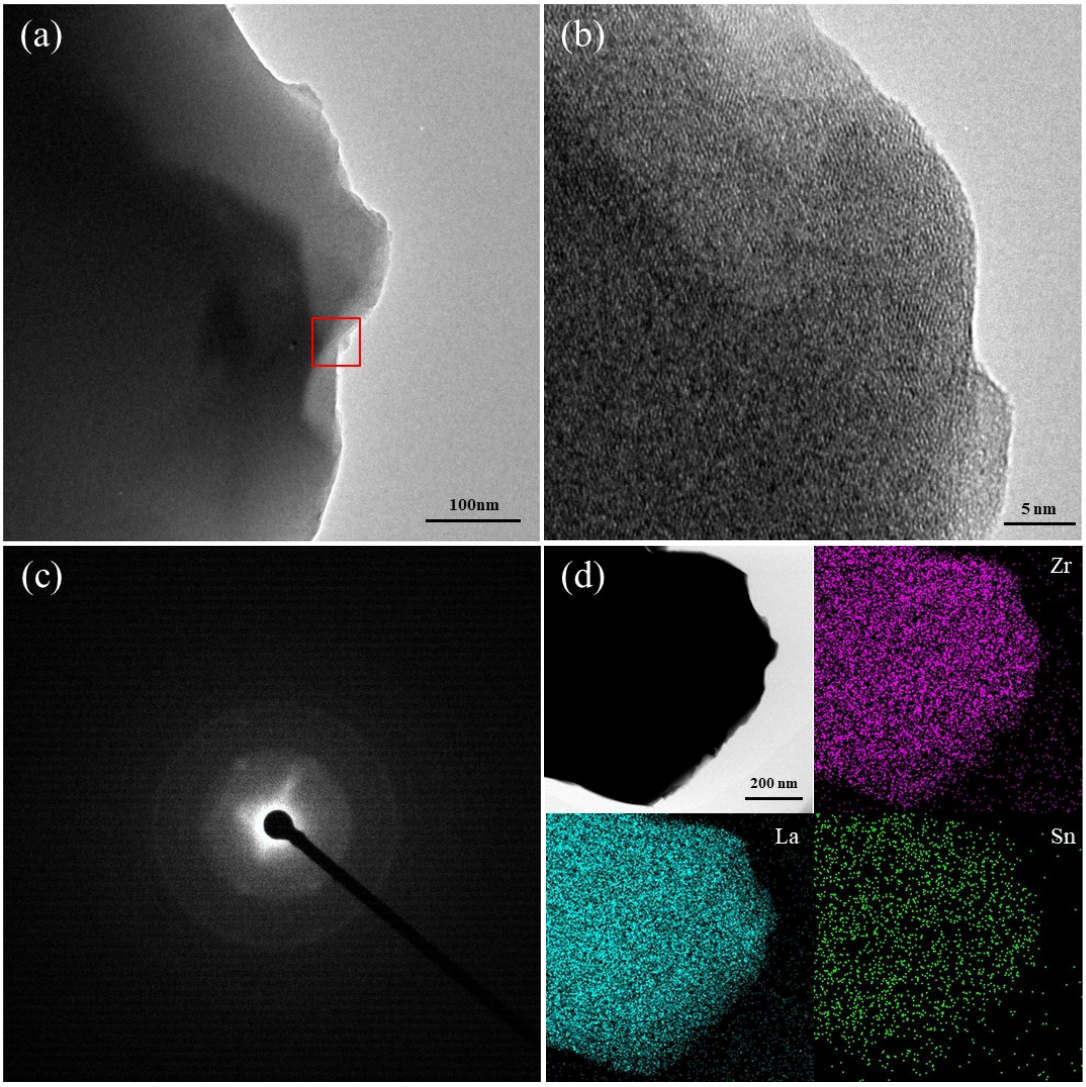


Fig. S5 (a) Dark field TEM image of as-scratched SnO_2 powders, (b) HRTEM image of the red box area, and (c) SAED pattern. (d) Overall EDS mapping images of Zr, La and Sn.

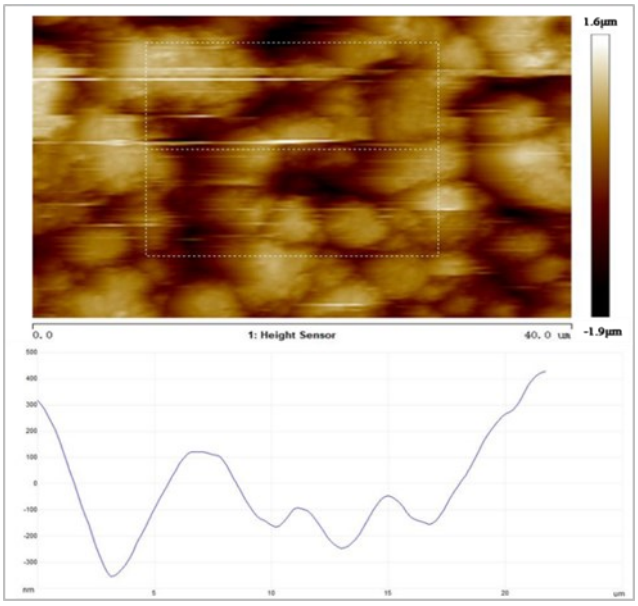


Fig. S6 AFM image of the pristine LLCZN pellet, which shows a rough surface with a fluctuation of over 100 nm.

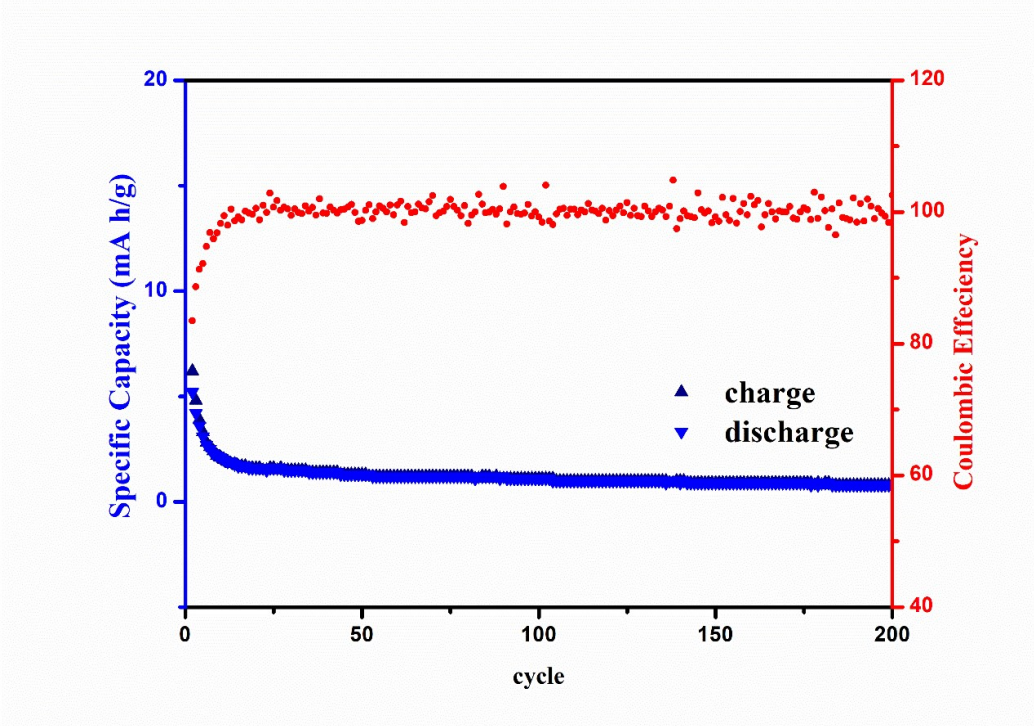


Fig. S7 Specific capacity and coulombic effeciency of Li|liquid electrolyte|LLCZN cells with the cut-off voltage from 0.5 V to 4.2 V.

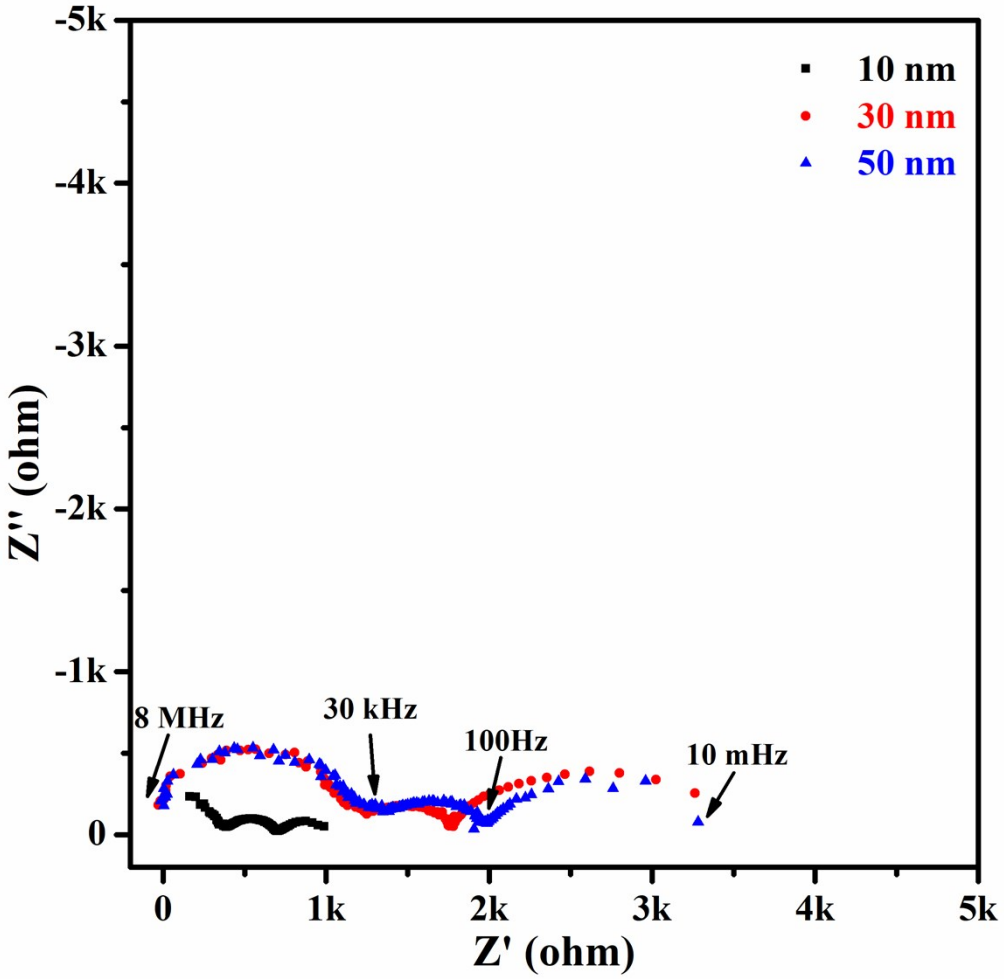


Fig. S8 EIS images of lithium symmetric cell of different thickness of SnO_2.

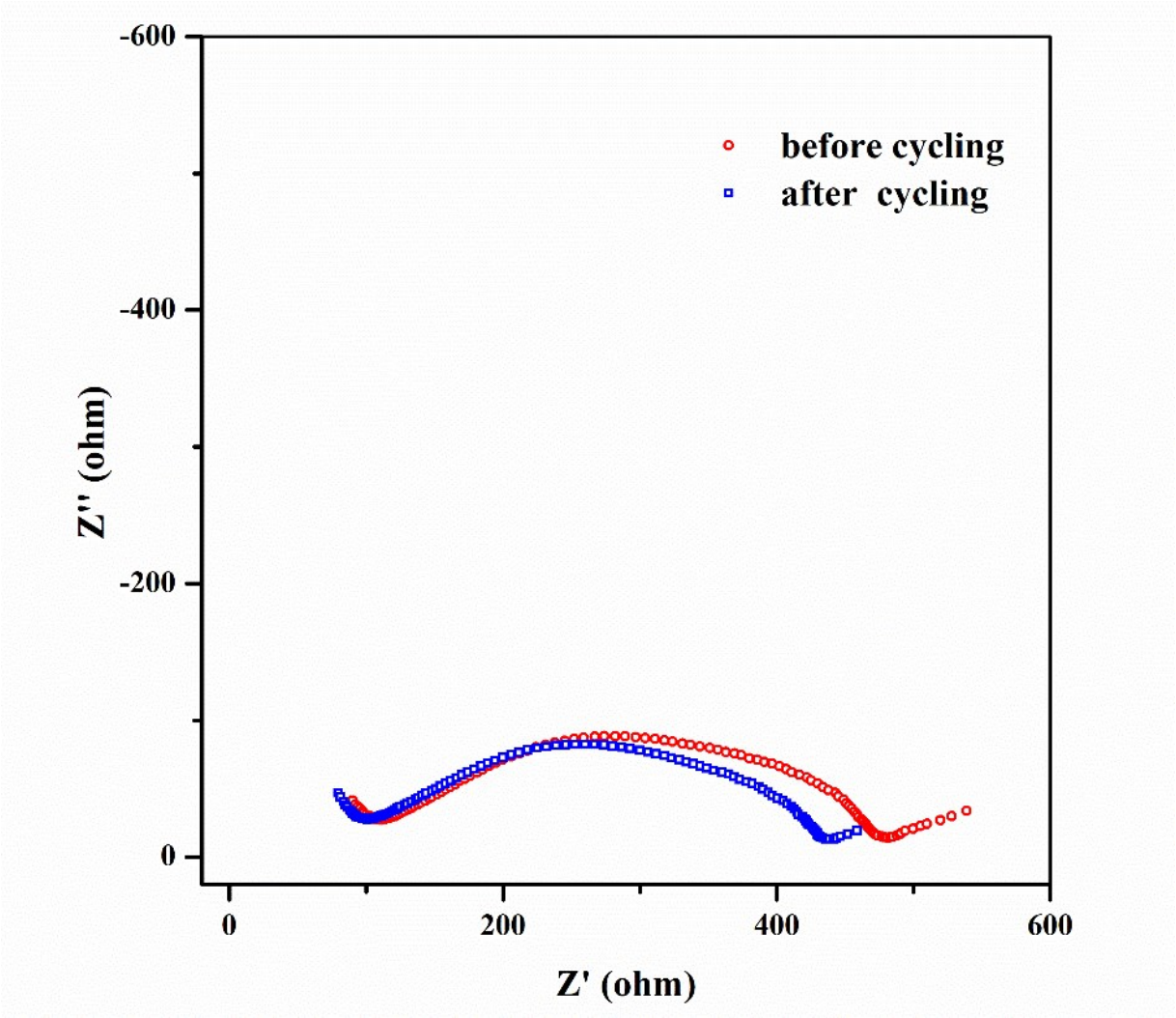


Fig. S9 EIS of the symmetric cell before and after cycling.

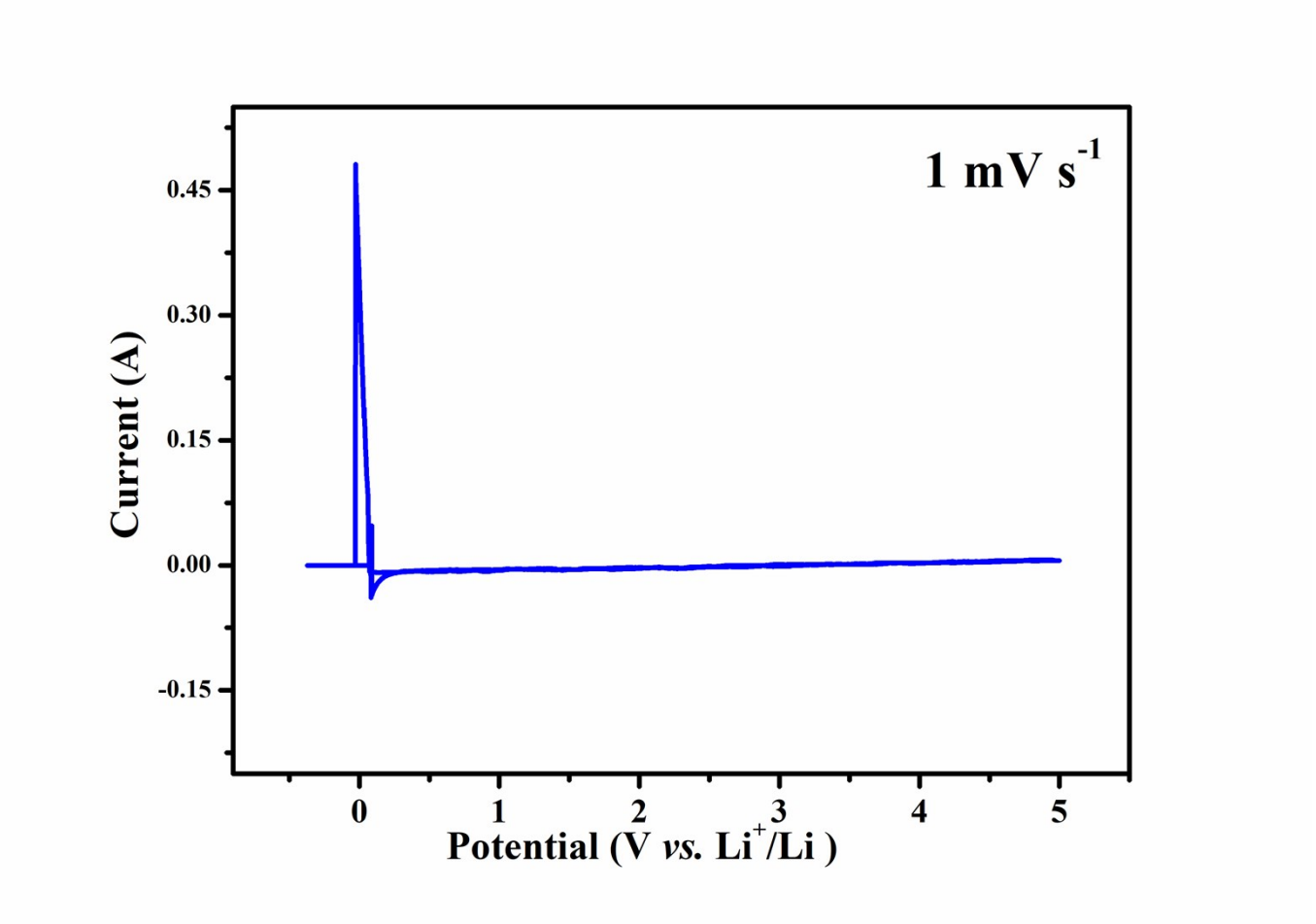


Fig. S10 CV curve of Li/LLCZN ALD SnO_2/Li cells at the voltage range of -0.5-5V with the scan rate of 1 mV s^{-1}.

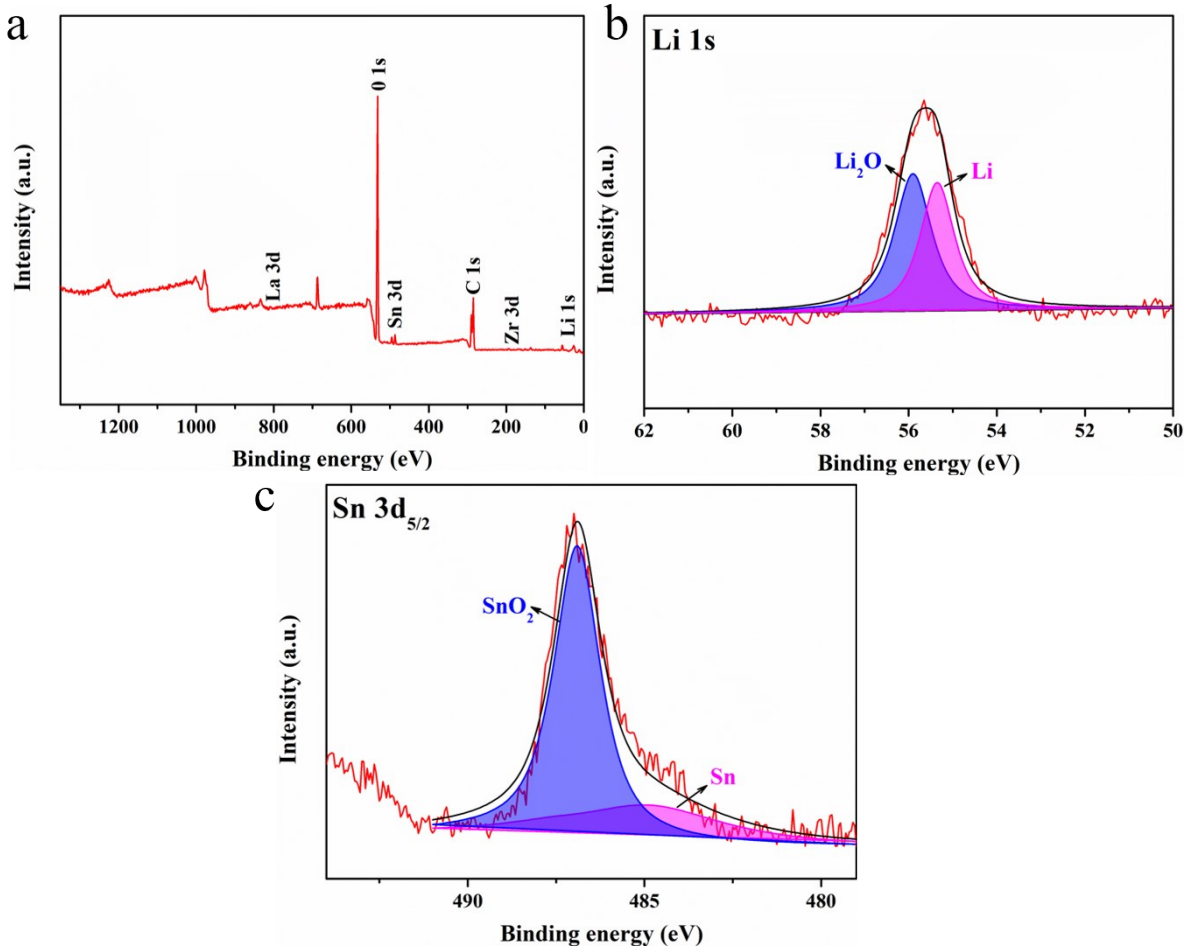


Fig. S11 XPS of after-cycled SnO_2 coated LLCZN. (a) Full spectra of Li, C, O, Sn, La, and Zr; (b) spectral lined of Li 1s; (c) spectral lines of Sn $3d_{5/2}$.