Electronic Supplementary Material (ESI) for Faraday Discussions.

Supplementary Information

Effect of depth of discharge (DOD) on cycling *in situ* formed Li anodes

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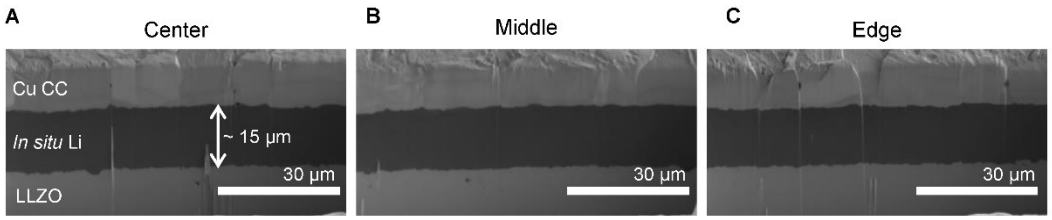

Figure S1. *In situ* Li layer after *in situ* plating.

SEM images of *in situ* Li/LLZO interfaces after *in situ* plating of 3 mAh cm^{-2} at (A) the center, (B) the middle and (C) the edge of the electrode.

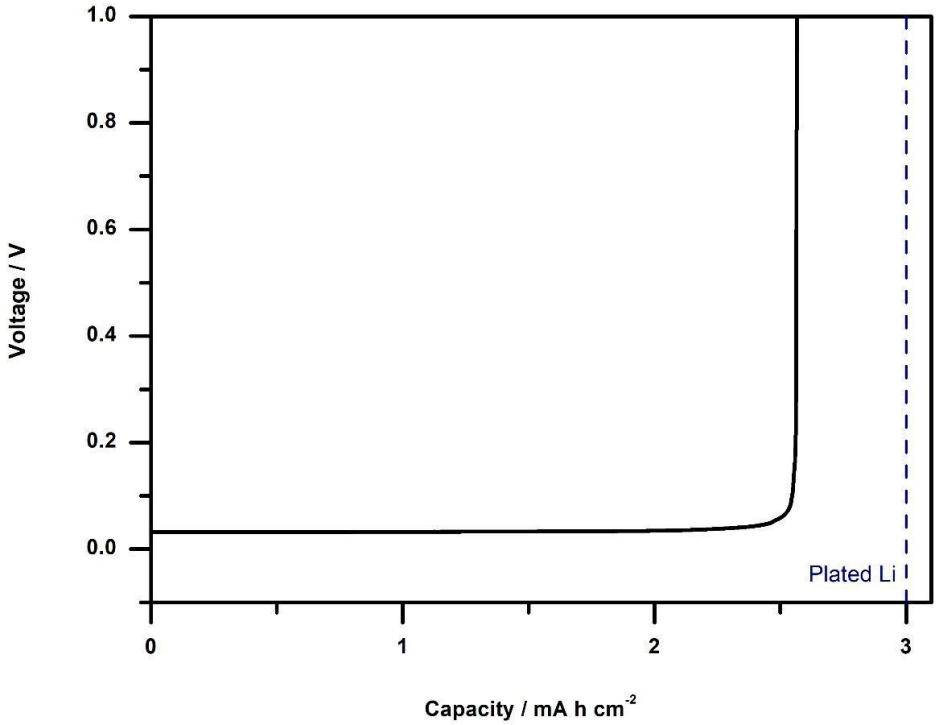

Figure S2. Voltage profile of unidirectional stripping.

3 mAh cm^{-2} of *in situ* Li was unidirectionally stripped at 0.75 mA cm^{-2}, 4.2 MPa and 60 °C.

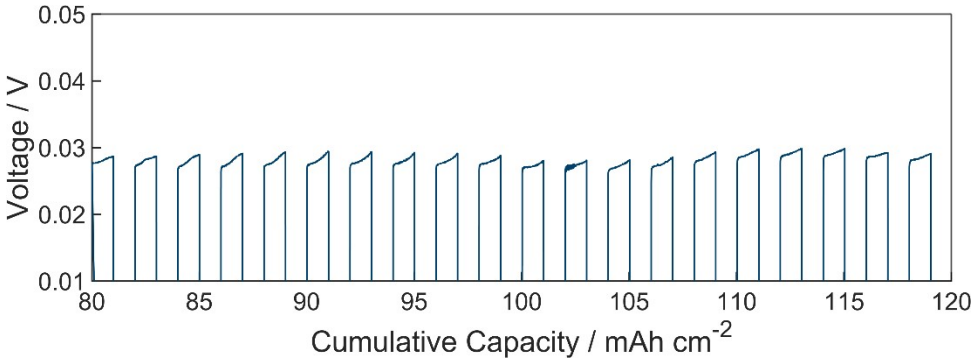

Figure S3. Magnified view of the voltage profile in Figure 2A.

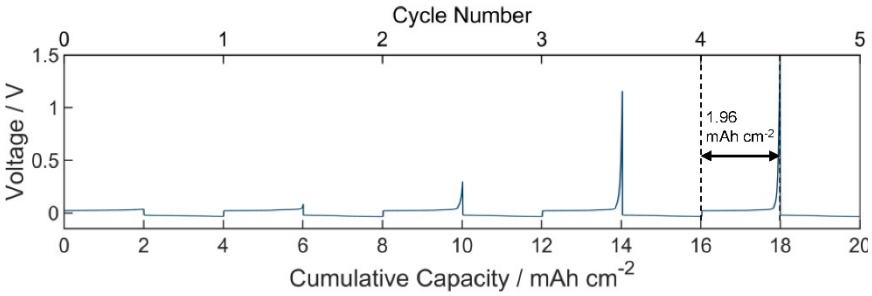

Figure S4. Voltage profile of the cell cycling at a DOD of 66% for Figure 4 D-F.

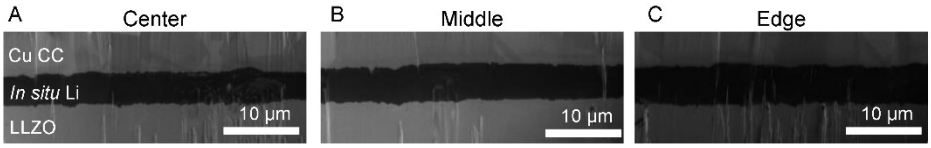

Figure S5. Li/LLZO interfaces after the first stripping half-cycle at a DOD of 66%.

Cross-sectional images of Li/LLZO interfaces at the (A) center, (B) middle and (C) edge of the electrode after stripping 2 mAh cm^{-2} out of total capacity of 3 mAh cm^{-2}.

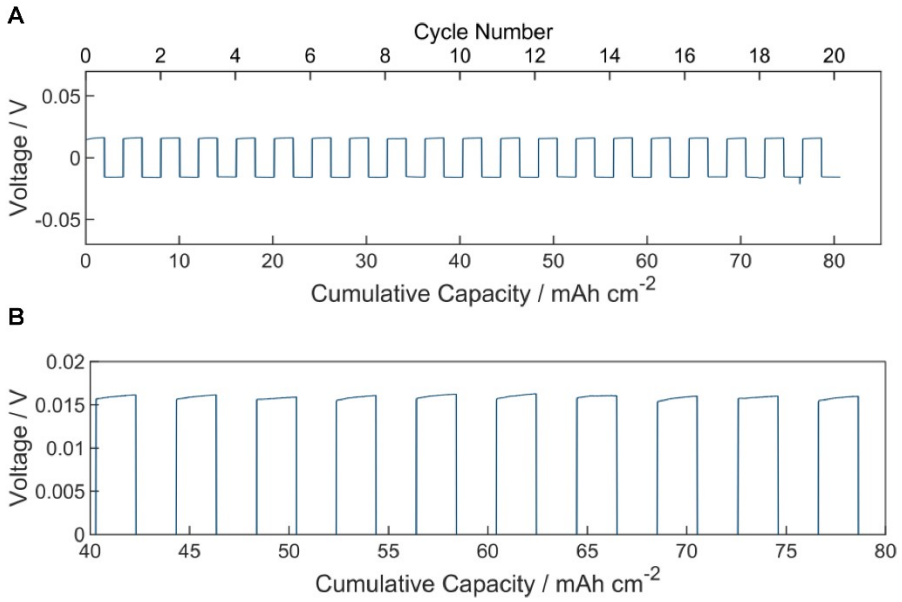

Figure S6. Cycling thick Li foil

(A) Voltage profile of cycling thick Li foil with a cycling capacity of 2 mAh cm^{-2} and a current density of 0.75 mA cm^{-2}. (B) Magnified view of (A).

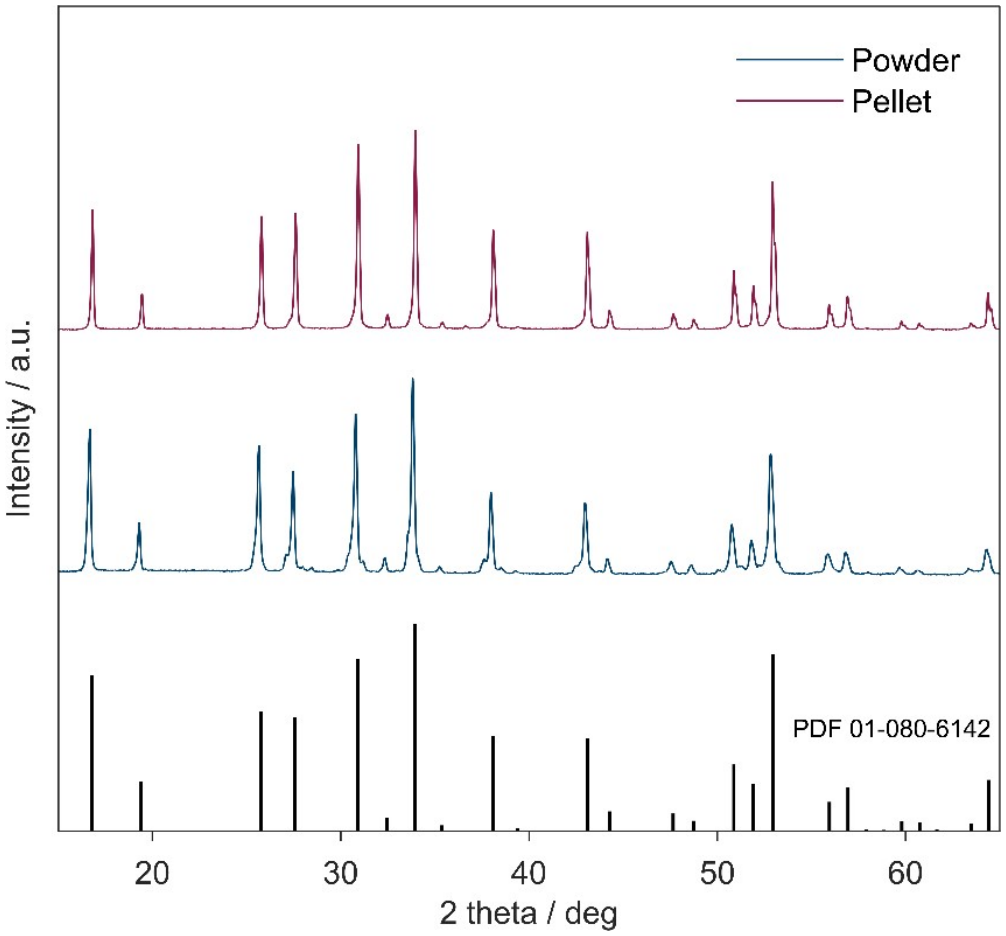

Figure S7. X-ray diffraction (XRD) spectra of Ta-doped LLZO powder (blue) and a hot-pressed pellet (red).