## **Supporting Information**

## Reinforcing Ionic Conductivity and Alleviating Dendrite Propagation of Dense Cubic Ga<sub>0.3</sub>Li<sub>6.1</sub>La<sub>3</sub>Zr<sub>2</sub>O<sub>12</sub> via Two-Step

## Sintering

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Figure S1. Schematic of TSS and CS method and corresponding digital images of the Ga-LLZO pellets under different temperature and time.



Figure S2. DC polarization curves of the Ga-LLZO samples.



Figure S3. ToF-SIMS depth profiles of the Ga-LLZO samples: (a) TSS 1200\_5, (b) TSS 1200\_10 and (c) TSS 1150\_10.



Figure S4. Digital photograph of the cross-section of the cycled Ga-LLZO.