Supporting Information for

Formation and Stability of Interface between Garnet-type Ta-doped $Li_7La_3Zr_2O_{12}$ Solid Electrolyte and Lithium Metal Electrode

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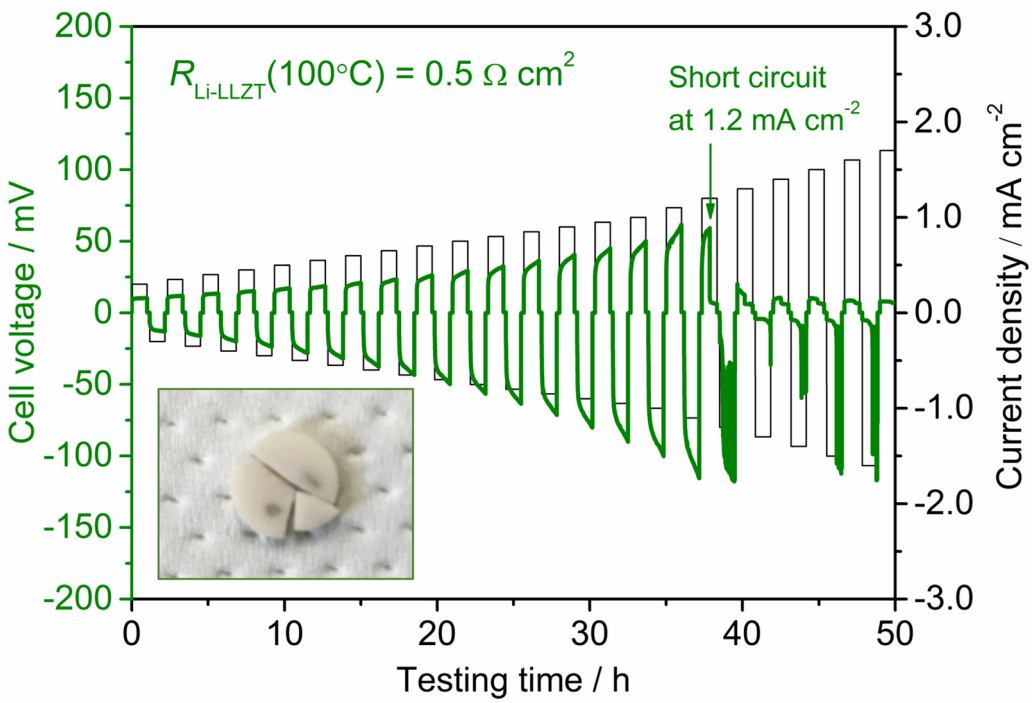

Figure S1. Galvanostatic cycling at 100ºC for Li/LLZT/Li cell with $R_{Li\text{-}LLZT}$ = 25 Ωcm^2 at 27ºC and 0.5 Ωcm^2 at 100ºC. Short circuit in the cell is occurred at current density of 1.2 mAcm^{-2}, which is three times higher than that for the cell tested at 25ºC in Figure 6(b). An inset in the graph is the photo of LLZT pellet removed from the cell after occurring short circuit.

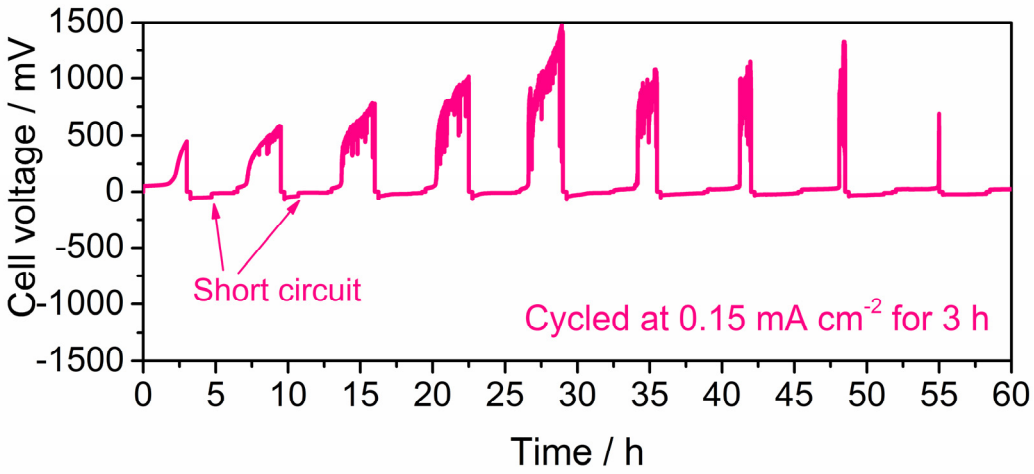

Figure S2. Galvanostatic cycling at 25ºC for Li/LLZT/Li cell with $R_{\text{Li-LLZT}}$ (27ºC) = 28 Ωcm^2 tested at 0.15 mAcm^{-2} for 3 h. The cell could not be cycled stably and short circuit is occurred during the cycling.

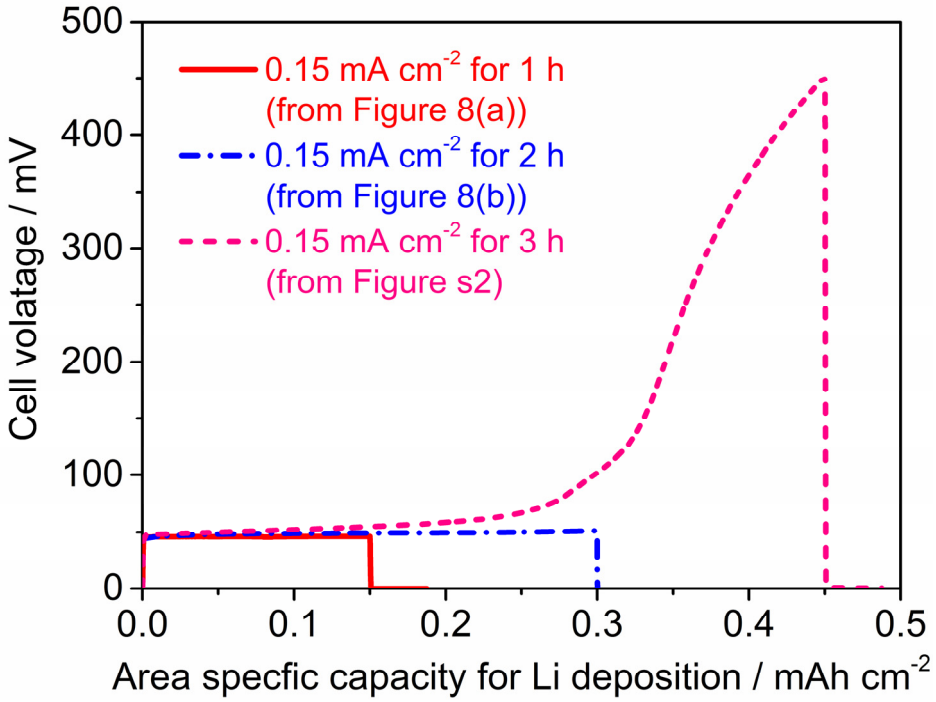

Figure S3. Cell voltage at 25°C and 0.15 mAcm^{-2} for 1, 2 and 3 h in Li/LLZT/Li cells as a function of area specific capacity for Li deposition. The plotted data are calculated from the data at the 1st cycle in Figure 4(a), Figure 4(b) and Figure S2. At 0.15 mAcm^{-2} for 1 and 2 h, the cell was stably cycled without occurring short circuit, but at 0.15 mAcm^{-2} for 3 h, the cell could not be cycled stably as shown in Figure S2. Increase in cell voltage becomes significant at area specific capacity above 0.3 mAh cm^{-2}.