

Supporting information for

Li₇La₃Zr₂O₁₂ Interface Modification for Li Dendrite Prevention

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Table S1. ICP-OES result for HP-LLZ:Ta.

Element	Al	La	Li	Zr	Ta
wt %	<0.01	0.38	4.96	15.7	7.99
at %	0.00	2.99	6.64	1.6	0.411

*The relative error for the content: >1% \pm 3%, otherwise it is \pm 10%

Table S2. Fitting parameters of Li/LLZ:Ta/Li cells that using and without using Au buffer layers. The fitting model circuit and results are shown in figure 5.

	R1	R2	CPE2-T	CPE2-P	R3	CPE3-T	CPE3-P
Without Au	107.1	1055	2.446E-7	0.896	1871	1.496E-6	0.751
With Au	101.6	167.8	4.30E-6	0.689	116.6	1.14E-3	0.56

Table S3. Fitting parameters of Li/LLZ:Ta/Li cell for before and after the constant dc experiment with a current density of 0.5 mA cm⁻² at 25 °C. The fitting results are shown in figure S4.

	R1	R2	CPE2-T	CPE-T	R3	CPE3-T	CPE3-P	R4	CPE4-T	CPE4-P
Before	101.40	33.07	8.36E-7	0.73	210.4	7.83E-3	0.5	-	-	-
After	98.96	5921	3.19E-8	0.95	40121	3.25E-8	0.89	9949	3.70E-5	0.5

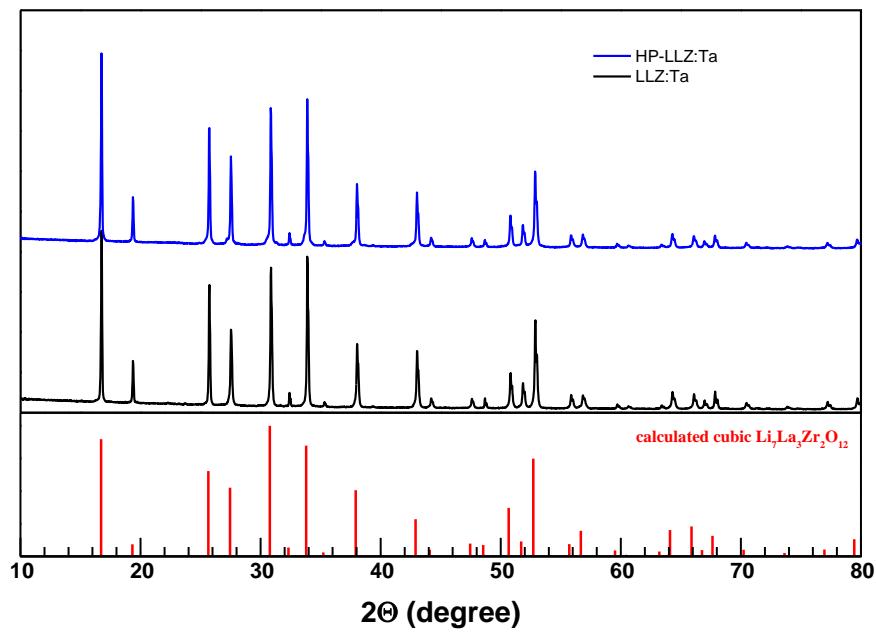


Figure S1. The XRD patterns of LLZ:Ta and HP-LLZ:Ta. The calculated cubic $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$ was calculated from the result of Awaka *et al.* in reference¹.

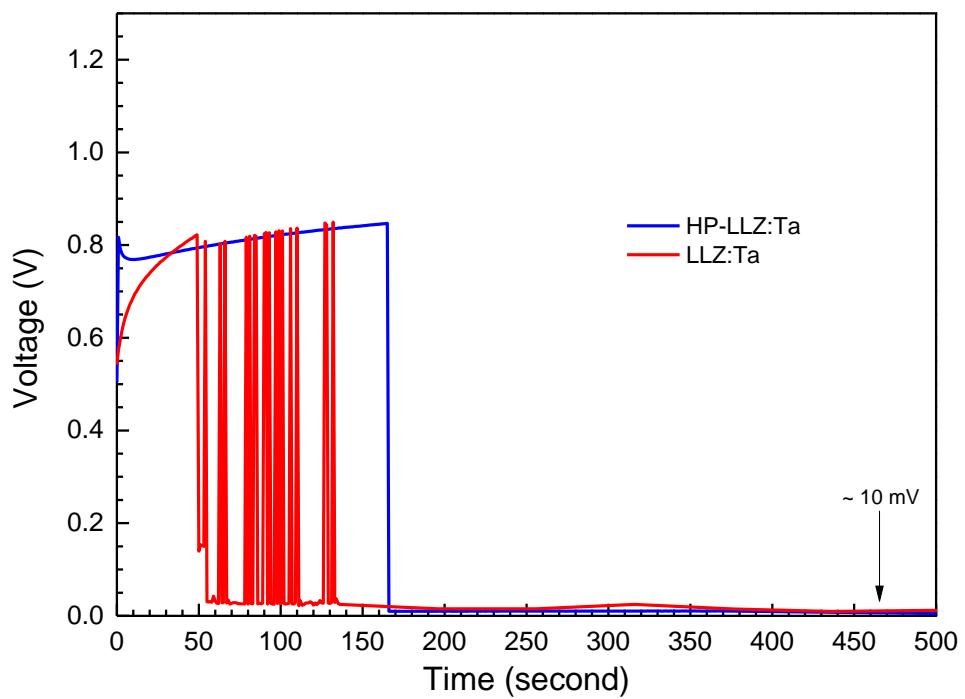


Figure S2. Constant dc measurements of Li/LLZ:Ta/Li and Li/HP-LLZ:Ta/Li cells without using Au as buffer layer at a current density of 0.5 mA cm^{-2} .

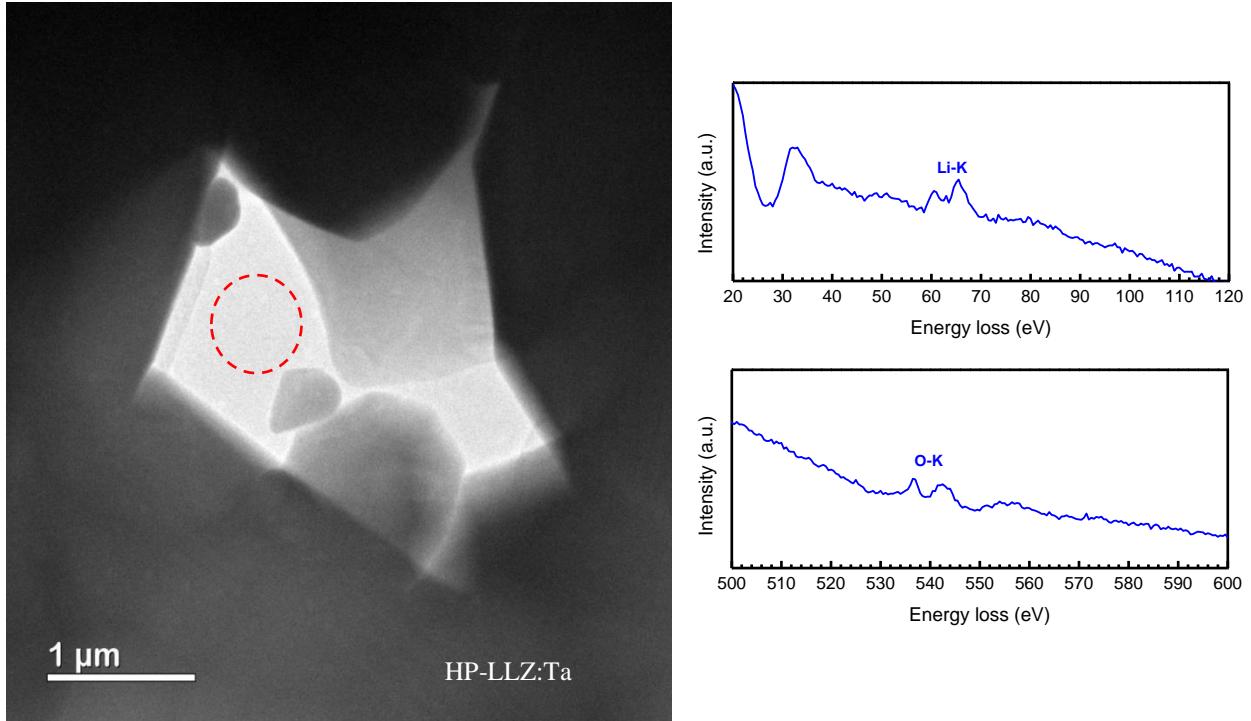


Figure S3. TEM images and EELS of HP-LLZ:Ta where Li oxide was found along the grain boundaries. The area used for the EELS is marked with the red circle.

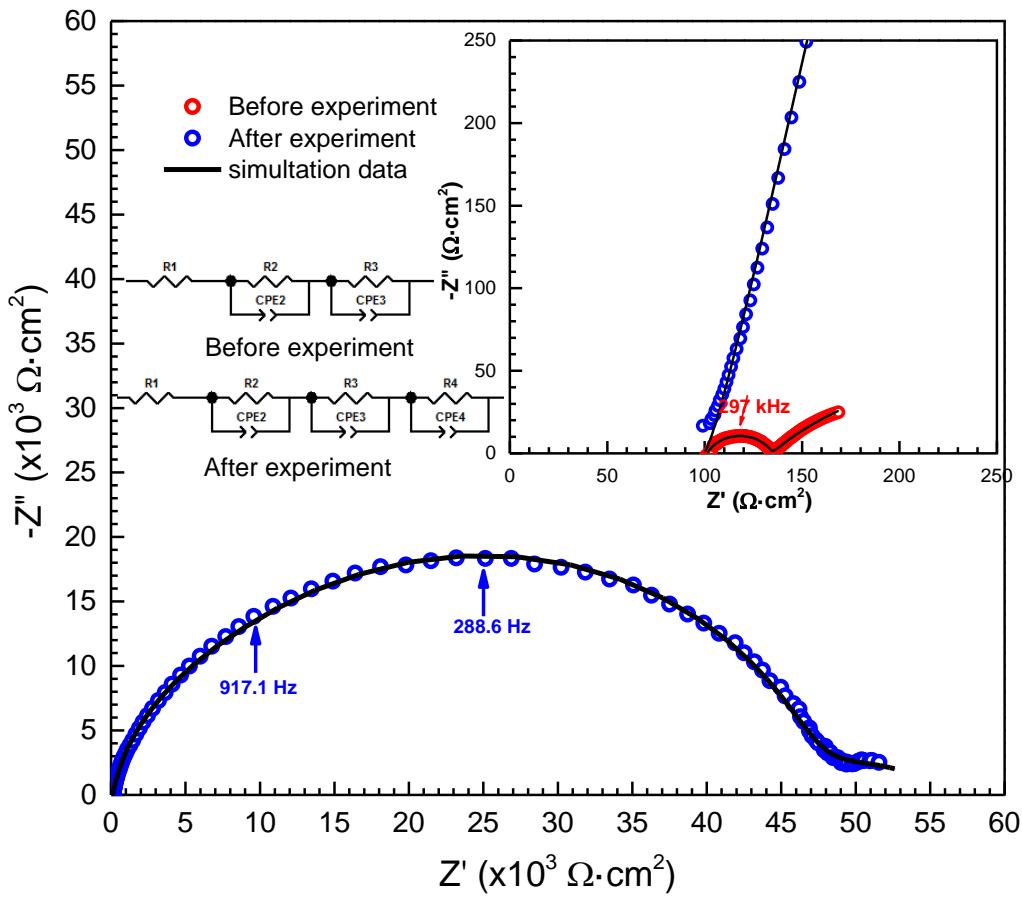


Figure S4. Impedance spectra for constant dc measurement of Li/LLZ-Ta/Li cell using Au buffer layers at 25 °C. The current density was 0.5 mA cm⁻². The inset model circuits were used for fittings.

1. Awaka, J.; Takashima, A.; Kataoka, K.; Kijima, N.; Idemoto, Y.; Akimoto, J. Crystal Structure of Fast Lithium-Ion-Conducting Cubic $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$. *Chem. Lett.* **2011**, 40, 60-62.