

Supporting Information

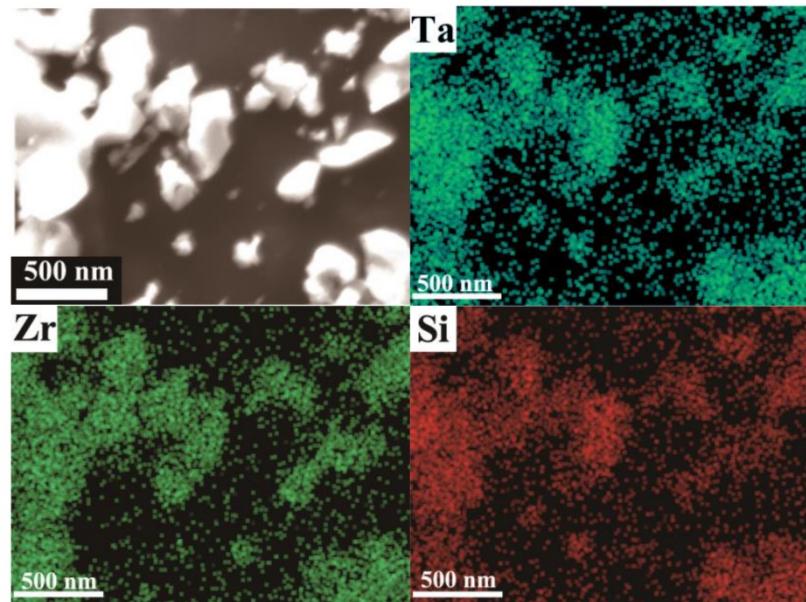


Figure S1. SEM image of K-LLZO and corresponding Ta, Zr, and Si element EDS mapping images

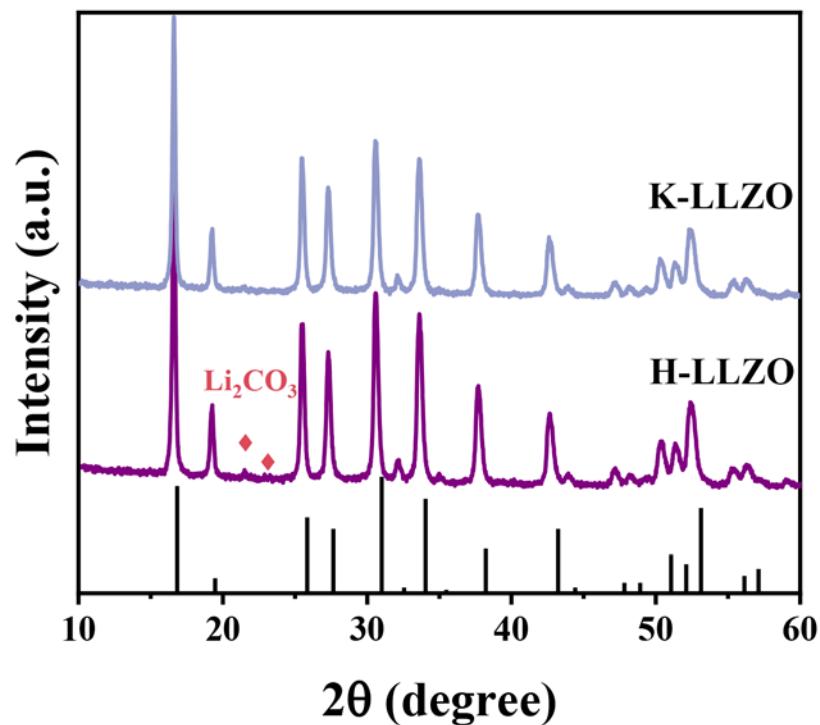


Figure S2. XRD patterns of K-LLZO and H-LLZO after one month exposure to air

Table S1. Comparation of energy storage property with the reported literatures

	SE	Operating temperature	Capacity retention	Reference
1	LLZTO@PDA/PEO	50°C	99.6% @50 cycles	[1]
2	LLZTO/PEO	50°C	87.0% @50 cycles	[1]
3	P-LAPL	RT	~50% @50 cycles	[2]
4	T-LAPL	RT	~90% @50 cycles	[2]
5	10Ca–CeO ₂ / PEO	60°C	~92% @40 cycles	[3]
6	LALZO@PEO	60°C	~95% @50cycles	[4]
7	LLZTO@PEO	60°C	~86% @50cycles	[5]
8	Garnet nanosheet@PEO	40°C	97.5% @30cycles	[6]
9	PISE-10% LZONF	RT	94.9% @ 60 cycles	[7]
10	KLP	RT	~100% @60 cycles	This work

RT: Room temperature

P-LAPL: Li_{6.4}La₃Zr₂Al_{0.2}O₁₂ particle with PEO/LiTFSI

T-LAPL: Three-dimensional Li_{6.4}La₃Zr₂Al_{0.2}O₁₂ framework with PEO/LiTFSI

LALZO: Al doped-LLZO

LLZTO: Ta doped- LLZO

PISE-10%LZONF: The 10% LLZTO Nanofibers reinforced polymer-in-salt PEO-based composite electrolyte

KLP: KH-550 modified LLZO/PEO

Table S2 Equivalent circuit fitting value

Samples	R_{ohm}/Ω	R_{ct}/Ω	R_{total}/Ω
10% PLP	249.8	195.9	445.7
15% PLP	236.4	160.8	397.2
20% PLP	213.2	111.8	325
30% PLP	199.1	180.8	379.9
1%-20% KLP	~1	251.1	252.1
2%-20% KLP	~1	95.7	96.7
3%-20% KLP	~1	124.4	125.4
4%-20% KLP	~1	159.5	160.5

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