

Supporting Information

Lithium-Salt-Containing Ionic Liquid-Incorporated Li-Al-Layered Double Hydroxide-Based Solid Electrolyte with High-Performance and Safety in Solid-State Lithium Batteries

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Table S1. Comparison with the reported electrochemical performances of ionic liquid-based SEs.

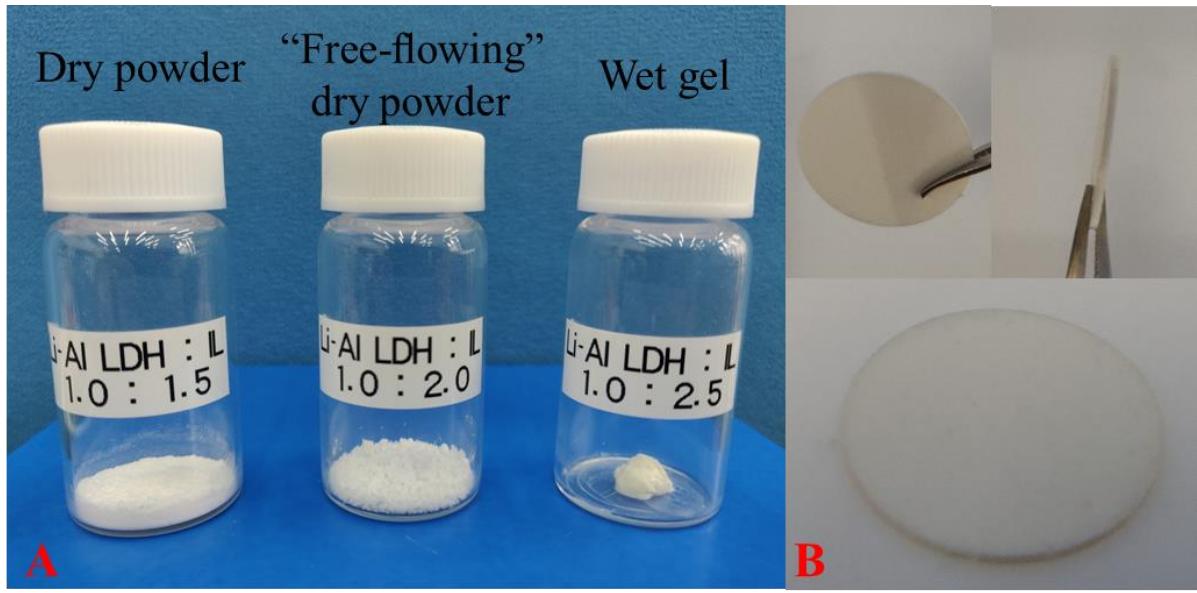


Figure S1. (A) Photographs of the Li–IL@Li–Al LDH with different contents of Li-IL and (B) Li–IL@Li–Al LDH (2.0:1) SE dish.

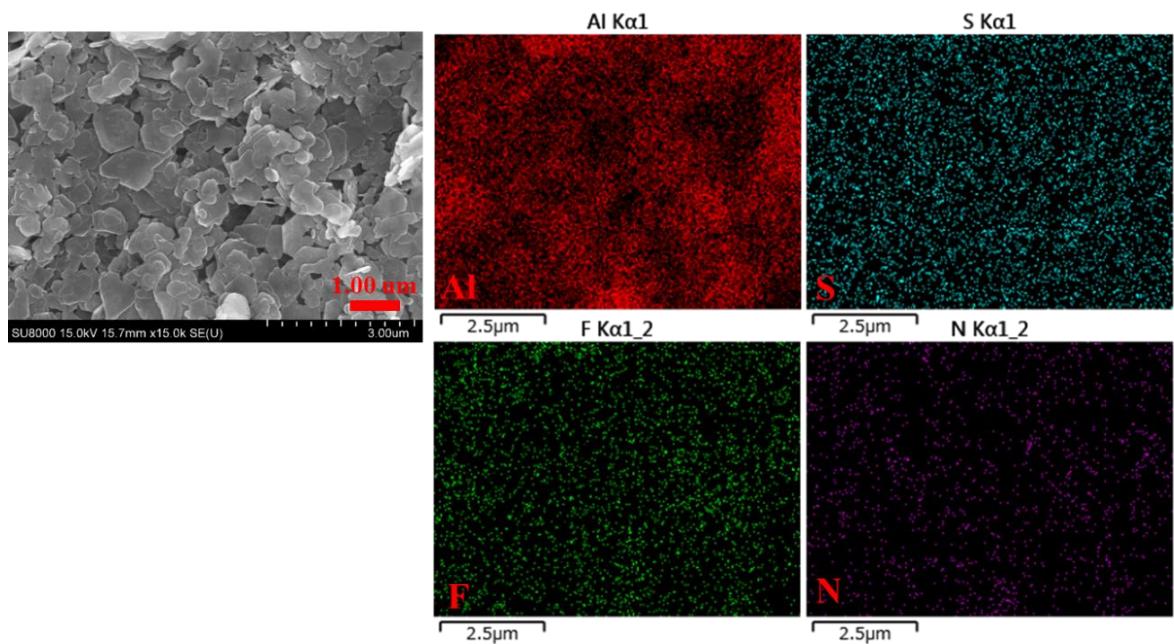


Figure S2. EDS mappings of the Li–IL@Li–Al LDH (2.0:1).

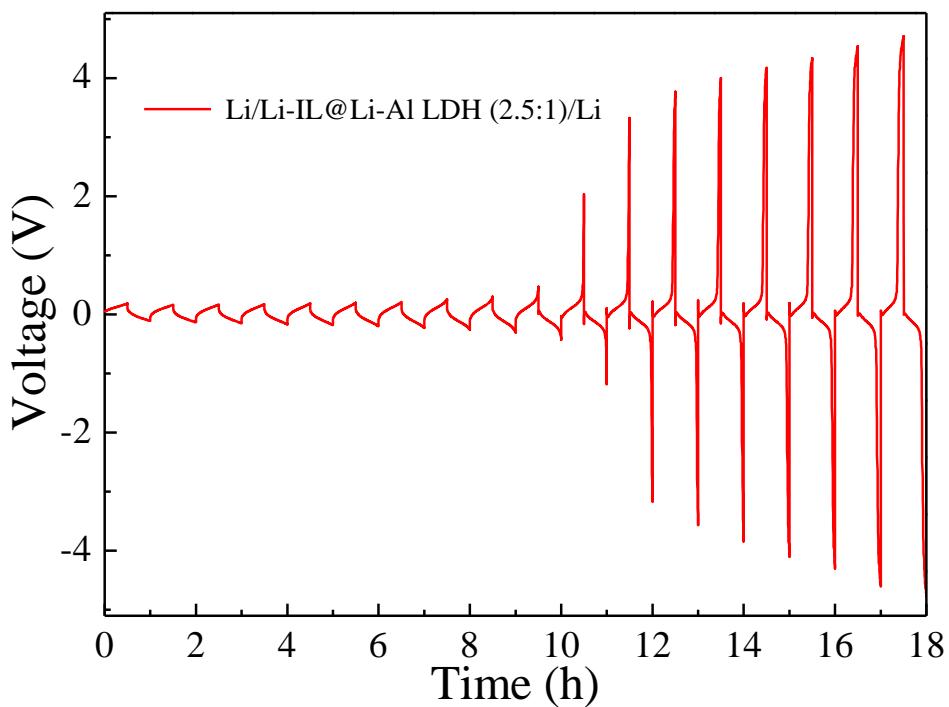


Figure S3. Voltage–time profile of Li metal plating and stripping at 0.2 mA for Li/Li–IL@Li–Al LDH (2.5:1)/Li batteries.

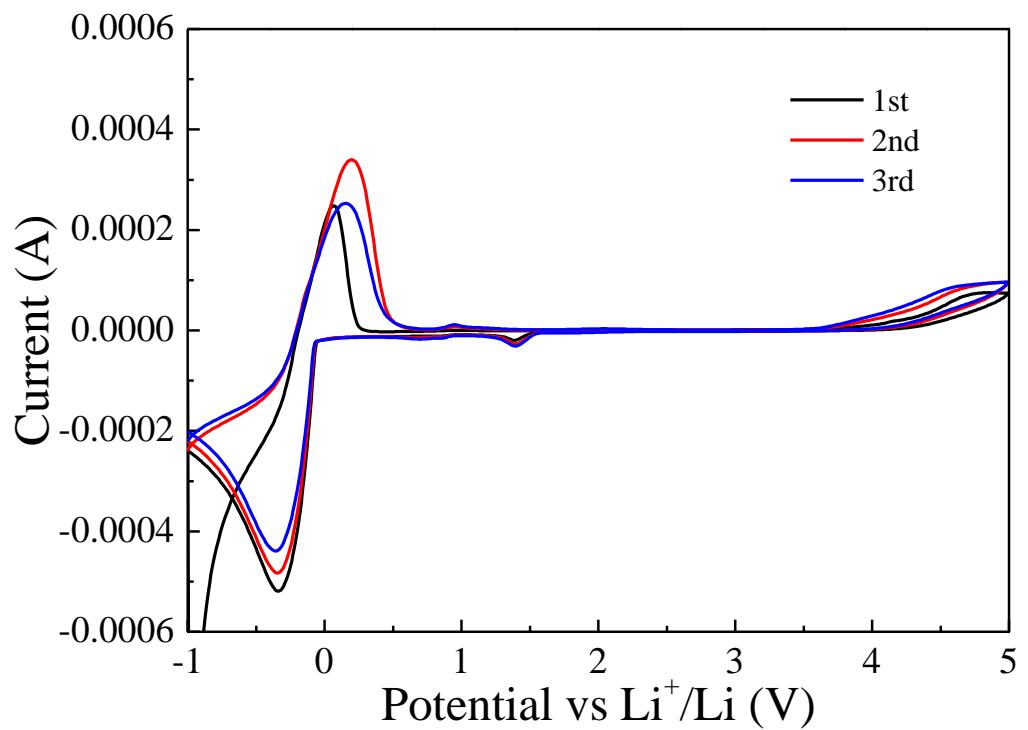


Figure S4. CV curves of Li-IL@Li-Al LDH (2.5:1) based batteries under a scan rate of 0.5 $\text{mV}\cdot\text{s}^{-1}$.

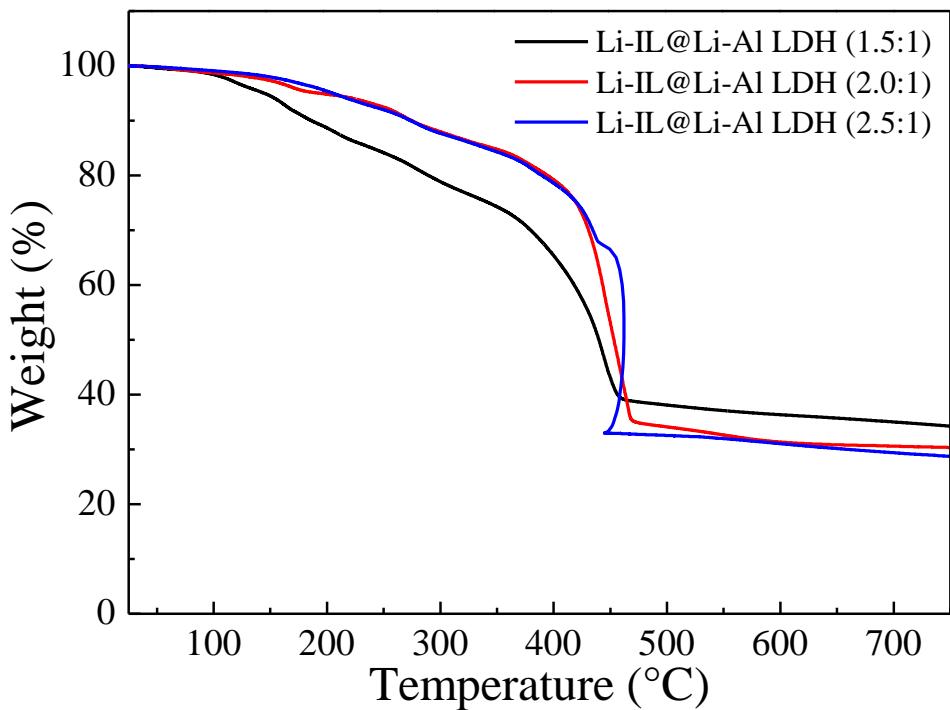


Figure S5. TGA analyses of Li-IL@Li-Al LDH (1.5:1), Li-IL@Li-Al LDH (2.0:1), and Li-IL@Li-Al LDH (2.5:1).

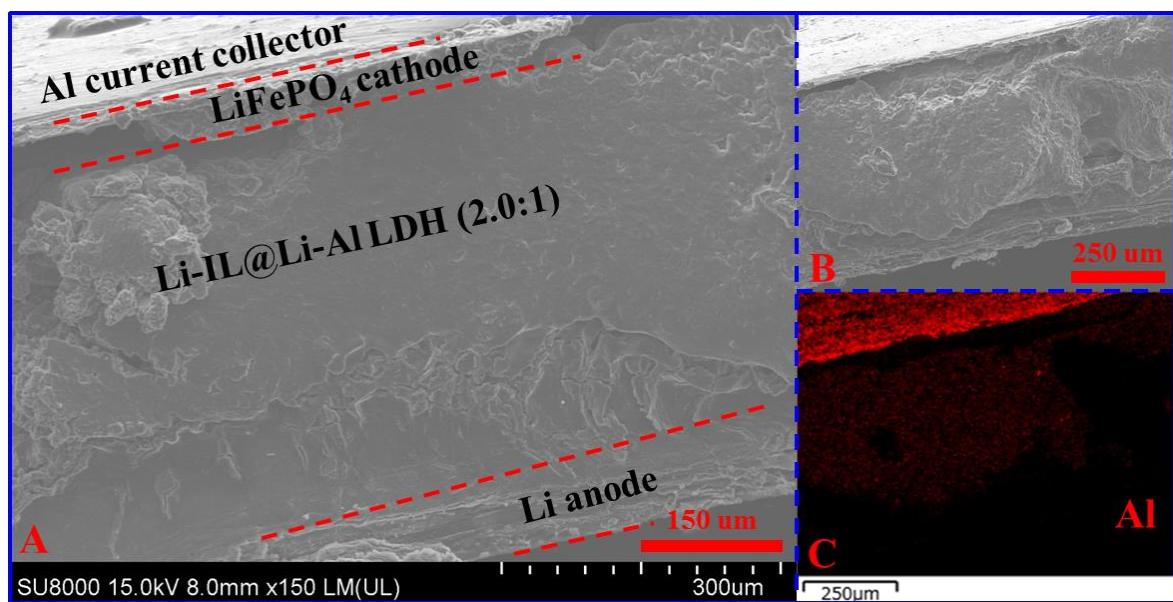


Figure S6. (A) Cross sectional image and (B-C) EDS of the LiFePO₄/Li-IL@Li-Al LDH (2.0:1)/Li battery.

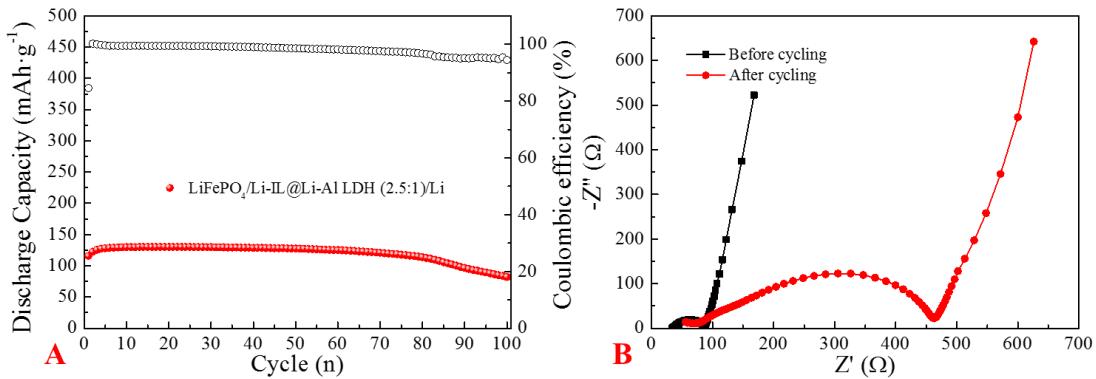


Figure S7. Cycling performances at (A) 1 C and (B) EIS spectra of the LiFePO₄/Li-IL@Li-Al LDH (2.5:1)/Li battery at 40 °C.

Table S1. Comparison with the reported electrochemical performances of ionic liquid-based SEs.

Solid electrolyte	Li salt	Conductivity ($\times 10^{-3}$ S·cm ⁻¹)	Electroche mical windows	Temperatur e (°C)	Ref.
Graphene-IL-					
sulfonated polyimide	Li ⁺ NTFSI ⁻	7.5	-	160	¹
PEO-IL	LiDFOB	0.185	-	30	²
PVDF-HFP-I					
L	LiClO ₄	0.6	-	-	³
LLZO-IL	LiTFSI	0.4	5.5	25	⁴
Li-IL@Li-Al	LiTFSI	0.850	4	30	This

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