

Granular Creep and Its Role in Optimizing Solid Electrolyte Fabrication for Solid-State Batteries

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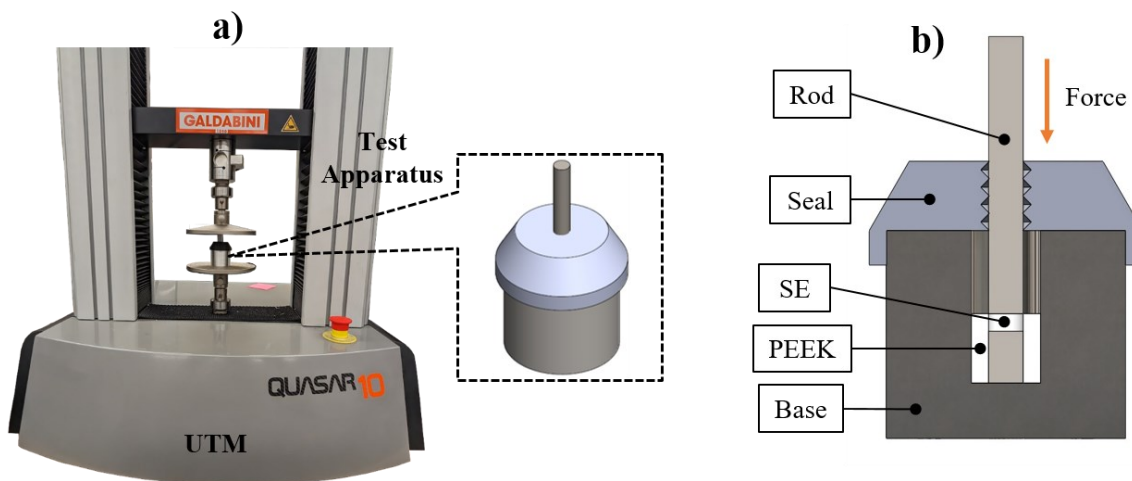
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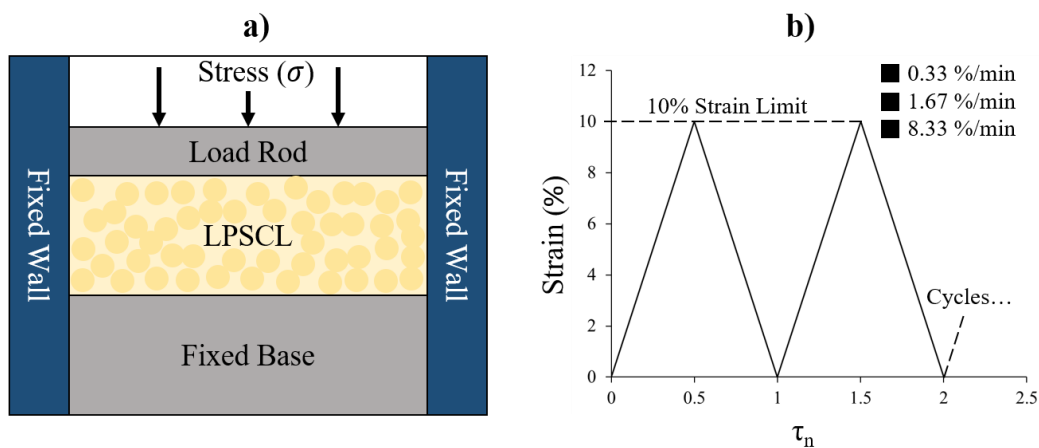
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Supplementary Information

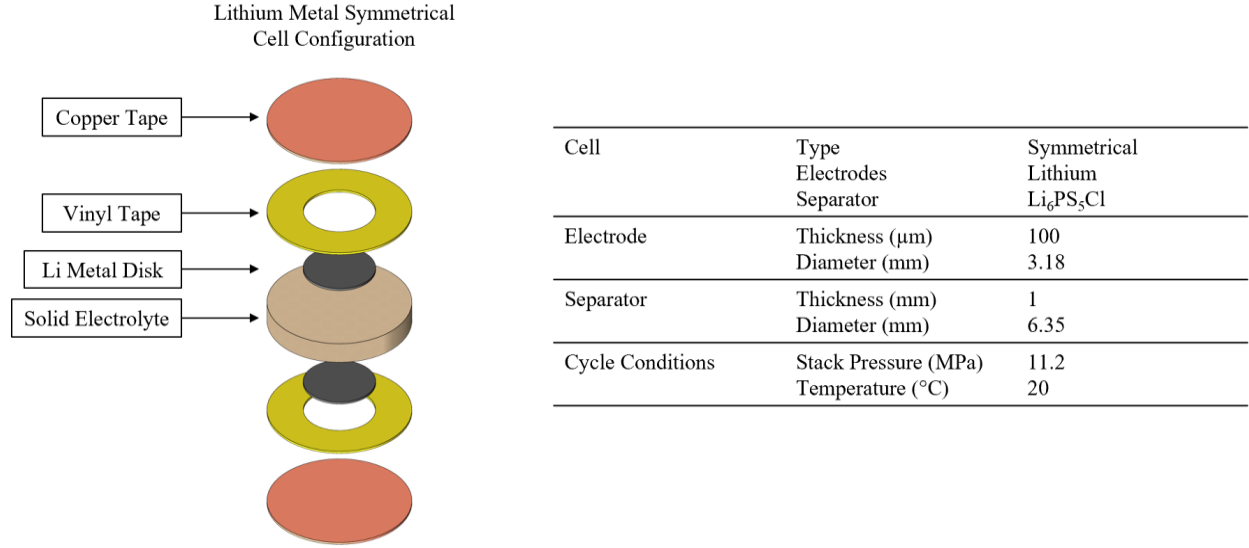


SI Figure 1. Solid Electrolyte preconditioning testing setup. a) Picture of UTM with testing apparatus. b) Labeled schematic of testing apparatus.

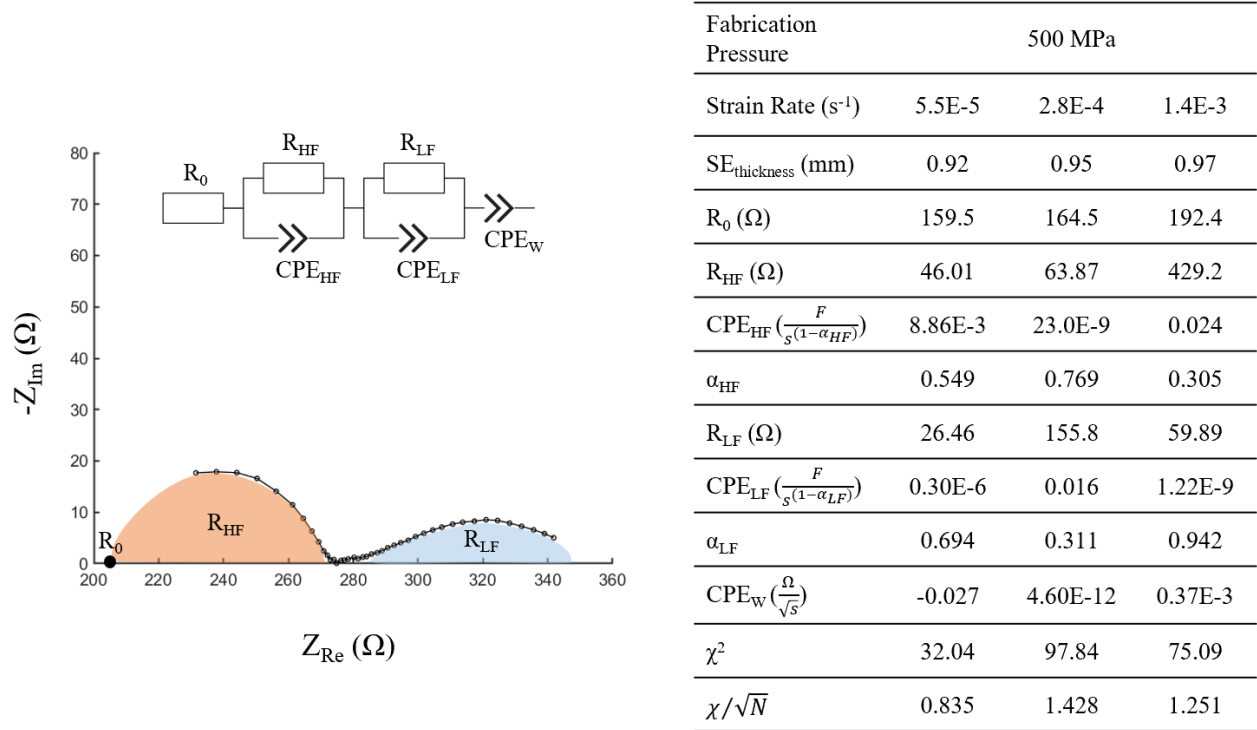


SI Figure 2. a) Schematic of LPSCl pellet configuration during mechanical loading preconditioning. b) Varying strain rates provided by UTM mechanical loading, where is τ_n normalized time.

Support Information

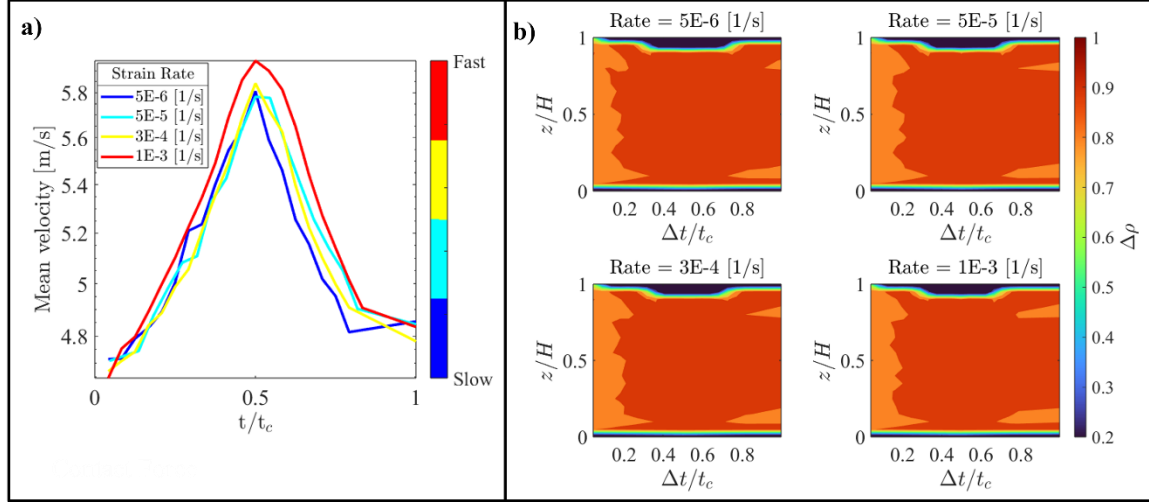


SI Figure 3. Lithium metal symmetrical cell configuration schematic and relevant parameters table.



SI Figure 4. Equivalent circuit model and analysis table for EIS analysis.

Support Information



SI Figure 5. Compression and decompression states for different strain rates at high cohesive surface energy; (a) Spatial average velocity of the grains as a function of time; and (c) Temporal evolution of the packing fraction for different strain rates.

Table 1. Simulation Parameters

Description	Units	SE (LPSCl)
Young's Modulus (E)	GPa	22.1 ¹
Poisson's ratio (ν)		0.3 ¹
Density (ρ)	g/cm^3	1.64 ²
Coefficient of Friction (μ)		0.1*
Coefficient of Rolling Friction (μ_r)		0.1*
Coefficient of Restitution (e)		0.1*
Cohesion Energy Density (k)	J/m^3	1E+5*

[1] Fukunishi, G., Tabuchi, M., Ikezawa, A., Okajima, T., Kitamura, F., Suzuki, K., ... & Arai, H. (2023). AC impedance analysis of NCM523 composite electrodes in all-solid-state three electrode cells and their degradation behavior. *Journal of Power Sources*, 564, 232864.

[2] [Lithium phosphorus sulfur chloride \(LPSCl\) powder battery grade | Sigma-Aldrich](#)

[*] Numerical values obtained from benchmark tests comparing stress strain curves from experiments