Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Solvent Exchange-Induced Facile Recrystallisation and Particle Size Control of Sulphide Solid Electrolytes for All-Solid-State Li-Ion Batteries

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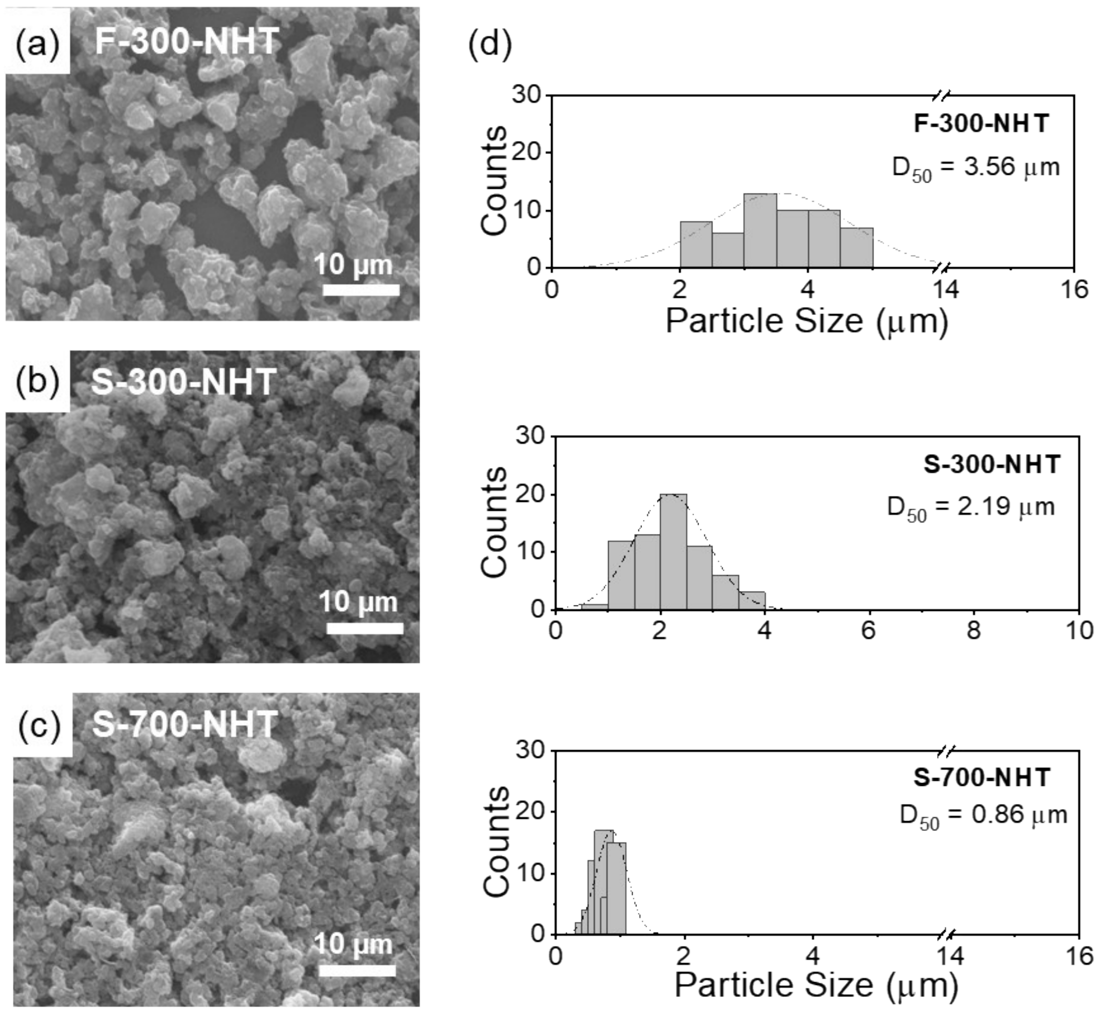
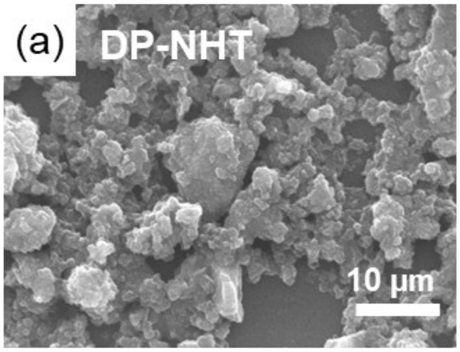
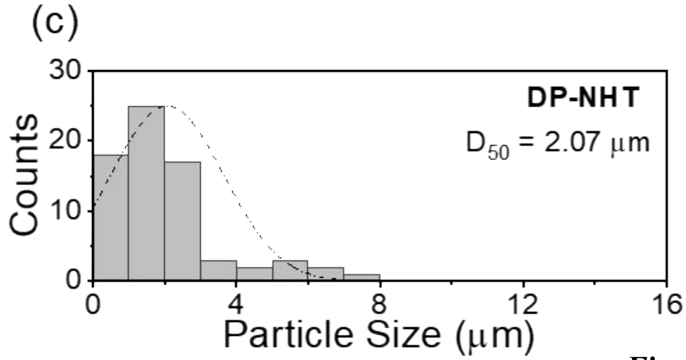
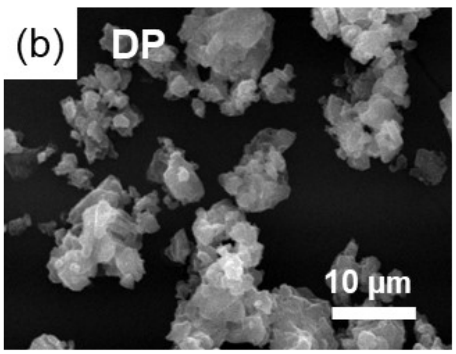


Figure S1. *(a-c) SEM images of SSE powderss prepared by the solvent exchange technique (a: F-300-NHT b: S-300-NHT, and c: S-700-NHT). (d) Particle size distribution of F-300-NHT, S-300-NHT, and S-700-NHT SSE powders for the estimation of the* D_{50} *values.*







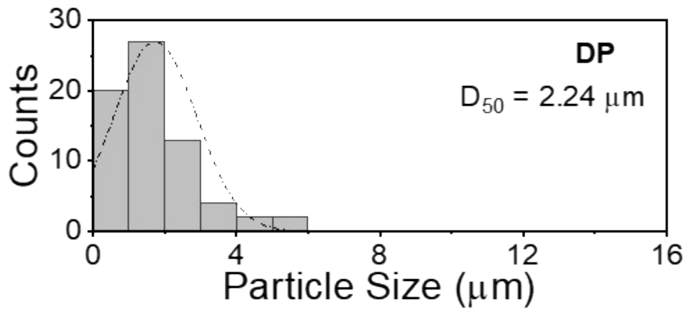


Figure S2. *(a-b) SEM images of the DP SSE powders (a: DP-NHT and b: DP). (c) Particle size distribution of DP-NHT and DP SSE powders for the estimation of the* D_{50} *values.*

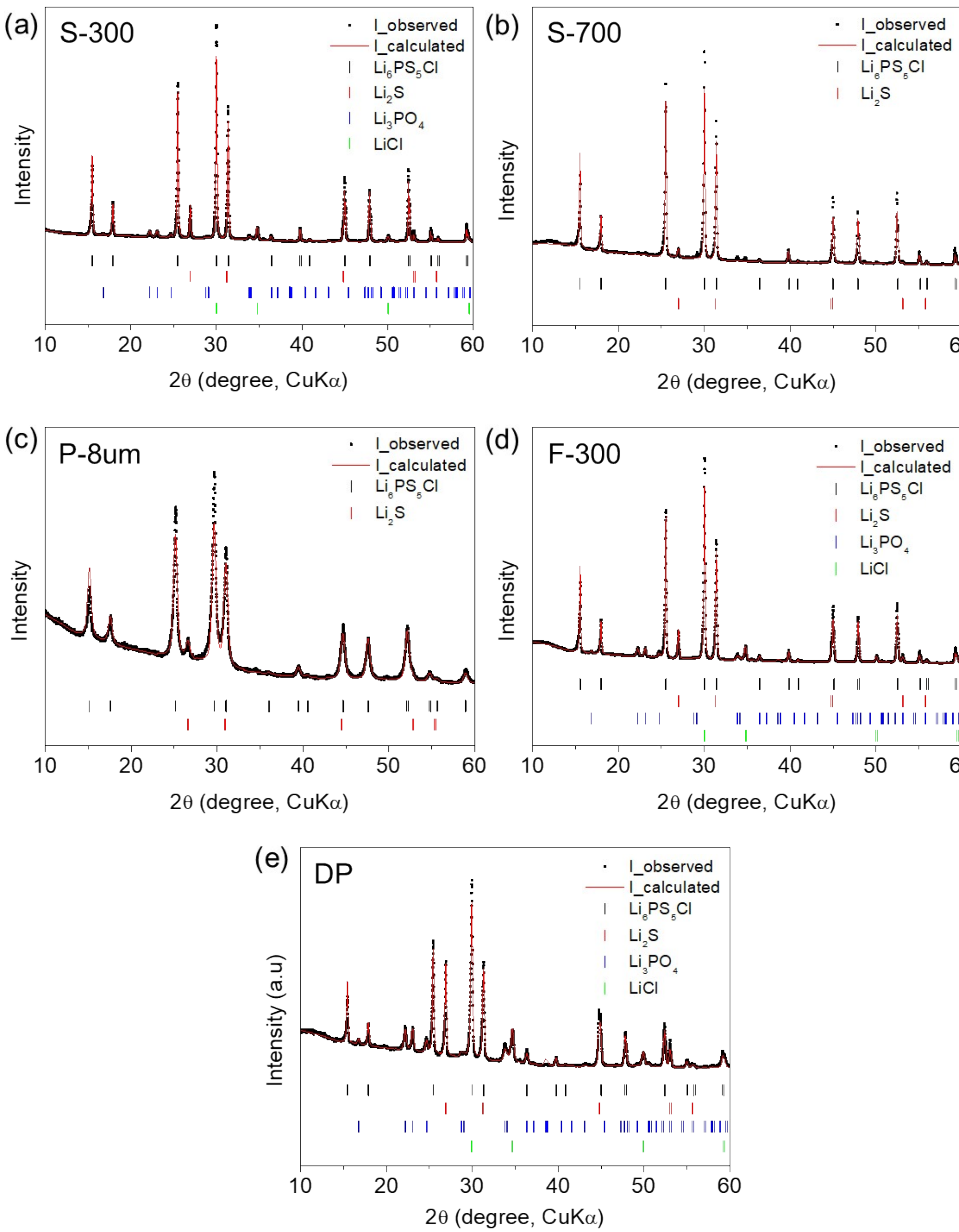


Figure S3. *Rietveld refinement results for a) S-300, b) S-700, c) P-8μm, d) F-300, and e) DP SSE powders.*

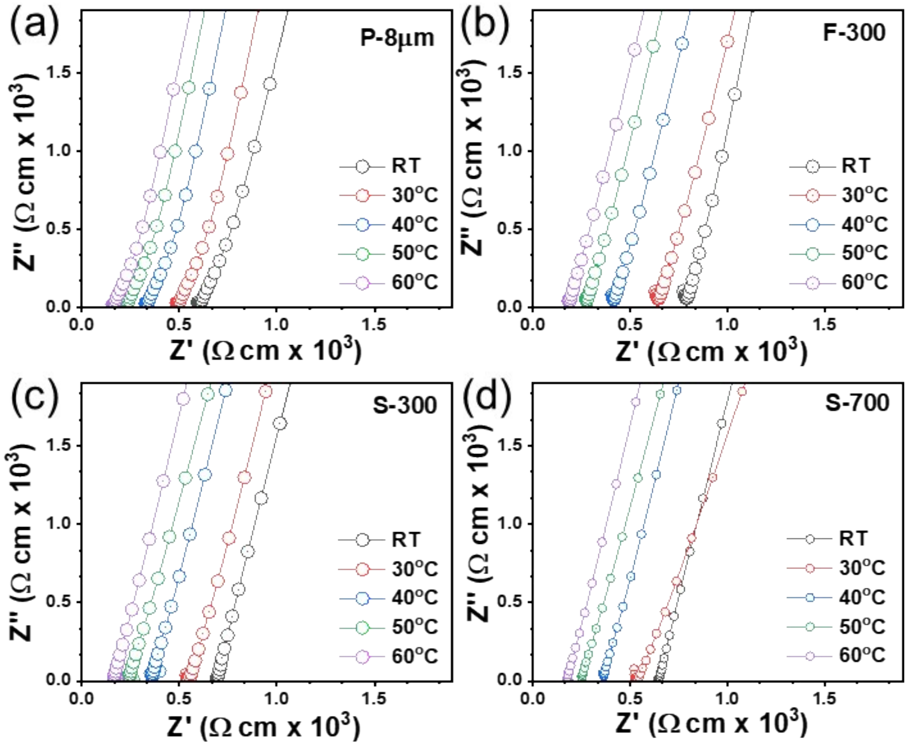


Figure S4. *(a-d) EIS Spectra of P-8μm, F-300, S-300, and S-700 SSEs under varying temperatures between 25 ˚C to 60 ˚C.*

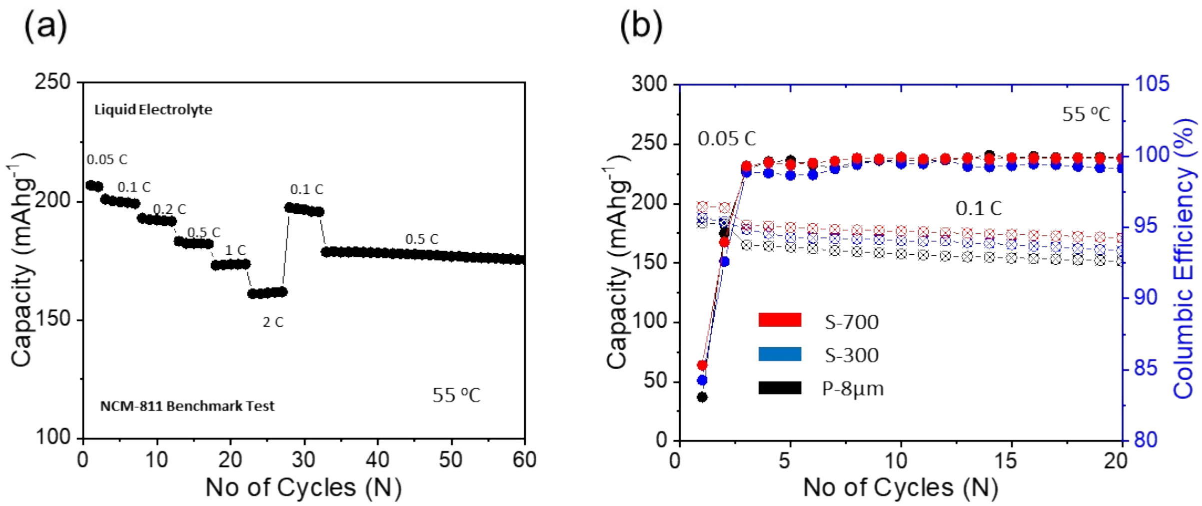


Figure S5. *(a) Benchmark test for LNO-coated NCM-811 with liquid electrolyte. (b) Capacity retention and Coulombic efficiency of the ASSLBs with P-8μm, S-300, and S-700, cycled at 0.1 C for 20 cycles.*

Material	Crystallite Size (Å)	Strain (%)	FWHM (°2θ)	Size SEM (μm)
P-8um	181.6	0.062	0.554	7.91
S-300	1084.8	0.011	0.188	2.24
S-700	779.0	0.012	0.161	0.88

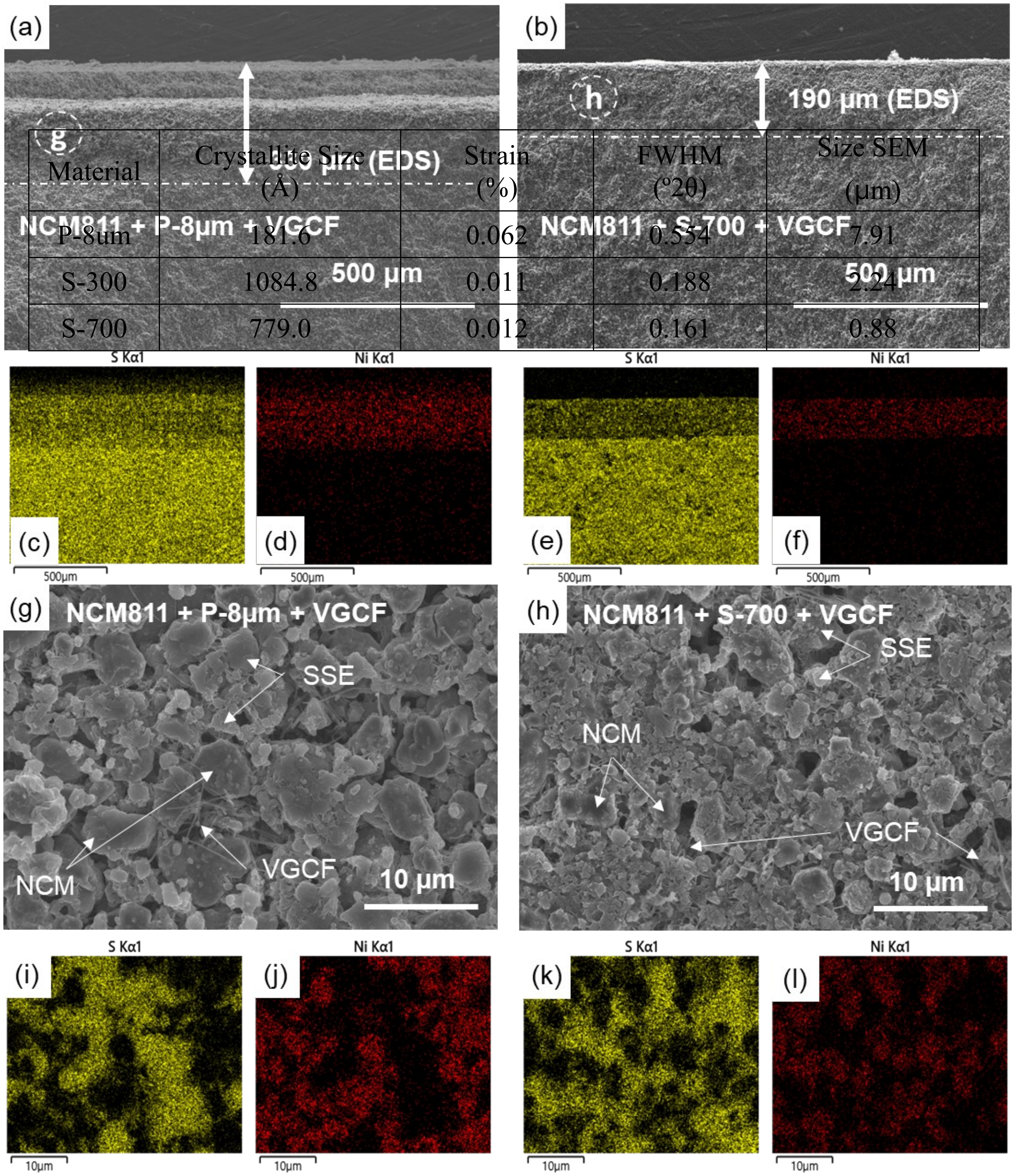


Figure S6. *(a and b) The cross-sectional SEM images of cathode composite | SSE pellet containing P-8μm and S-700 SSE respectively. (c–f) EDS mapping for sulfur (S) and nickel (Ni) to differentiate cathode composite and SSE part as well as calculating the thickness. (g–f) cross-sectional SEM images of cathode composite for NCM811 + P-8μm + VGCF and NCM811 + S-700 + VGCF samples, respectively. The arrows indicate dispersed NCM811, SSE and VGCF in cathode composite. (i-l) EDS mapping for S and Ni to indicate the dispersion of SSE and NCM in cathode composite for NCM811 + P-8μm + VGCF, and NCM811 + S-700 + VGCF samples, respectively.*

Table S1*. Summary of the strain and FWHM analysis of P-8μm, S-300, and S-700 SSE powders.*