Supplementary Materials

Synergistic Effect of Dual-Ceramics for Improving the Dispersion Stability and Coating Quality of Aqueous Ceramic Coating Slurries for Polyethylene Separators in Li Secondary Batteries

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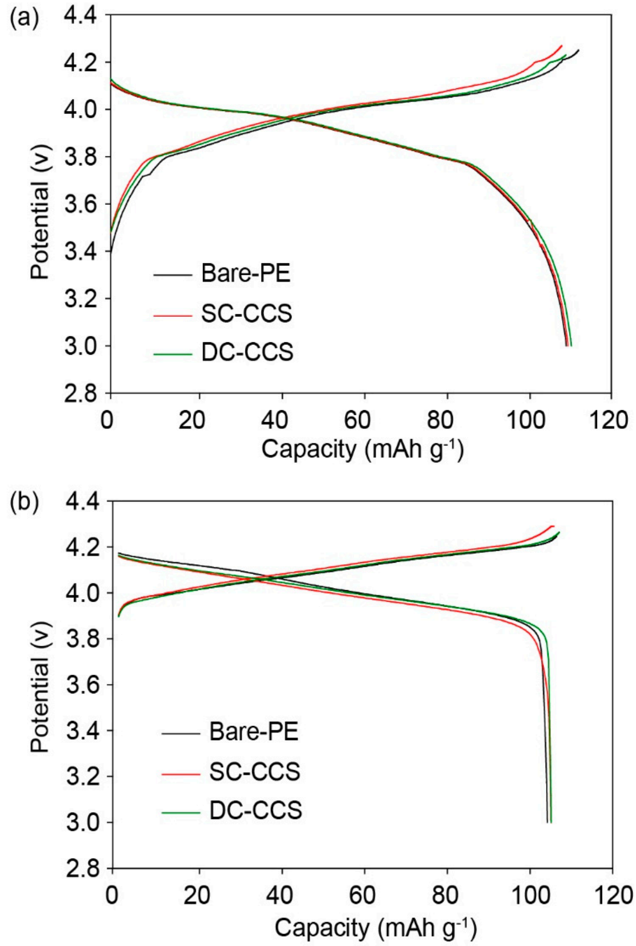

Figure S1. Potential profiles during the precycling (at a C/5 rate between 3.0 and 4.3 V vs. Li/Li^+) of (a) half cells (LMO/Li metal) and (b) full cells (LMO/graphite) (charging rate = discharging rate = C/5, i.e., 0.257 mA cm^{-2}).

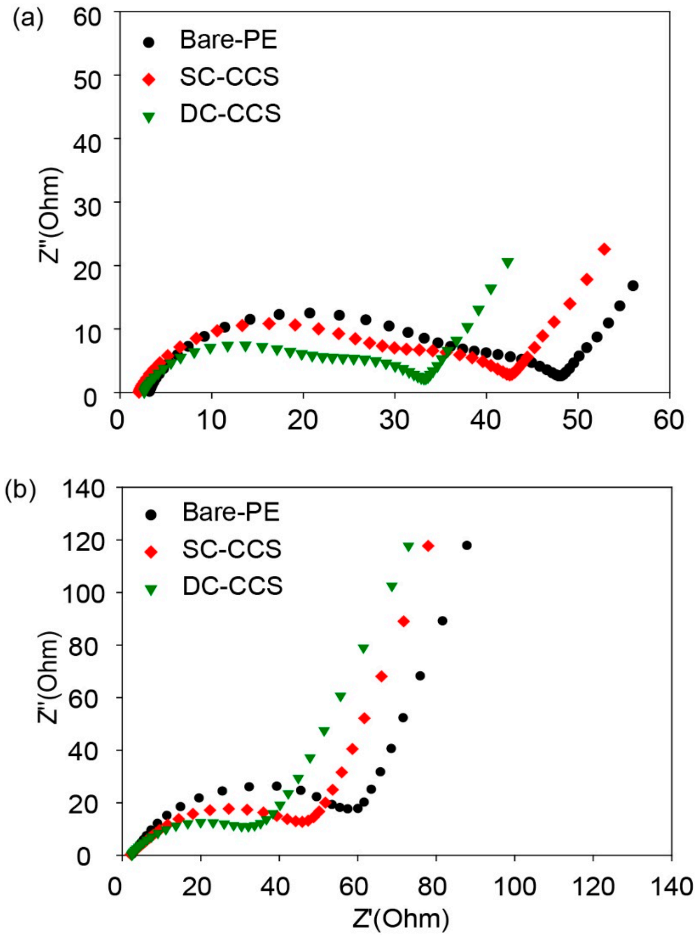

Figure S2. Nyquist plots of (a) full cells (LMO/graphite) and (b) half cells (LMO/Li metal) containing bare PE, SC-CCS, and DC-CCS PE separators after precycling, corresponding to Figure S1.

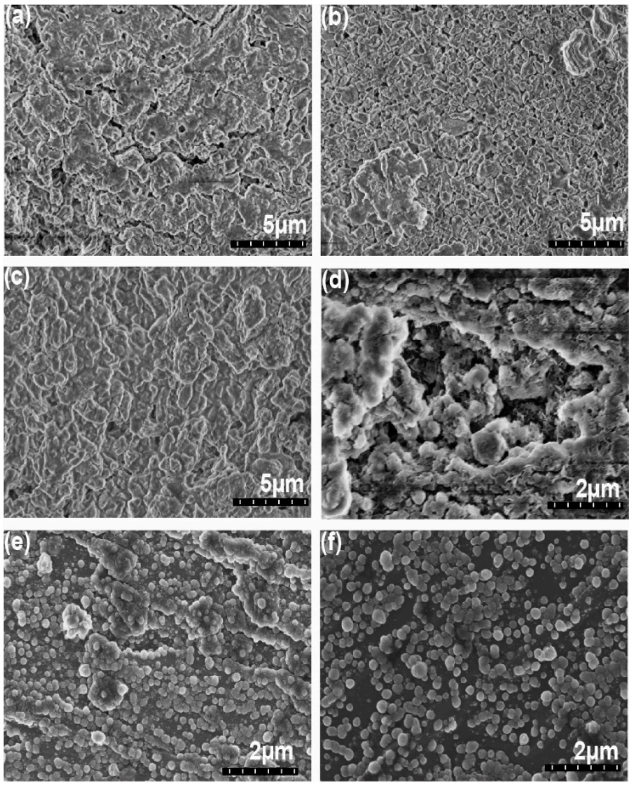

Figure S3. Surface SEM images of Li metal disassembled from half cells (LMO/Li metal) containing (a) bare PE, (b) SC-CCSs, and (c) DC-CCSs after cycle number 25, shown in Figure 7c. Surface SEM images of Li metal disassembled from Li/Li symmetric cells containing (d) bare PE, (e) SC-CCSs, and (f) DC-CCSs after plating at 0.2 mA cm^{-2} for 30 min.

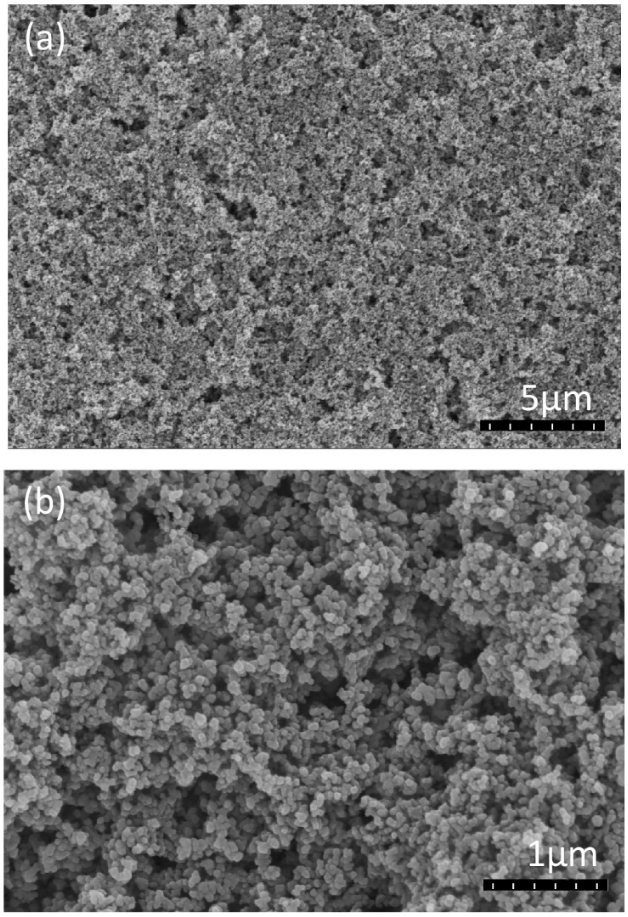

Figure S4. SEM images of SC-CCSs containing SiO_2.

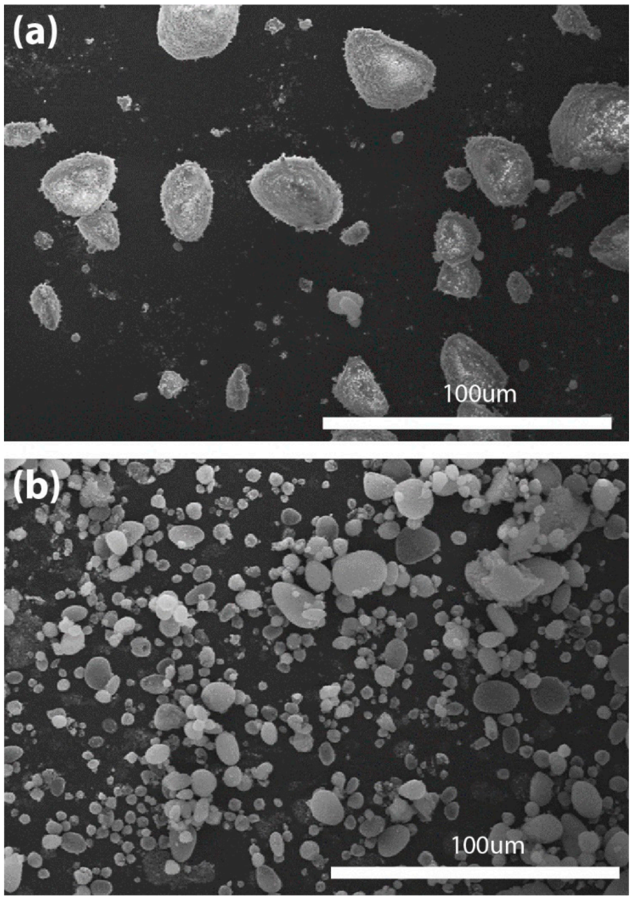

Figure S5. SEM images of pure (a) Al_2O_3 and (b) SiO_2.

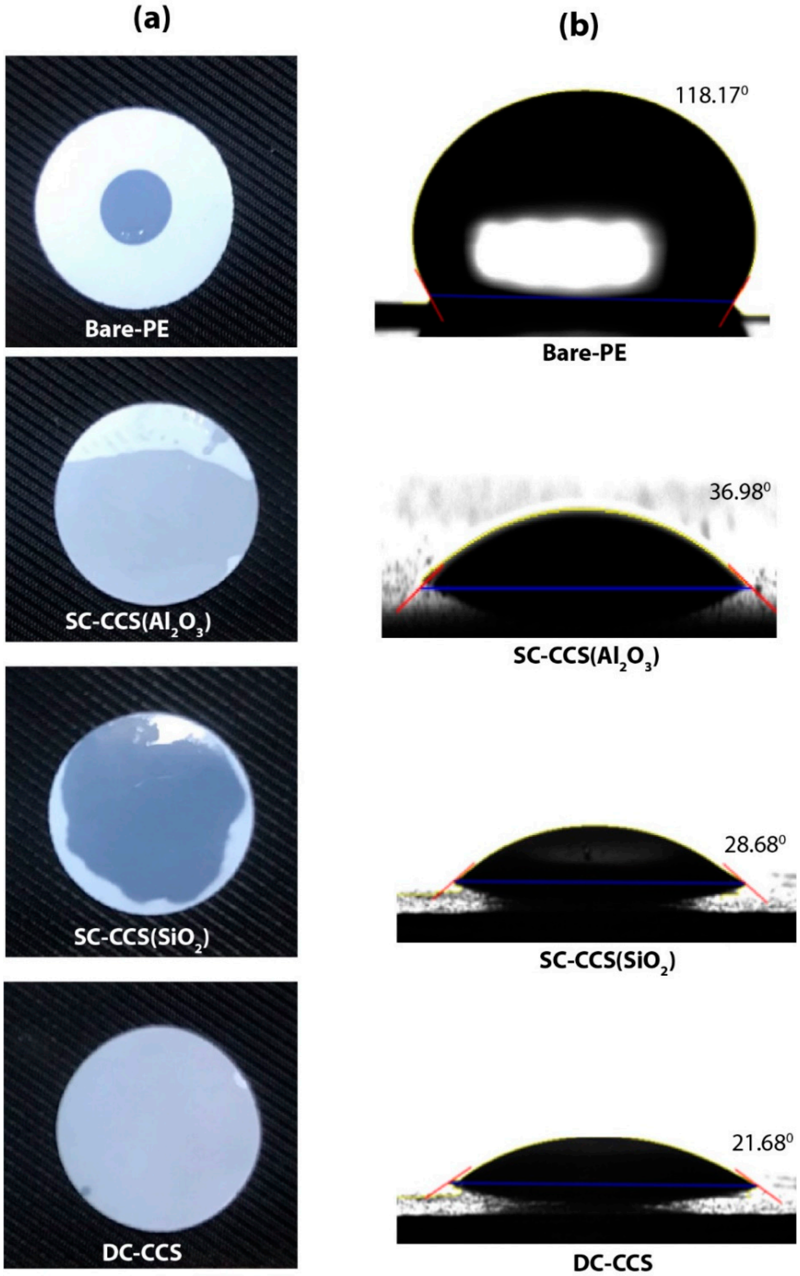

Figure S6. (a) Digital camera images of bare PE, SC-CCS(Al_2O_3), SC-CCS(SiO_2), and DC-CCSs surfaces 5 min after pouring a drop of liquid electrolyte. (b) Contact angle images of separator surfaces with a drop of D.I. water.

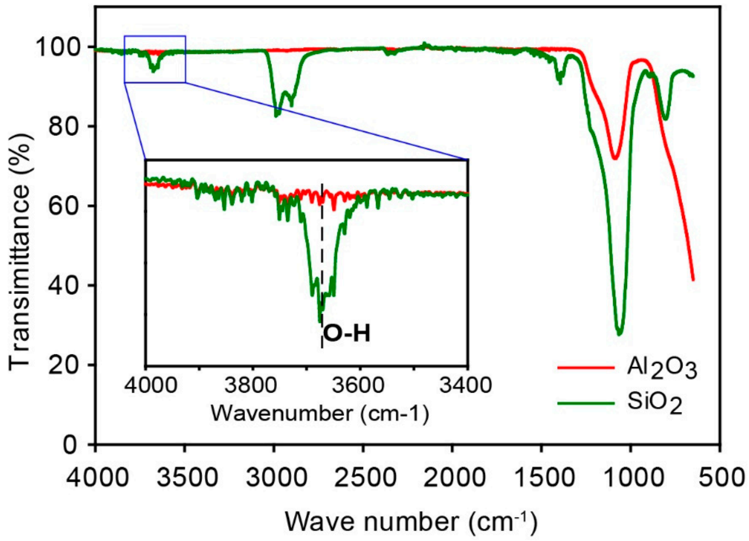

Figure S7. FT-IR spectra of SiO_2 and Al_2O_3 showing the absorption bands of surface hydroxyl groups (–OH) on particle surfaces.

Table S1. Calculation of the Li transference number (t_+) of each separator system

Cell	Polarization time (h)	ΔV(mV)	R_0 (Ω)	R_{ss} (Ω)	I_0 (mA)	I_{ss} (mA)	t_+
Bare-PE	5	10	1.348	1.383	0.0198	0.0065	0.33
SC-CCS(Al_2O_3)	5	10	1.511	2.174	0.0156	0.0062	0.40
SC-CCS(SiO_2)	5	10	1.700	2.522	0.0190	0.0082	0.43
DC-CCS	5	10	1.554	1.681	0.0158	0.0070	0.45

The Li transference number (t_+) is determined by the following equation [1]:

$$t_+ = \frac{I_{SS}\left(\Delta V - I_0 R_0\right)}{I_0\left(\Delta V - I_{SS} R_{SS}\right)}$$

where I_{ss} is the steady-state current, I_0 is the initial current, ΔV is the applied potential, R_e is the electrolyte resistance, and R_{ss} and R_0 are the electrode resistances after and before the polarization, respectively.

Reference

[1] Evans, J.; Vincent, C.A.; Bruce, P.G. Electrochemical measurement of transference numbers in polymer electrolytes. *Polymer* **1987**, *28*, 2324-2328.