Supplementary Information

Surface Engineering of Sponge-like Silicon Particles for High-Performance Lithium-Ion Battery Anodes

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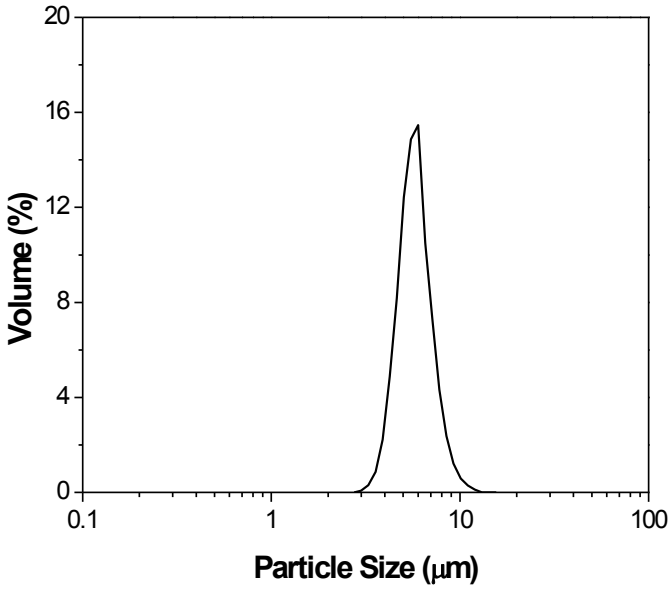

Figure S1. Paricle size distribution of sponge-like Si particles after chemical etching. After etching, an average particle size of the Si is ~6 μm.

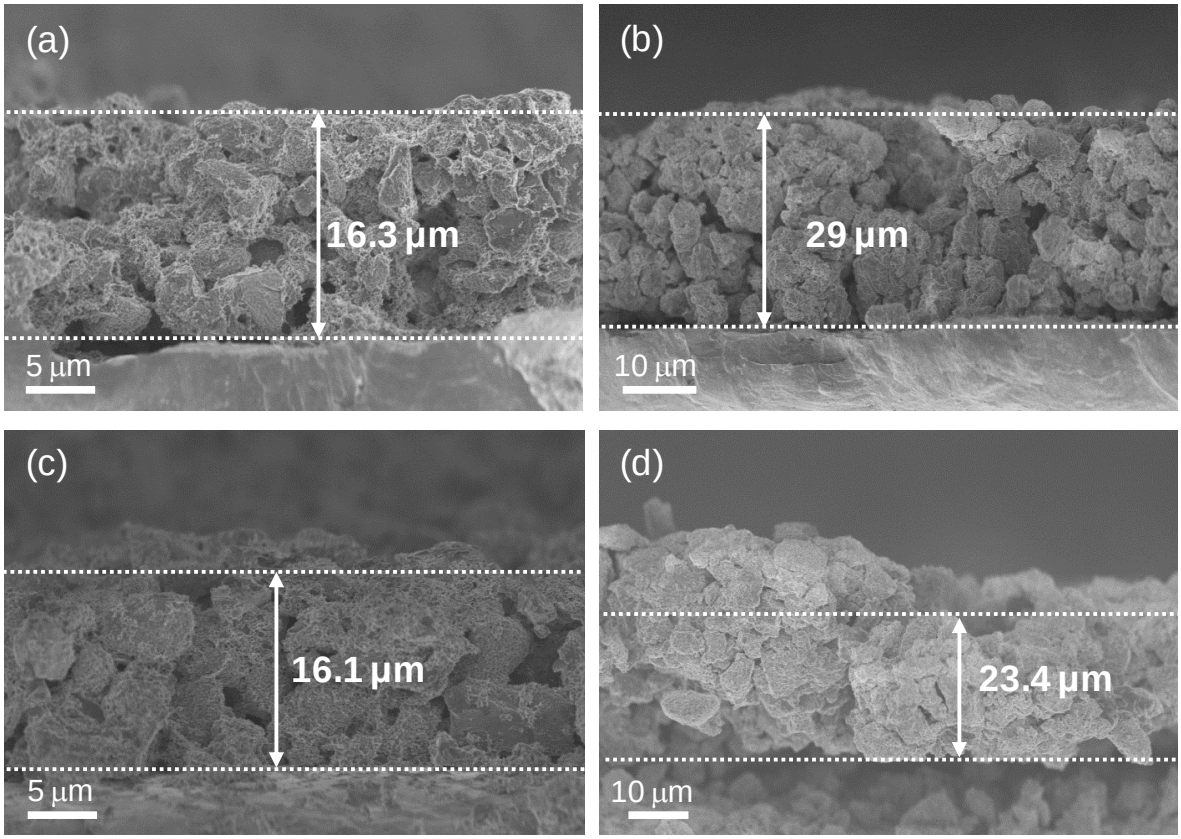

Figure S2. SEM images showing volume expansion of electrodes before and after cycling. Thicknesses of Si@C (A: before, B: after cycle) and Si@C@PI (C: before, D: after cycle) electrodes were investigated by cross-sectional SEM. The Si@C electrode showed volume expansion of 78%, while the Si@C@PI exhibited less volume expansion of 45% after 80 cycles.

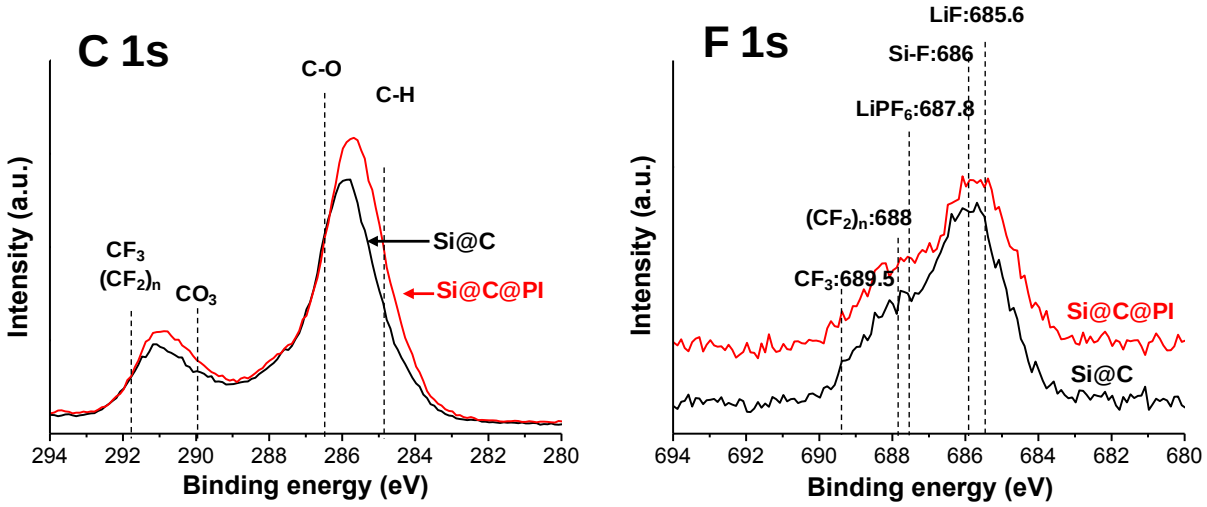

Figure S3. XPS spectra of C 1s and F 1s core level obtained from the Si@C (black) and Si@C@PI (red) electrodes after 30 cycles. The peaks of Li_2CO_3 and $ROCO_2Li$ at 291eV, the peak at 136 eV arising from Li_xPOF_y and Li_xPF_y, and the LiF peak at 687.2 eV are typically seen in carbon-coated Si electrodes.

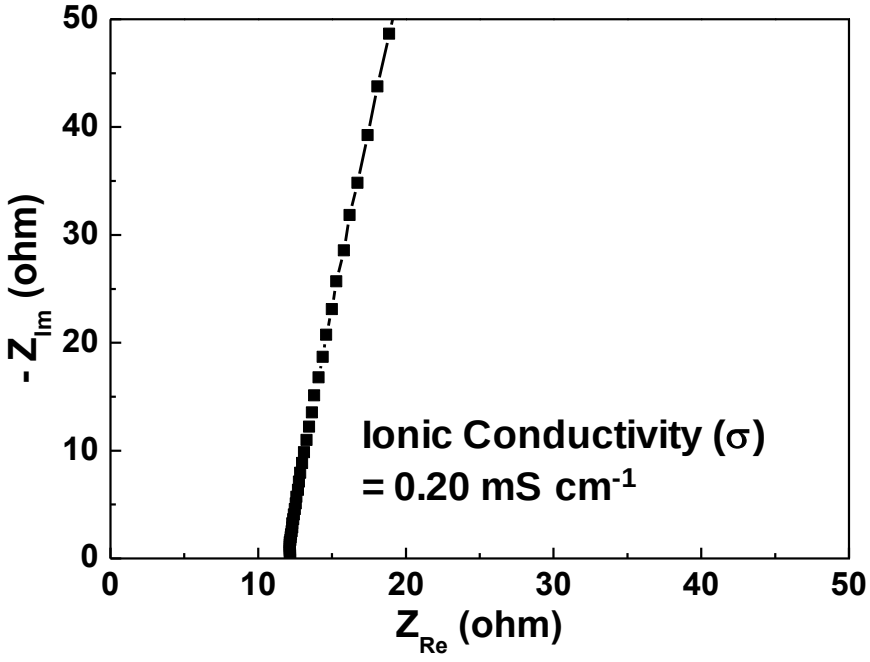

Figure S4. Ionic conductivity of PI films swelled with the liquid electrolyte (1.3 M $LiPF_6$ in EC/DEC = 30/70 v/v). The liquid electrolyte-swollen PI film was found to provide a high ionic conductivity of 0.20 mS cm^{-1} at room temperature.

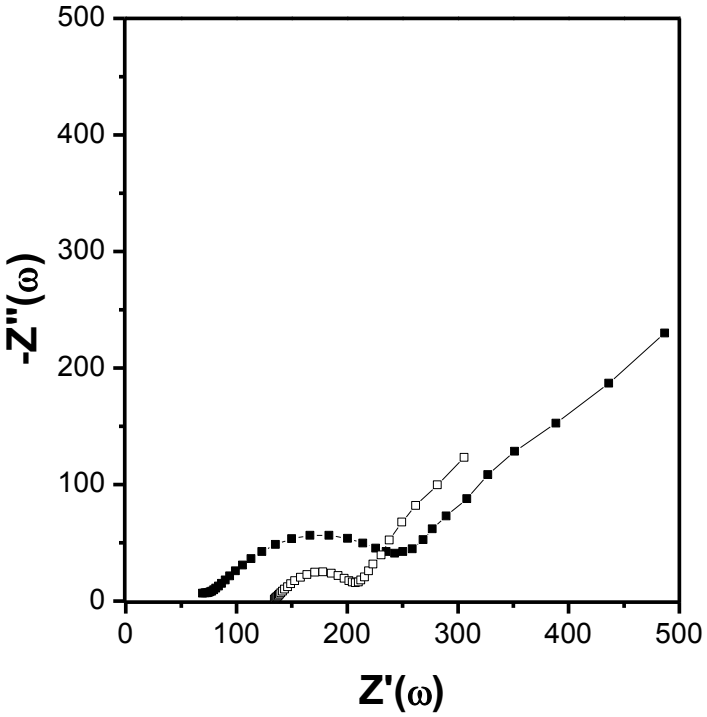

Figure S5. AC impedance spectra (after 80 cycles) of cells assembled with Si@C (solid square) and Si@C@PI (open square).