Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information for

Artificial lithium fluoride surface coating on silicon negative electrodes for the inhibition of electrolyte decomposition in lithium-ion batteries: visualization of solid electrolyte interphase by in-situ AFM

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1. Characterization of the as-deposited Si thin film

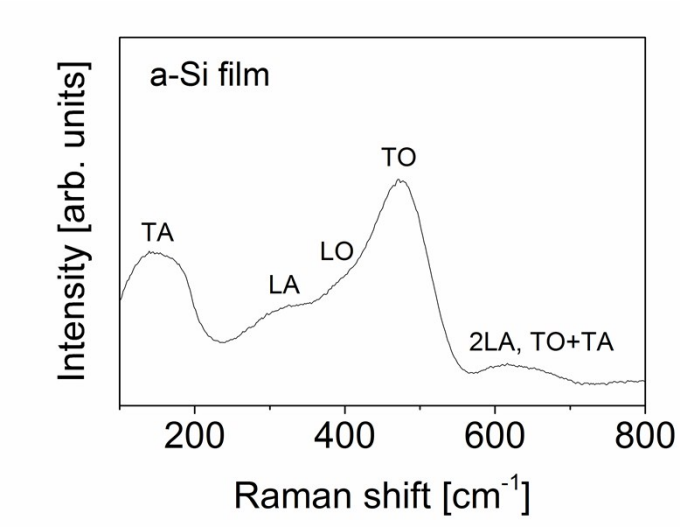

Figure S1. Raman spectrum of the as-deposited Si thin film.

2. Surface morphology of the as-received mirror-polished Cu substrate and the as-deposited Si thin films

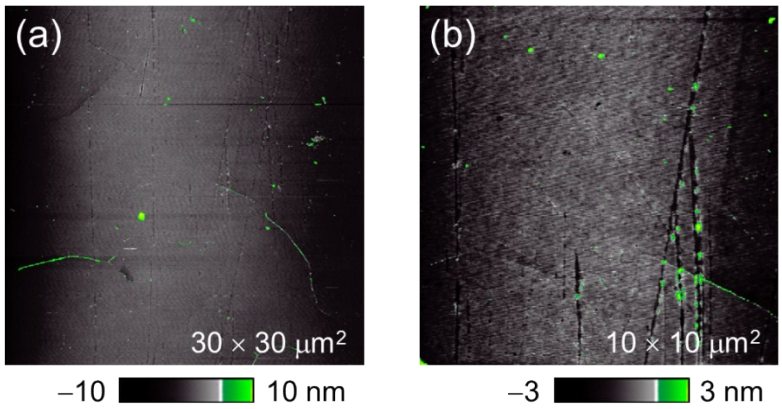

Figure S2. AFM images of the as-received mirror-polished Cu substrate. The scan areas and the height ranges are: (a) 30 × 30 μm² and ±10 nm, and (b) 10 × 10 μm² and ±3 nm, respectively.

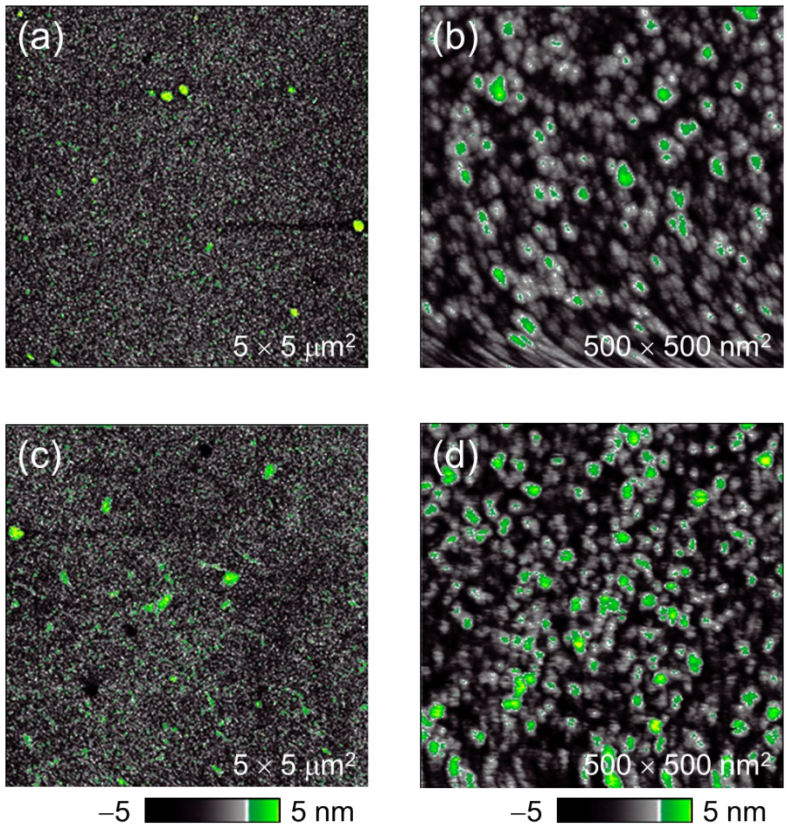

Figure S3. AFM images of as-deposited Si thin films (a, b) without and (c, d) with 4-nm-thick LiF. The scan areas are: (a, c) 5 × 5 μm² and (b, d) 500 × 500 nm².

3. Cyclabilities of Si thin-film electrodes coated with LiF layers

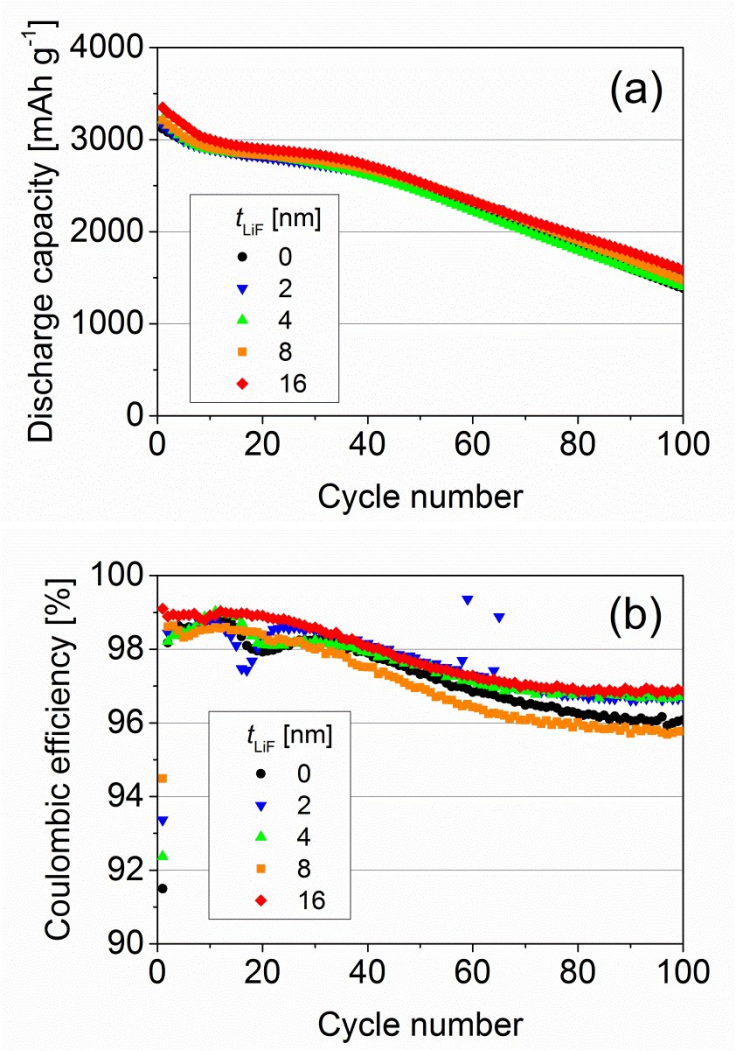

Figure S4. (a) Discharge capacities and (b) Coulombic efficiencies of Si thin-film electrodes with LiF layers of different thickness (t_{LiF} = 0, 2, 4, 8, and 16 nm) in 1 M $LiPF_6$/EC+DEC electrolyte, as functions of cycle number.

4. Surface analyses of Si thin-film electrodes after cycling

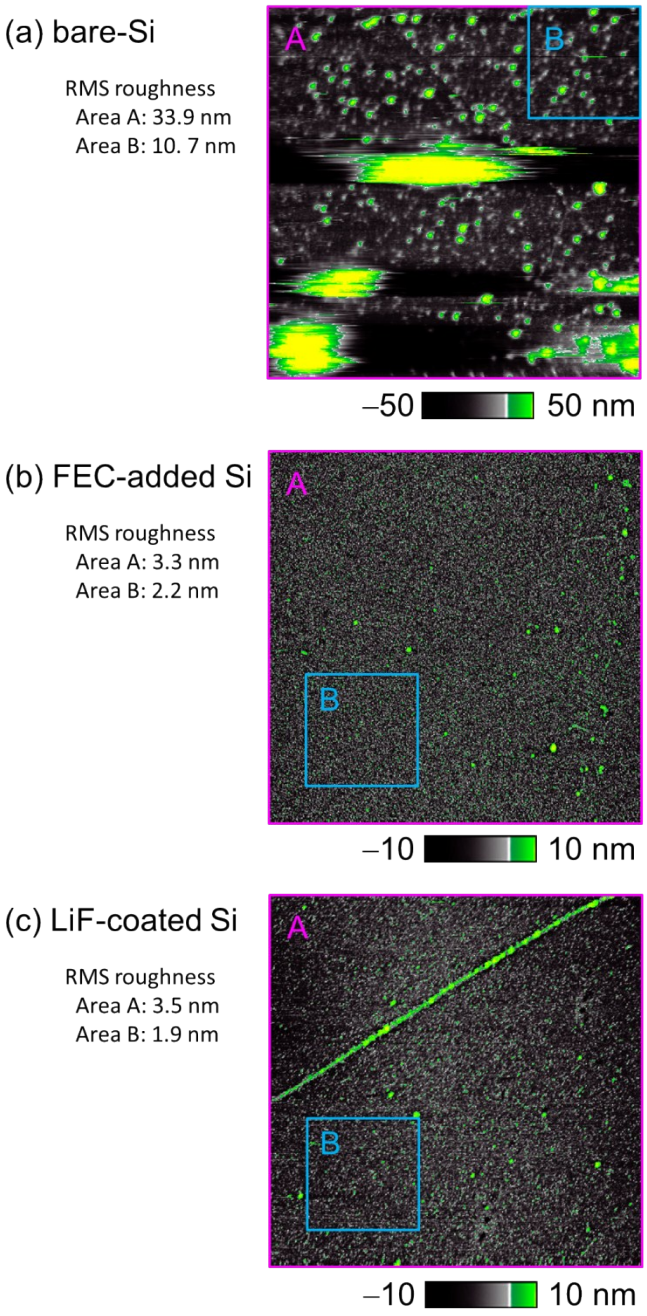

Figure S5. Root-mean-square surface roughness of Si thin-film electrodes (a,b) without and (c) with 4-nm-thick LiF after two cycles in 1 M LiTFSI/EC+DEC electrolytes (a,c) without and (b) with 10-wt.% FEC. Analyzed areas of A and B are 10 × 10 μm^2 and 3 × 3 μm^2, respectively.