

Supplementary information

Ultra-lithiophilic oxidation layer in a Ni-foam-based anode for lithium metal batteries

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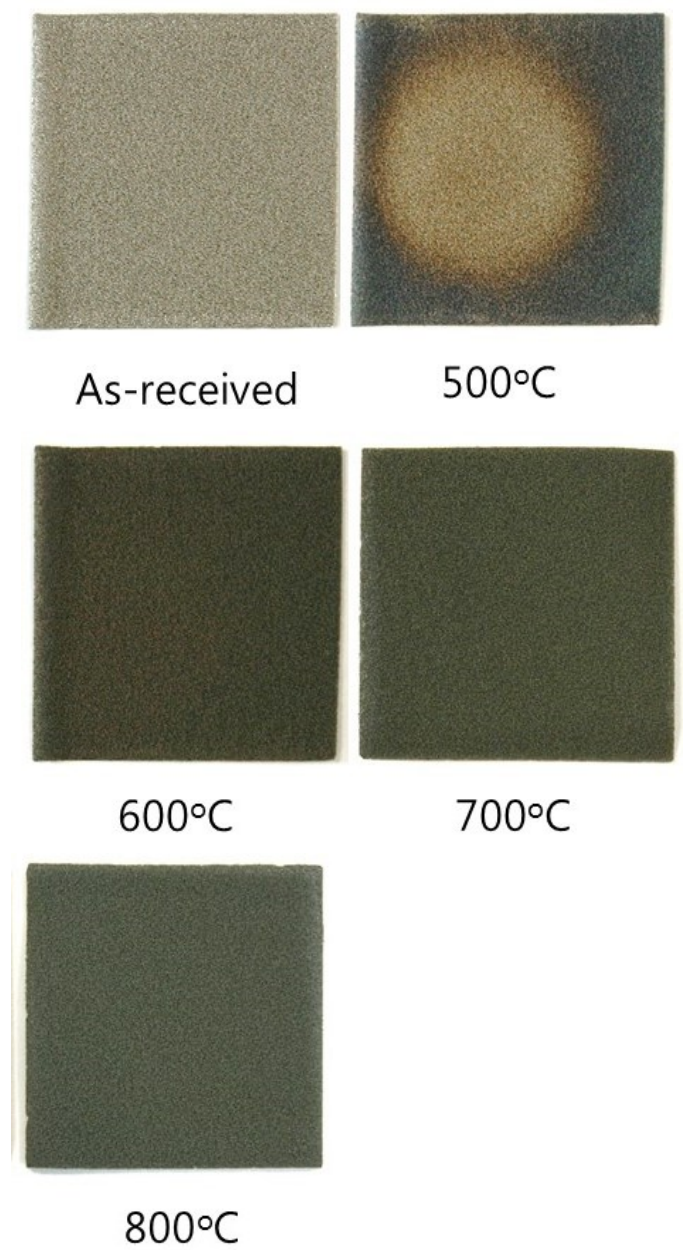


Figure S1. Photographs of Ni-foam oxidized at different temperatures.

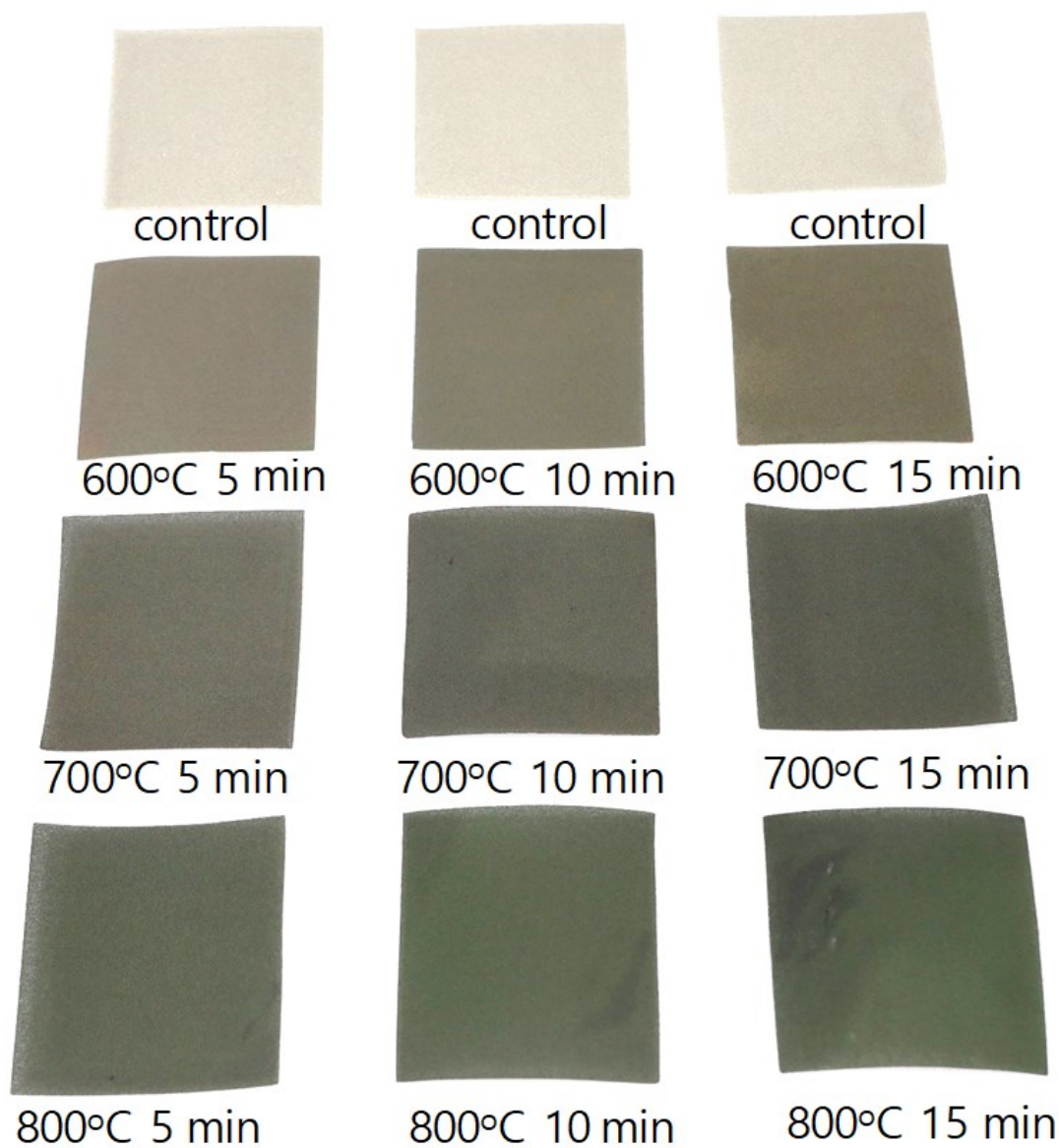


Figure S2. Photographs of Ni-foam oxidized at different temperatures and different durations.

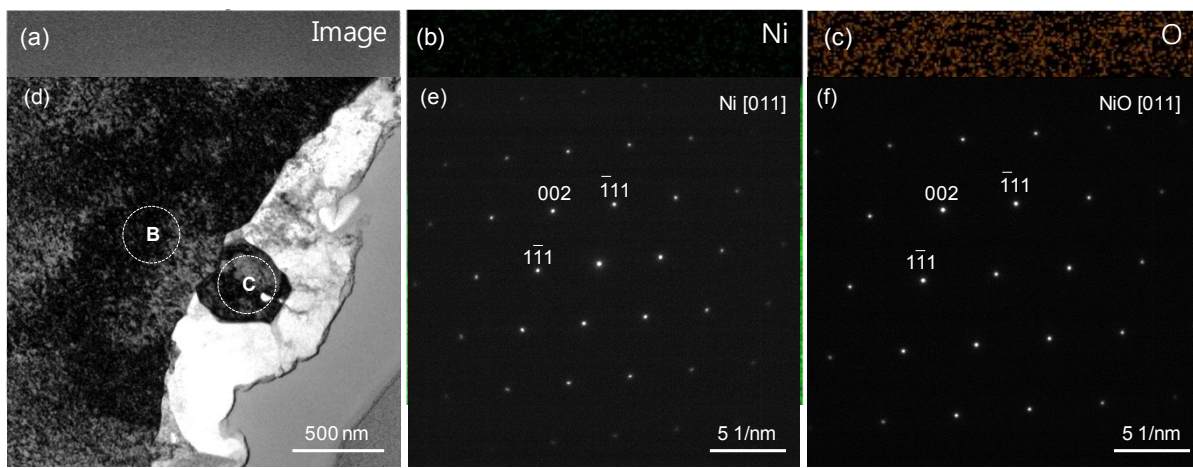


Figure S3. (a) TEM images of Ni-foam oxidized at 700 °C for 5 min after FIB milling. (b) Ni and (c) O EDS maps of the area shown in (a). (d) HRTEM of the interface between Ni and NiO for Ni foam oxidized at 700 °C for 5 min. SAED image of (e) Ni and (f) NiO regions indicated by the circles “B” and “C” in (d).

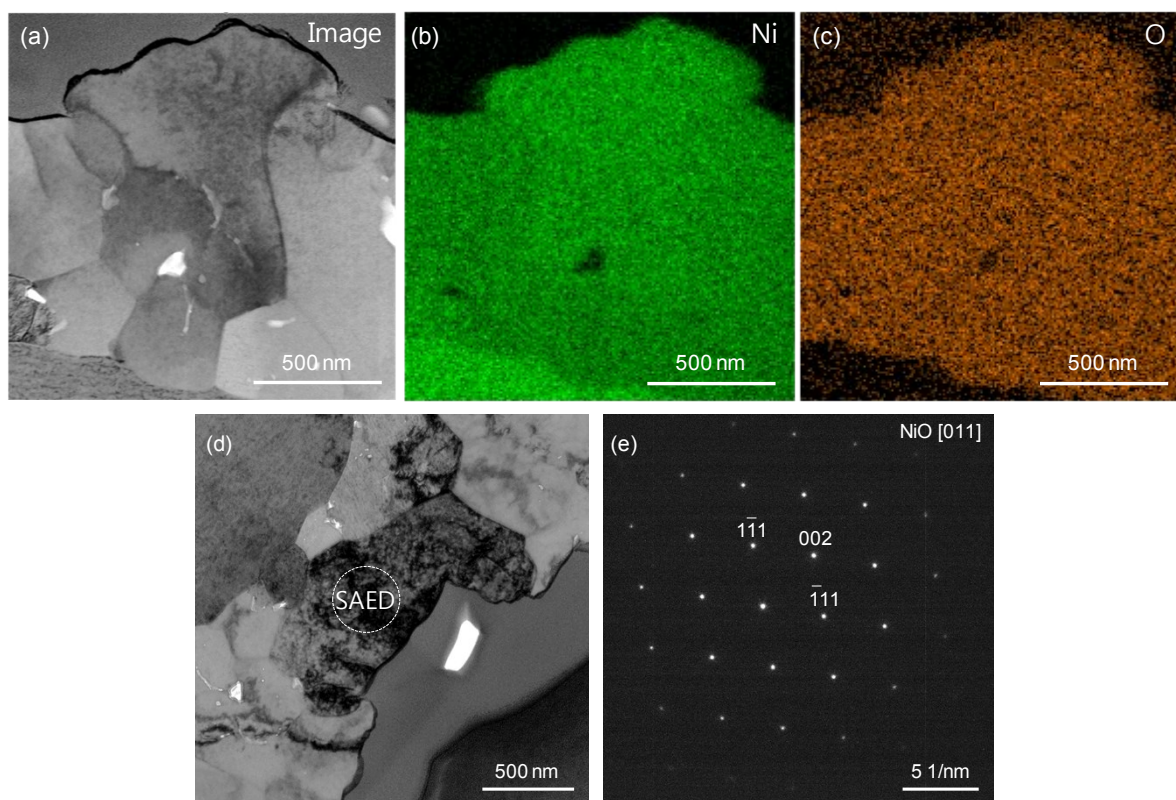


Figure S4. (a) TEM images of Ni-foam oxidized at 800 °C for 5 min after FIB milling. (b) Ni and (c) O EDS maps of the area shown in (a). (d) HRTEM of the interface between Ni and NiO for Ni-foam oxidized at 800 °C for 5 min. (e) SAED image of the NiO region in (d).

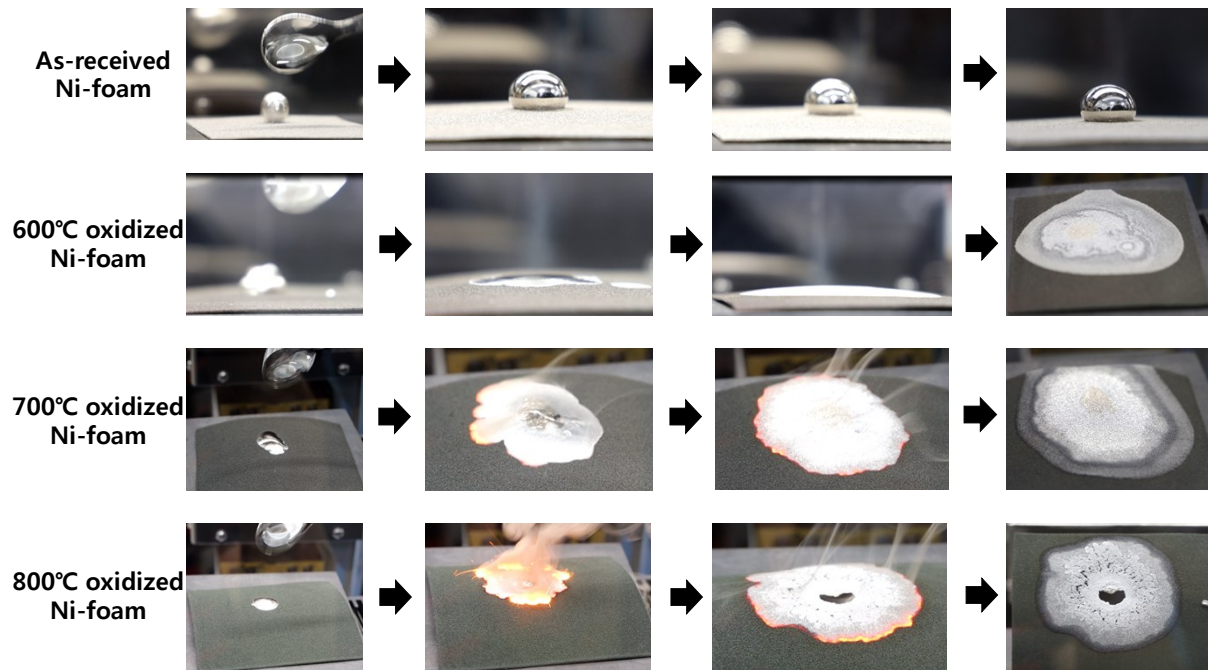


Figure S5. Li-infusion process for the as-received Ni-foam, and that for the Ni-foam oxidized at 600, 700, and 800 °C.

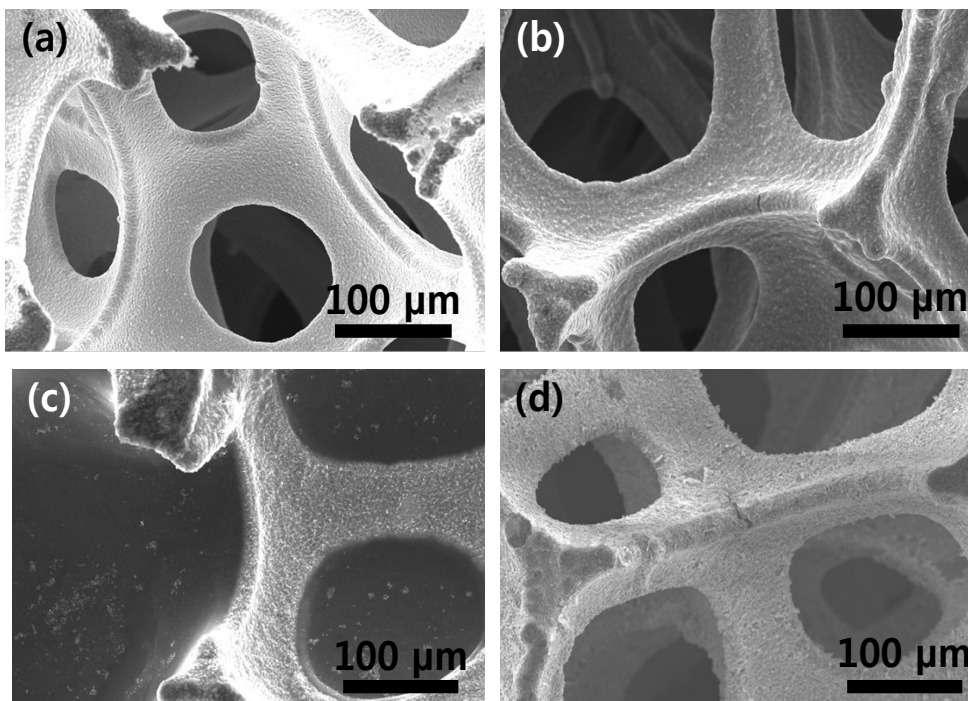


Figure S6. SEM images of Ni-foam oxidized at 600 °C (a) before and (b) after the surface was coated with molten Li. SEM images of (c) molten Li infused into the oxidized Ni-foam and (d) Ni-foam shown in (c) after washing in water to remove Li.

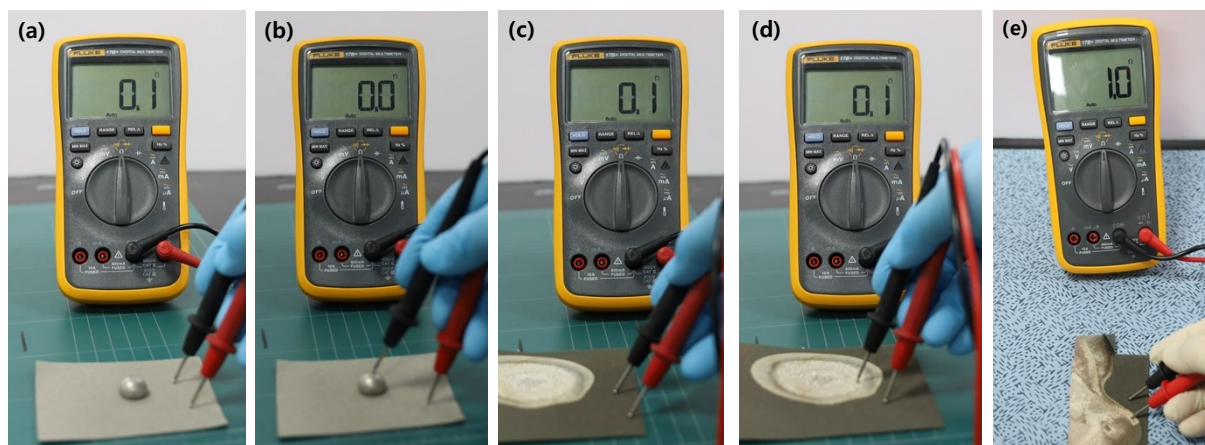


Figure S7. Resistivity between two points on the Ni-foam and a Li droplet and the Ni-foam for (a,b) as-received, (c,d) oxidized (600 °C, 5 min), and (e) oxidized (800 °C, 5 min) Ni-foam.

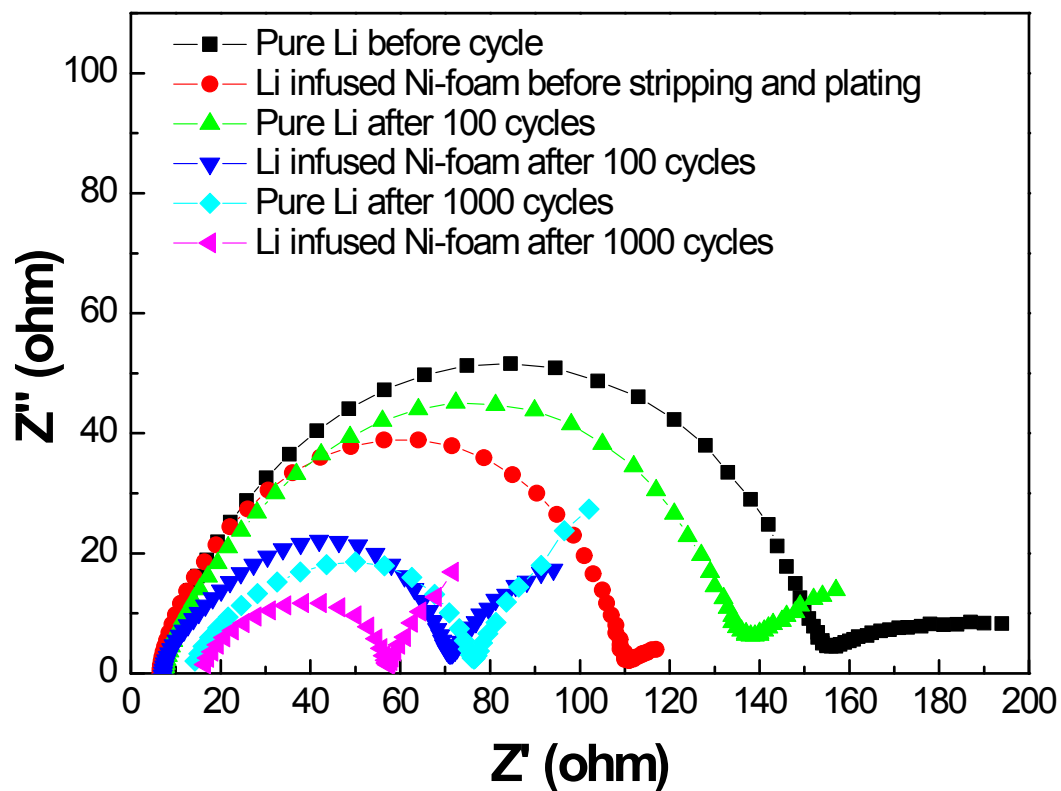


Figure S8. Nyquist plots of the Li-infused Ni-foam and pure Li electrodes before and after stripping and plating.

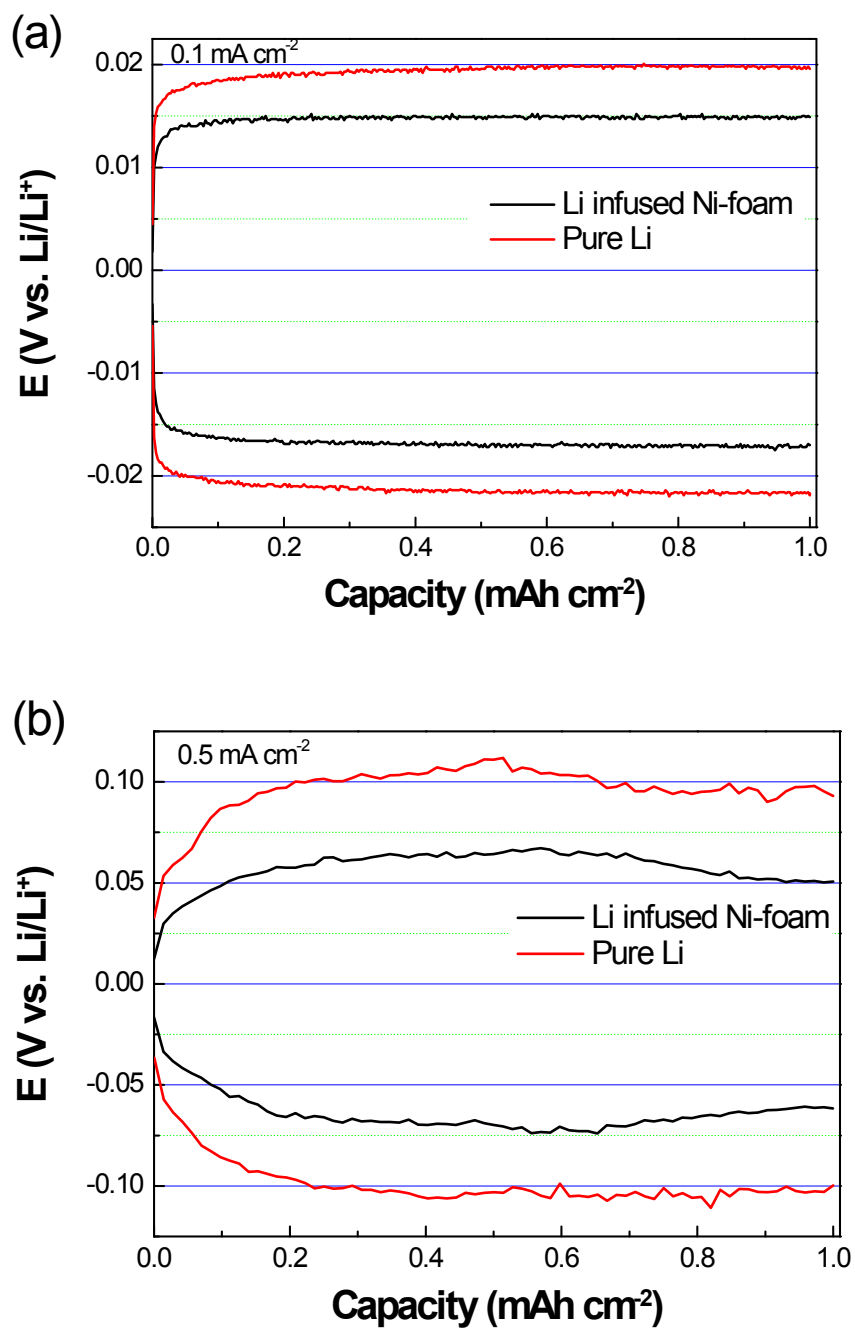


Figure S9. Overpotential and hysteresis of Li-infused Ni-foam and pure Li electrodes after stripping and plating at (a) 0.1 mA cm^{-2} for 100 cycles and (b) 0.5 mA cm^{-2} for 500 cycles.

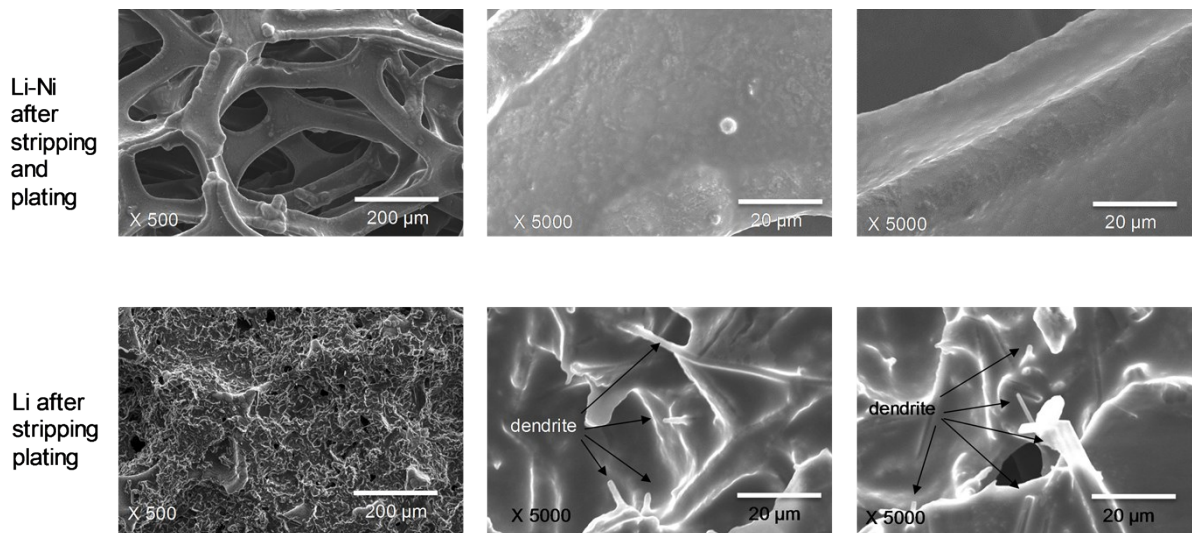


Figure S10. SEM images after stripping and plating of the surface for the oxidised Ni-foam and pure Li.



Figure S11. Photographs of dismantled symmetric cells which are molten Li surface coated on Ni-foam. The foam surface coated with molten Li became brittle after coin cell fabrication, which resulted in a short circuit.

Video Captions

Video Clip S1. Molten Li wetting the oxidized Ni-foam

Video Clip S2. Molten Li infusing into the oxidized Ni-foam