

Supporting Information

Kinetic Analysis of Silicon-Lithium Alloying Reaction in Silicon Single Crystal Using Soft X-ray Absorption Spectroscopy

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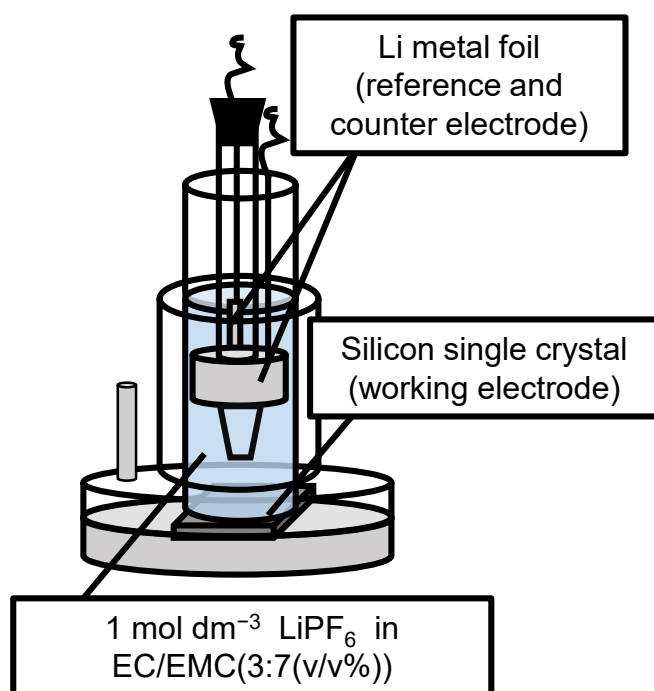


Figure S1. Schematic of the three-electrode electrochemical cell. Silicon single crystal was used as working electrode and Li metal was used as reference and counter electrode.

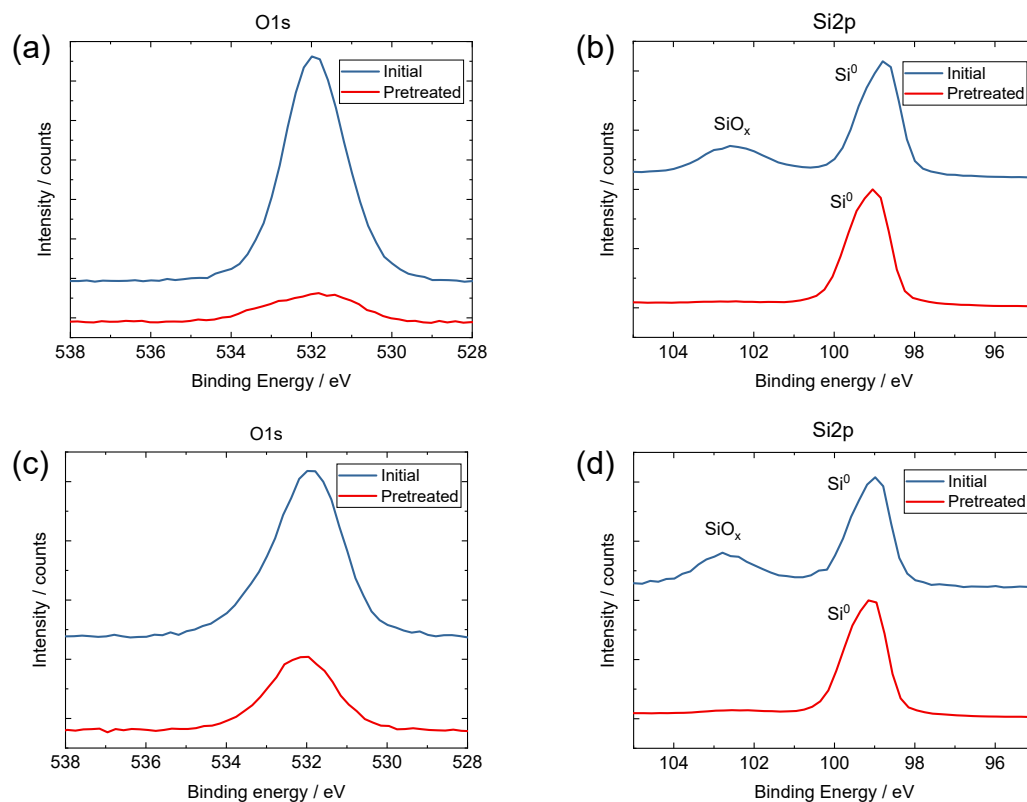


Figure S2. (a) O1s and (b) Si2p X-ray photoelectron (XPS) spectra of silicon (111) and (c) O1s and (d) Si2p XPS spectra of silicon (100) single crystal after being pretreated by piranha solution and hydrogen fluoride solution (red), and initial state one (blue). These spectra are normalized at Si2p peak top.

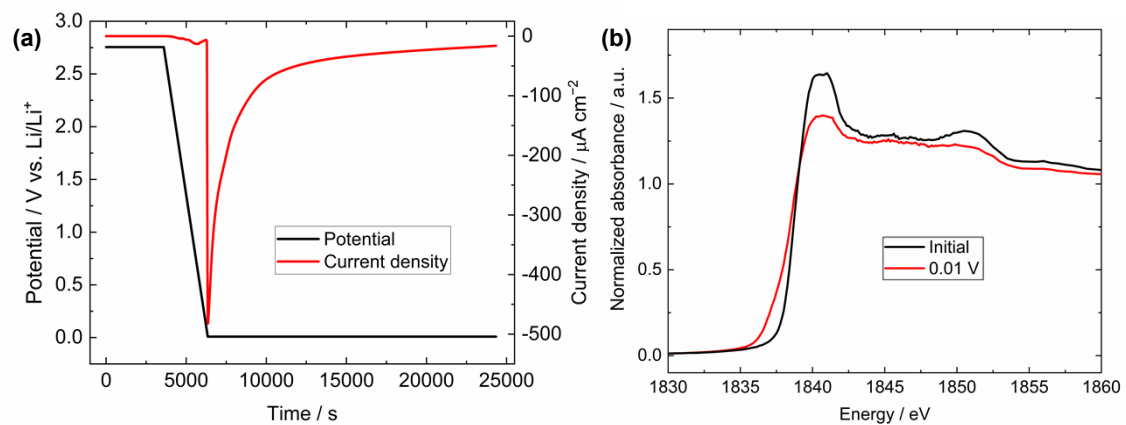


Figure S3. (a) LSV plot of Si (100), (b) Si K-edge XANES spectra of Si (100) after electrochemical Si-Li alloying reaction.

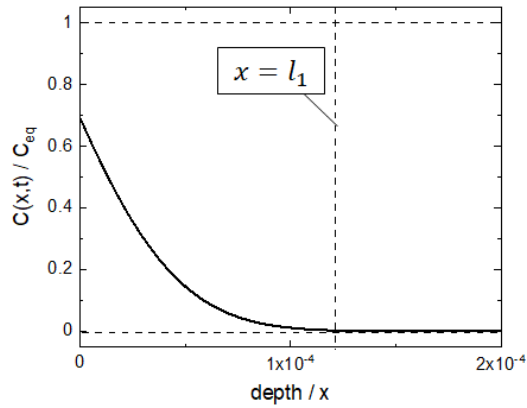


Figure S4. The simulated profile of concentration change to the reaction depth based on

the equation
$$c(x,t) = c_{eq} \left[\operatorname{erfc} \left(\frac{x}{2\sqrt{Dt}} \right) - \exp(-hx) \operatorname{erfc} \left(\frac{x}{2\sqrt{Dt}} + h\sqrt{Dt} \right) \right]$$
, assuming that k is $5.0 \times 10^{-7} \text{ cm s}^{-1}$, D is $1.0 \times 10^{-11} \text{ cm}^2 \text{ s}^{-1}$, and τ is 100 s.