Supplementary Information

One-minute deposition of micrometre-thick porous Si anodes for lithium ion batteries

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Fig. S1 Voltage-capacity curves of thick Si films (~10 μm) deposited at high $P_{\text{boat}} = 1600$ W and low $T_{\text{sub}} = RT$ on as-purchased Cu substrates. (a) An as-deposited Si film, and Si films post-annealed at (b) 200, (c) 400, and (d) 600 °C. Effective Si thicknesses were $t_{\text{eff}}$ = (a) 9.6, (b) 11.0, (c) 10.8 and (d) 10.3 μm.
Fig. S2 Voltage-capacity curves of thick Si films ($t_{\text{eff}}$ of $\sim$3 μm) deposited at high $P_{\text{boat}} = 1300$ W and low $T_{\text{sub}} = RT$ on as-purchased Cu substrates. (a) An as-deposited Si film, and Si films post-annealed at (b) 200, (c) 400, and (d) 600 °C. Effective Si thicknesses were $t_{\text{eff}}$ = (a) 3.2, (b) 3.1 (c) 2.8 and (d) 3.4 μm.
Fig. S3 Thickness profiles of typical porous Si films deposited on Cu substrates by RVD. (a) As-deposited films at different $T_{\text{sub}}$. (b) As-deposited and post-annealed films with $T_{\text{sub}} = 300 \, ^\circ\text{C}$. 
Fig. S4 Nyquist plots of a thick Si film anode ($t_{\text{eff}} = 3.5 \ \mu \text{m}$) deposited at $T_{\text{sub}} = 300 \ ^\circ\text{C}$ and post-annealed at $T_{\text{an}} = 600 \ ^\circ\text{C}$ after charging for different numbers of cycles.
Fig. S5 Photographs and SEM images of the Si film deposited at \( T_{\text{sub}} = 300 \, ^\circ\text{C} \) and post-annealed at \( T_{\text{an}} = 600 \, ^\circ\text{C} \) before and after the charge-discharge cycle. The sample is the same as that in Fig. 7. Before the cycle, the Si film was uniform over the Cu substrate and show porous surface structure. While it was detached from the substrate at some regions to show the Cu surface in the photograph and had several-tens-\( \mu \text{m} \) large protrusions in the SEM images after 80 cycles.