Supporting Information for "Kinetics-Driven High Power Li-ion Battery with *a*-Si/$NiSi_x$ Core-Shell Nanowire Anodes"

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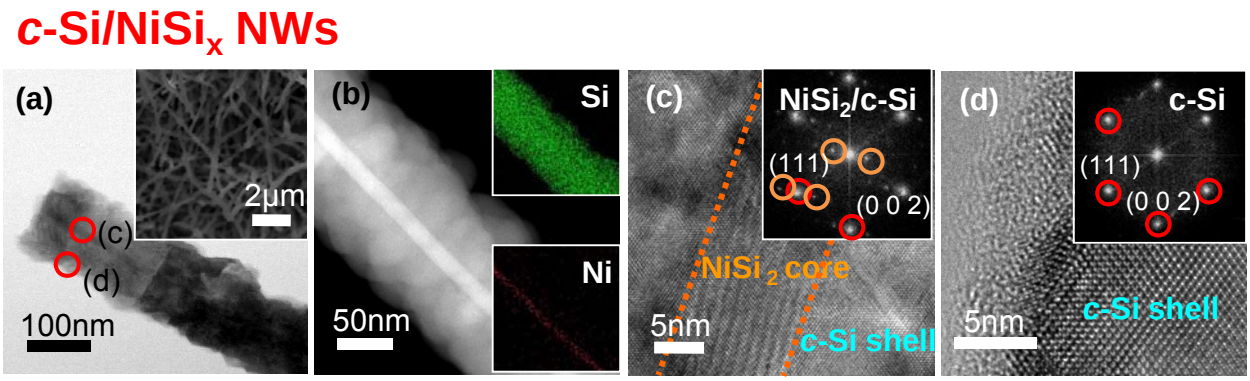
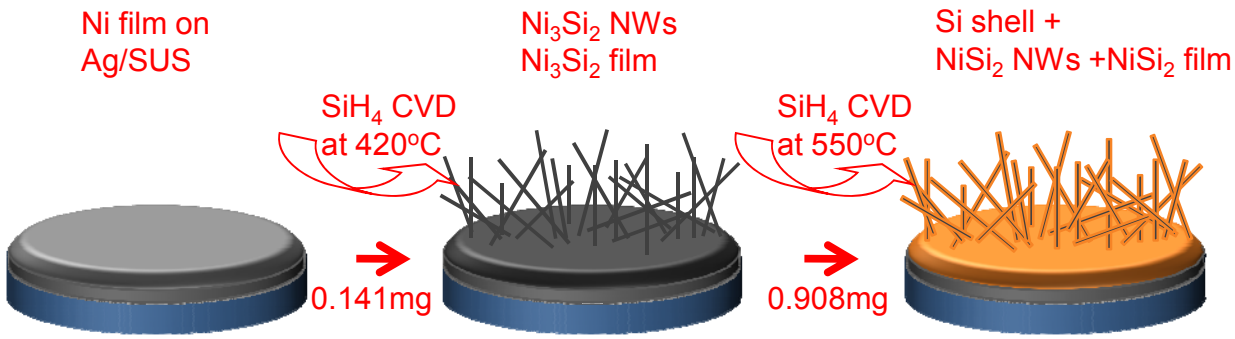


Figure S1 (a) TEM image of an individual c-Si /$NiSi_x$ NW. The inset shows a plan-view SEM image of *c*-Si/$NiSi_x$ NW grown on SUS substrate. **(b)** HAADF image of a *c*-Si/$NiSi_x$ NW and EDX elemental mapping images (inset). **(c)** HRTEM image of an individual *c*-Si/$NiSi_x$ NW at the core region and the corresponding FFT-DP along the [1-10] zone axis (inset). The spot in orange color circle arise from the interface-twin boundary between *c*-Si and $NiSi_2$ **(d)** HRTEM image of an individual *c*-Si/$NiSi_x$ NW at the shell region and the corresponding FFT-DP along the [1-10] zone axis (inset).

Figure S2 A photograph of the *a*-Si/$NiSi_x$ NW grown on the whole SUS substrate of 15 Φ diameter.



• Phase of Ni-silicide after SiH_4 reactions
- SiH_4 CVD on Ni at 420°C→ Ni_3Si_2 NWs and Ni_3Si_2 film
- SiH_4 CVD on Ni_3Si_2 NWs and Ni_3Si_2 film at 550°C → Si Shell, $NiSi_2$ NWs and $NiSi_2$ film

• Average mass change
- SiH_4 CVD on Ni film at 420°C for Ni_3Si_2 NW growth : 0.141mg
- SiH_4 CVD on Ni_3Si_2 NWs and Ni_3Si_2 film at 550°C for Si shell deposition: 0.908mg

• Additional mass due to phase transition
Ni → Ni_3Si_2 NWs + Ni_3Si_2 film : 0.141mg
From this result estimated additional mass due to phase transition
Ni_3Si_2 NWs + Ni_3Si_2 film → $NiSi_2$ NWs + $NiSi_2$ film : 0.282mg

• Mass calculation of the Si Shell
0.908mg = Si Shell + additional mass due to phase transition + other silicide reaction

Phase transition mass from Ni_3Si_2 to $NiSi_2$ is 0.282mg,
Therefore mass of Si shell is 0.626mg

We finally normalized the specific capacity of Si/Ni-silicide NW anode using the mean value of the expected mass of Si shell, 0.626mg.

Figure S3 Explanation of the normalization method for calculating the gravimetric capacity.

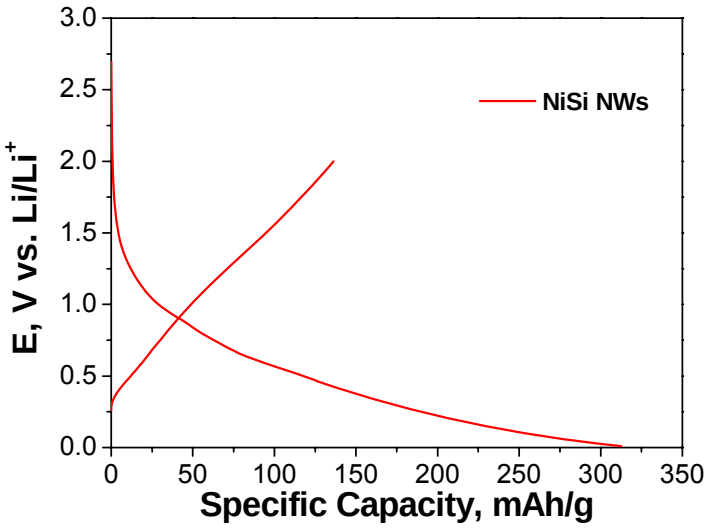


Figure S4 The current charge/discharge curve for the 1st cycle of the $NiSi_x$ NW cell in the galvanostatic mode.