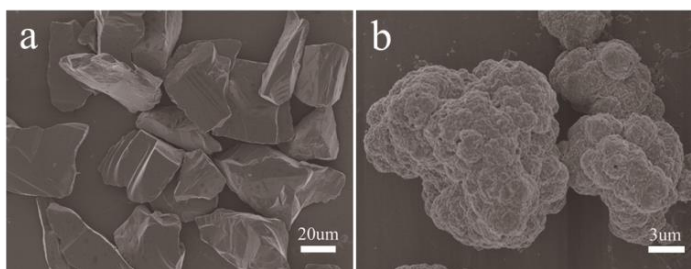


## Supplementary Information

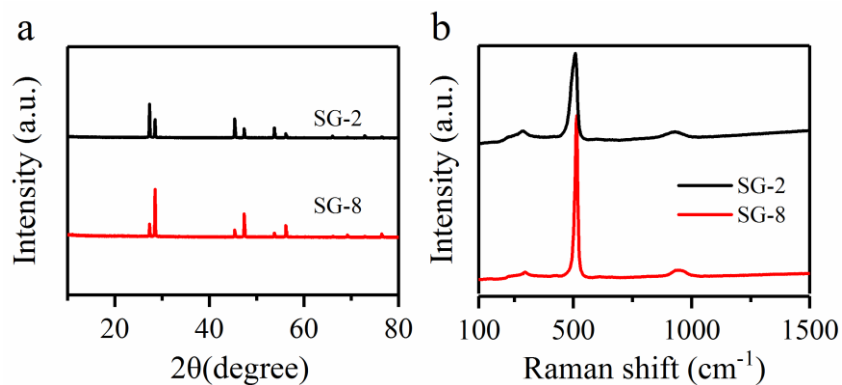
# Controllable Synthesis of Si/Ge Composites with Synergistic Effect for Enhanced Li Storage Performance

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**Figure S1.** SEM image of (a) commercial Si; (b) commercial GeO<sub>2</sub>.



**Figure S2.** (a) XRD patterns (b) Raman spectrums of SG-8 and SG-4.

**Supplementary calculations.** Theoretical specific capacity of Si/Ge composites is calculated according to the following formula. The compositions of lithiation phase are  $\text{Li}_{22}\text{Si}_5$  and  $\text{Li}_{22}\text{Ge}_5$ , respectively. As the capacity calculation: Specific capacity ( $\text{mA h g}^{-1}$ ) =  $96500 \cdot n / (3.6 \cdot M)$   $n$  is the charge carried by the lithium ion,  $M$  is the molar mass.

For SG-8,  $n=22/5=4.4$ ,  $M=8/9 \cdot 28 + 1/9 \cdot 72=32.89$  g/mol.

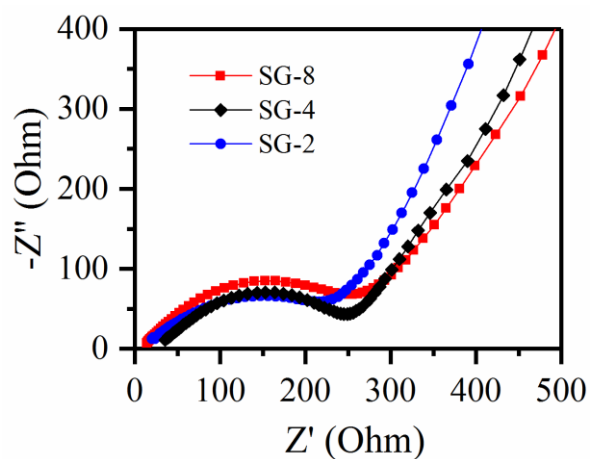
Specific capacity ( $\text{mA h g}^{-1}$ ) =  $96500 \cdot 4.4 / (3.6 \cdot 32.89) = 3586.0$   $\text{mA h g}^{-1}$

For SG-4,  $n=22/5=4.4$ ,  $M=4/5 \cdot 28 + 1/5 \cdot 72=37.4$  g/mol.

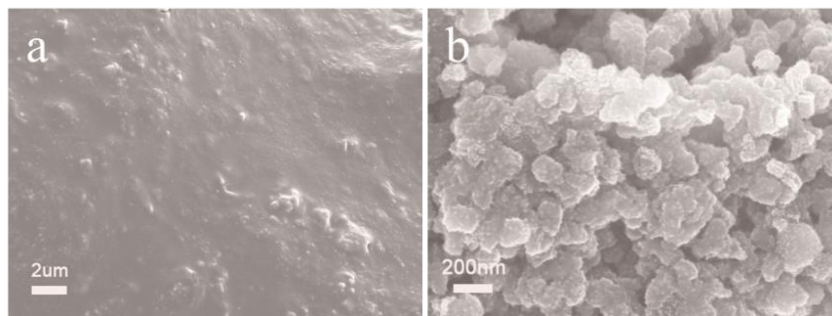
Specific capacity ( $\text{mA h g}^{-1}$ ) =  $96500 \cdot 4.4 / (3.6 \cdot 37.4) = 3153.6$   $\text{mA h g}^{-1}$

For SG-2,  $n=22/5=4.4$ ,  $M=2/3*28+1/3*72=42.7$  g/mol.

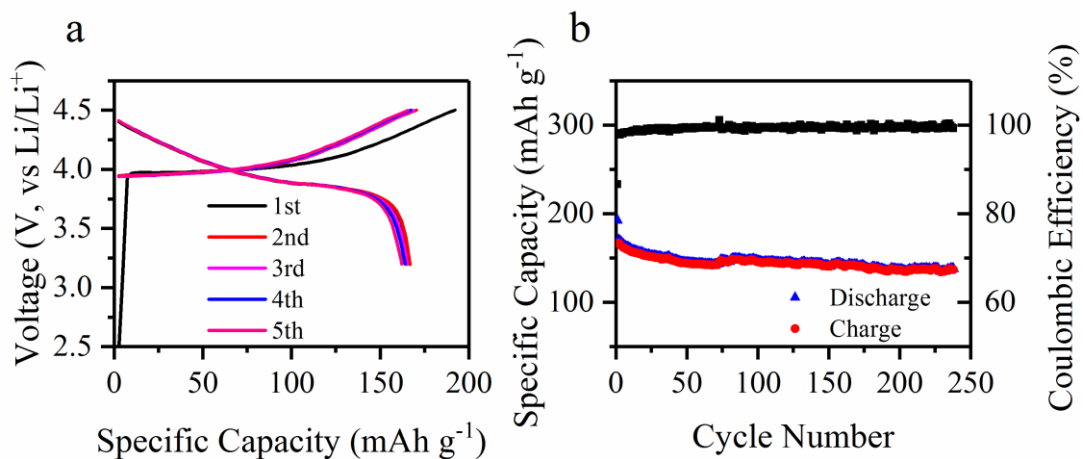
Specific capacity ( $\text{mA h g}^{-1}$ ) =  $96500*4.4/(3.6*42.7)= 2762.2$   $\text{mA h g}^{-1}$



**Figure S3.** Nyquist plots of Si/Ge composites with different ratios measured in the frequency range from 0.01 Hz to 100 kHz.



**Figure S4.** SEM images of SG-1 after 150 cycles (a) before immersion (b) after immersion in the DMC.



**Figure S5.** (a) Galvanostatic charge-discharge profile and (b) cycling property and Coulombic efficiency of the LiCoO<sub>2</sub> half cell at 1 C.

**Table S1.** The comparison of cycling stability between our work and previous representative reports is exhibited in the below table.

Materials	Reversible capacity (mAh g <sup>-1</sup> )	Current density	reference
SG-4	1761 mAh g <sup>-1</sup> after 150 cycles	0.6 A g <sup>-1</sup>	this work
3D-NP SiGe	1158 mAh g <sup>-1</sup> after 150 cycles	1 A g <sup>-1</sup>	1
Si/Cu/Ge NW	1500 mAh g <sup>-1</sup> after 100 cycles	0.4 A g <sup>-1</sup>	2

SiGe@C	560 mAh g <sup>-1</sup> after 400 cycles	0.8 A g <sup>-1</sup>	3
Si <sub>0.67</sub> Ge <sub>0.33</sub>	1360 mAh g <sup>-1</sup> after 250 cycles	0.2 C	4
Ge <sub>0.5</sub> Si <sub>0.5</sub>	1300 mAh g <sup>-1</sup> after 100 cycles	0.5 C	5
Si-Ge core-shell nanowires	974.5 mAh g <sup>-1</sup> after 50 cycles	0.2 C	6

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