

## Supplementary Information

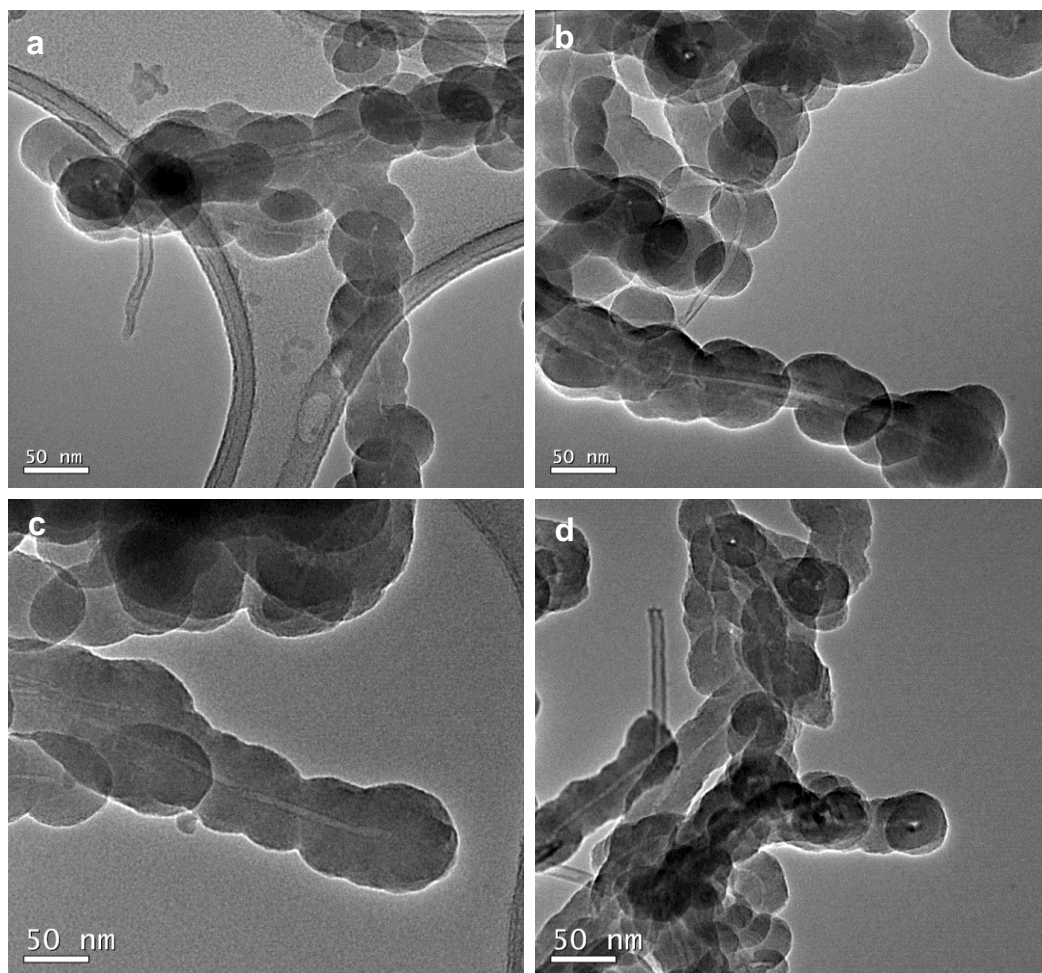
# **Synthesis of micro-assembled Si/titanium silicide nanotube anodes for high-performance lithium-ion batteries**

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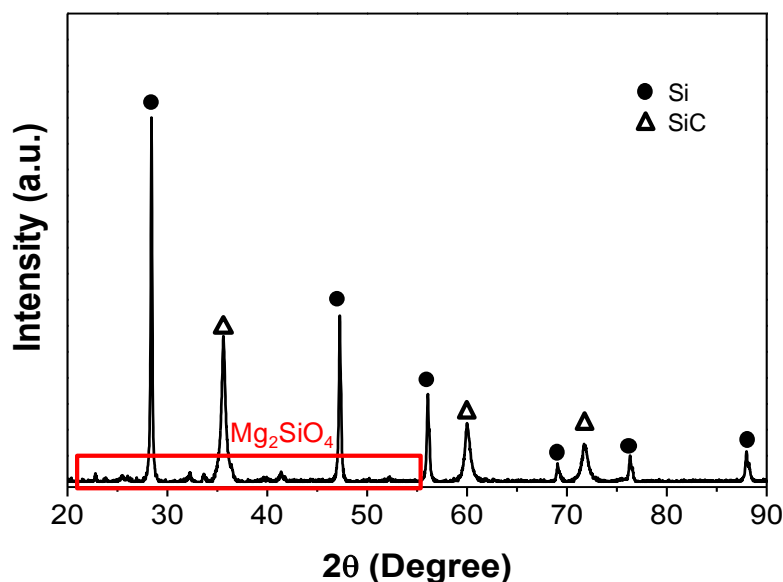
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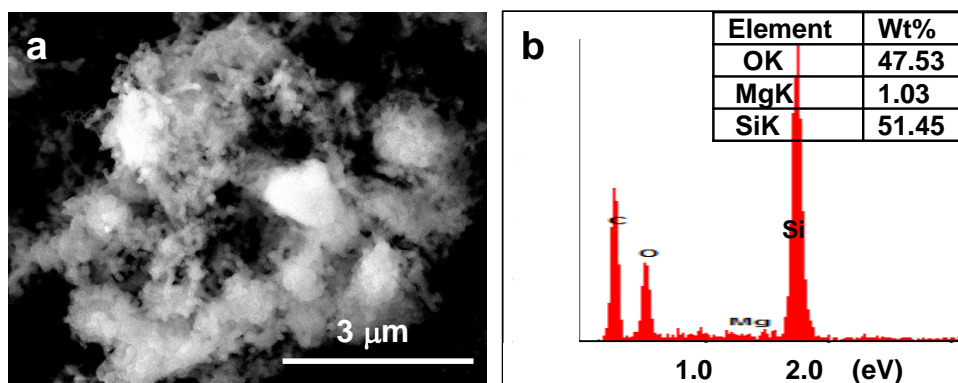
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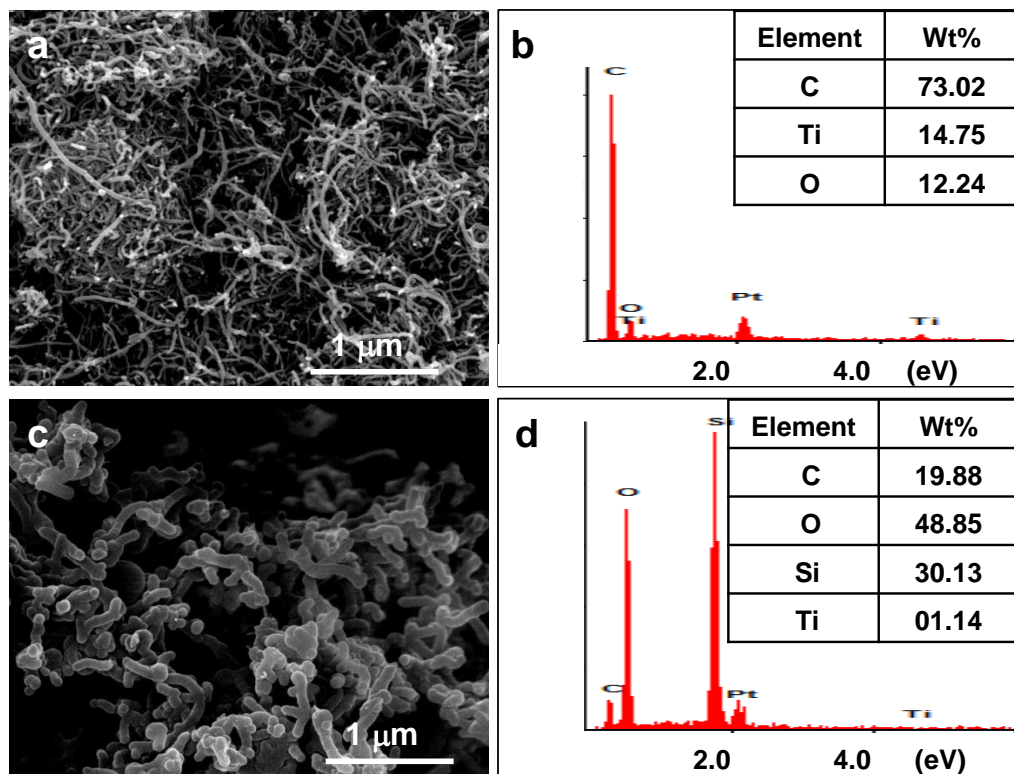
**Figure S1.** Control of SiO<sub>2</sub> layer thickness by volumetric ratio of NH<sub>4</sub>OH and TEOS. (a) NH<sub>4</sub>OH /TEOS = 16 mL/9 mL, (b) NH<sub>4</sub>OH /TEOS = 8 mL/9 mL, (c) NH<sub>4</sub>OH /TEOS = 12 mL/12 mL, and (d) NH<sub>4</sub>OH /TEOS = 12 mL/9 mL.



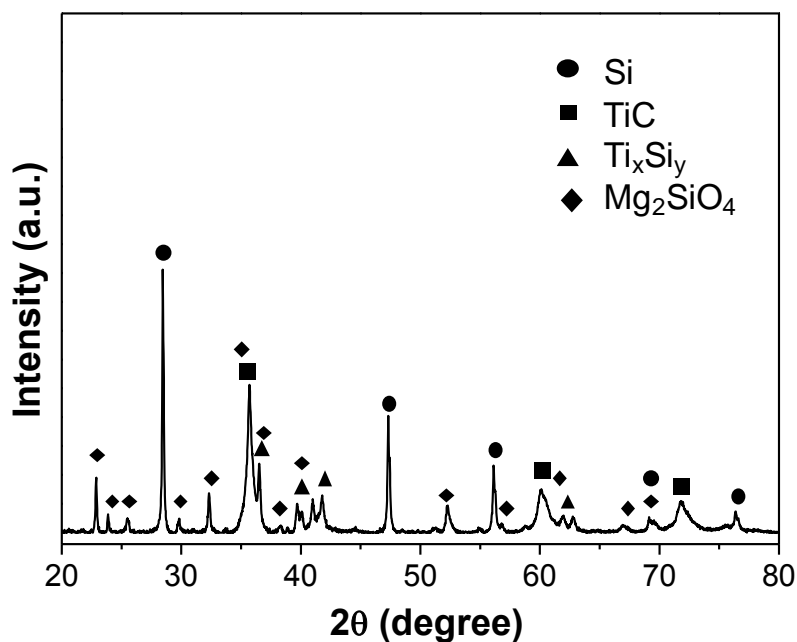
**Figure S2.** XRD patterns of as-synthesized CNT@SiC@Si prepared by a magnesiothermic reduction of  $SiO_2$ -coated CNTs. During the magnesiothermic reaction, SiC was formed at the interface between CNT and Si due to additional reaction of carbon source, CNT, and Si. Solid circle and triangle represent crystalline Si and SiC, respectively. Small peaks represent  $Mg_2SiO_4$  by-products.



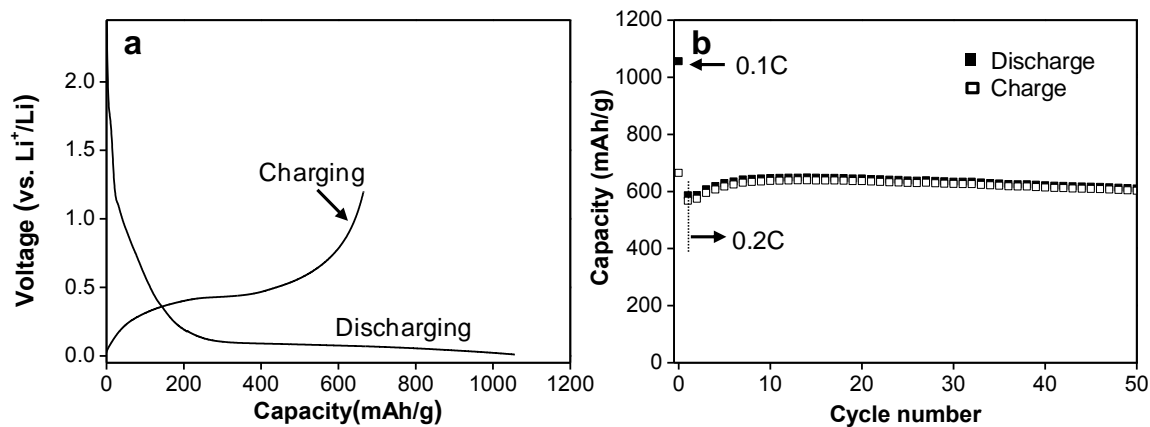
**Figure S3.** (a) SEM images and (b) EDAX profile of carbon-coated Si nanotubes.



**Figure S4.** SEM images of (a) TiO<sub>2</sub>-coated CNT and (c) micro-assembled CNT@TiO<sub>2</sub>@SiO<sub>2</sub> particles. EDAX profiles and elemental contents of (b) TiO<sub>2</sub>-coated CNT and (d) micro-assembled CNT@TiO<sub>2</sub>@SiO<sub>2</sub> particles.

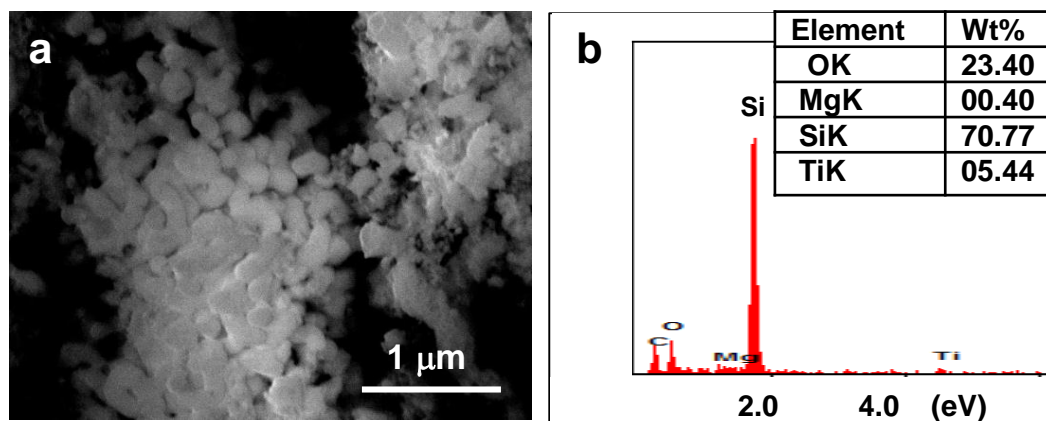


**Figure S5.** XRD patterns of as-synthesized CNT@TiC/Ti<sub>x</sub>Si<sub>y</sub>@Si prepared by magnesiothermic reduction of TiO<sub>2</sub>/SiO<sub>2</sub> double layer coated CNTs. During magnesiothermic reaction, TiC was formed at the interface between CNT and TiO<sub>2</sub> due to additional reaction of carbon source, CNT, and TiO<sub>2</sub> in addition Ti<sub>x</sub>Si<sub>y</sub> was formed at the interface between SiO<sub>2</sub> and TiO<sub>2</sub>.



**Figure S6.** Electrochemical properties of carbon-coated CNT@TiC/Ti<sub>x</sub>Si<sub>y</sub>@Si electrodes.

(a) The first cycle voltage profile and (b) cycling performance of the carbon-coated CNT@TiC/Ti<sub>x</sub>Si<sub>y</sub>@Si electrodes was obtained in the range of 0.01-1.2 V.



**Figure S7.** (a) SEM image and (b) EDAX profile of carbon-coated  $\text{Ti}_x\text{Si}_y\text{@Si}$  nanotubes.