

**Supplementary Information**

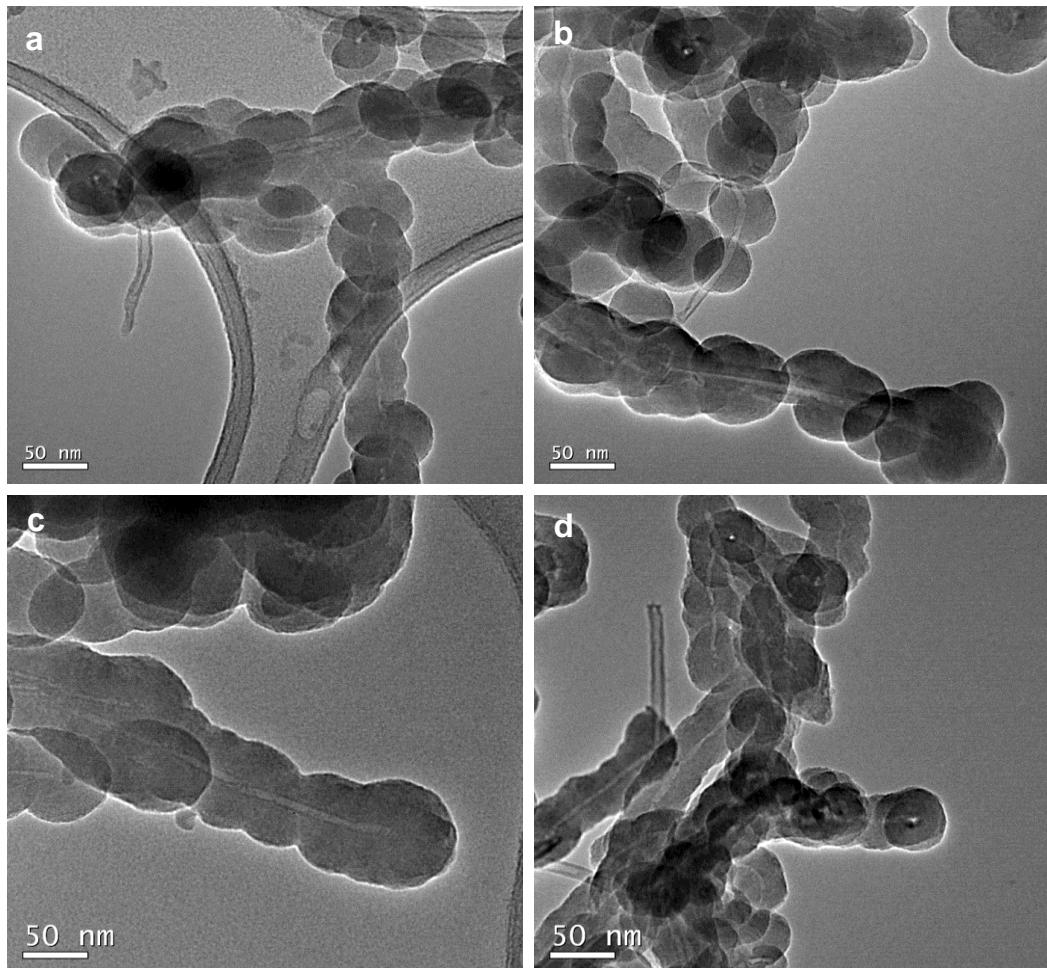
**Synthesis of micro-assembled Si/titanium silicide nanotube  
anodes for high-performance lithium-ion batteries**

Sinho Choi<sup>a</sup>, Jeong Chan Lee<sup>b</sup>, Okji Park <sup>a</sup>, Myung-Jin Chun <sup>a</sup>, Nam-Soon Choi <sup>a,\*</sup>,  
and Soojin Park <sup>a,\*</sup>

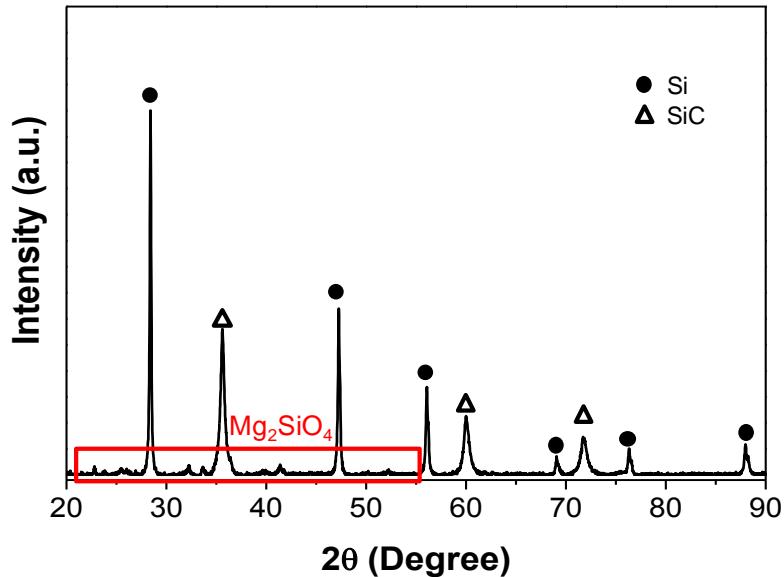
<sup>a</sup> *Interdisciplinary School of Green Energy, Ulsan National Institute of Science and  
Technology, Ulsan 689-798, Republic of Korea*

<sup>b</sup> *Duksan Hi-metal company, Yeonam-Dong, Buk-gu, Ulsan 683-804, Republic of Korea*

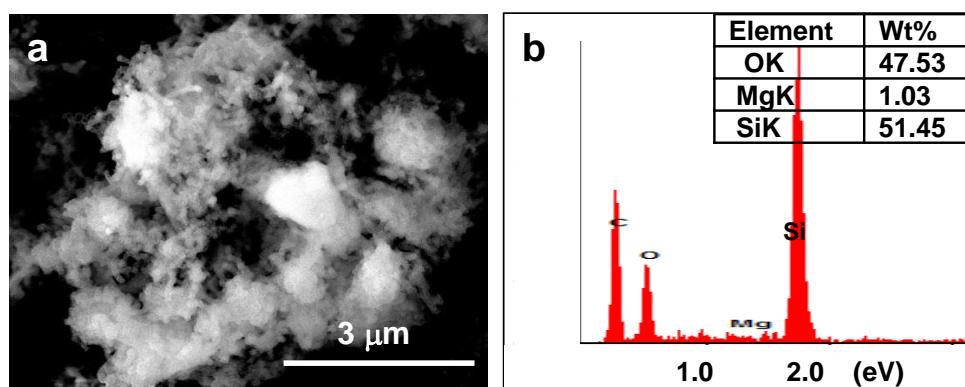
<sup>\*</sup> Corresponding authors: nschoi@unist.ac.kr and spark@unist.ac.kr



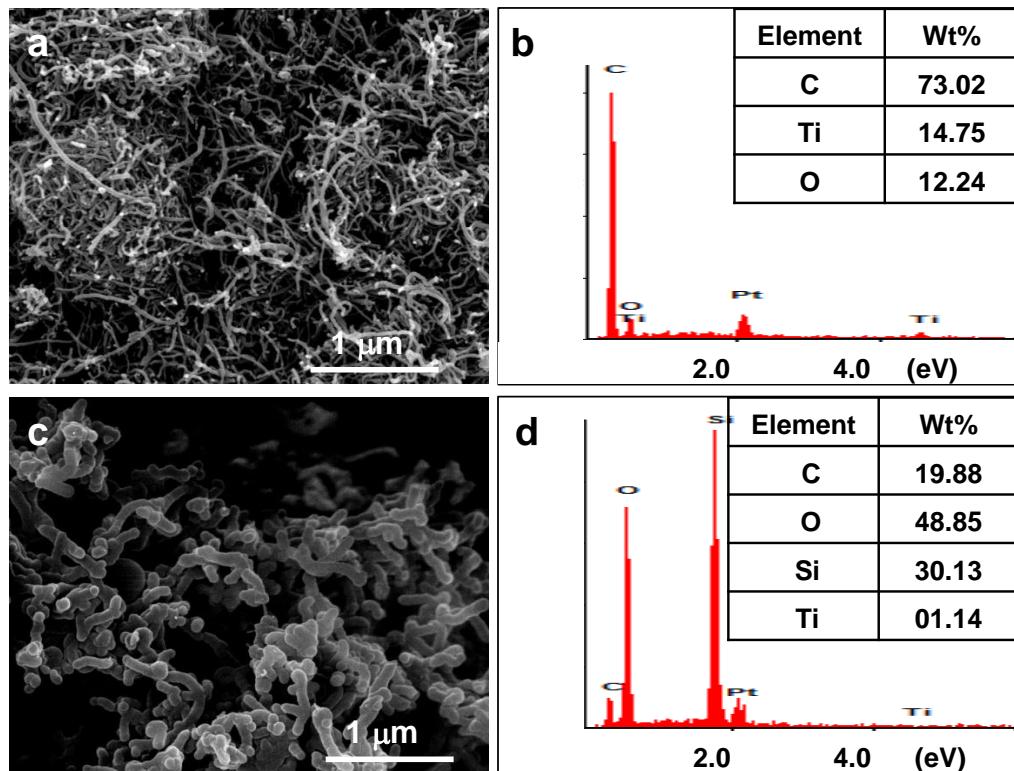
**Figure S1.** Control of  $\text{SiO}_2$  layer thickness by volumetric ratio of  $\text{NH}_4\text{OH}$  and  $\text{TEOS}$ . (a)  $\text{NH}_4\text{OH} / \text{TEOS} = 16 \text{ mL} / 9 \text{ mL}$ , (b)  $\text{NH}_4\text{OH} / \text{TEOS} = 8 \text{ mL} / 9 \text{ mL}$ , (c)  $\text{NH}_4\text{OH} / \text{TEOS} = 12 \text{ mL} / 12 \text{ mL}$ , and (d)  $\text{NH}_4\text{OH} / \text{TEOS} = 12 \text{ mL} / 9 \text{ mL}$ .



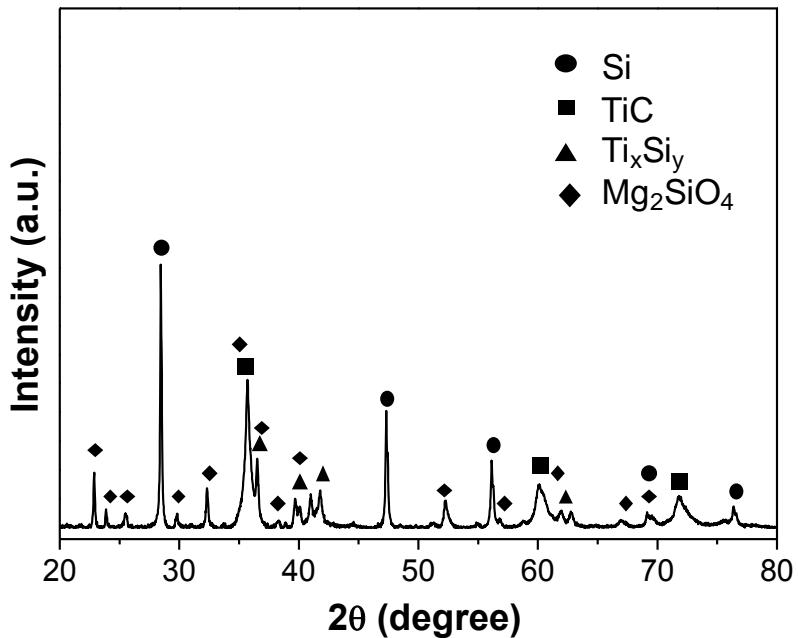
**Figure S2.** XRD patterns of as-synthesized CNT@SiC@Si prepared by a magnesiothermic reduction of SiO<sub>2</sub>-coated CNTs. During the magnesiothermic reaction, SiC was formed at the interface between CNT and Si due to additional reaction of carbon source, CNT, and Si. Solid circle and triangle represent crystalline Si and SiC, respectively. Small peaks represent Mg<sub>2</sub>SiO<sub>4</sub> by-products.



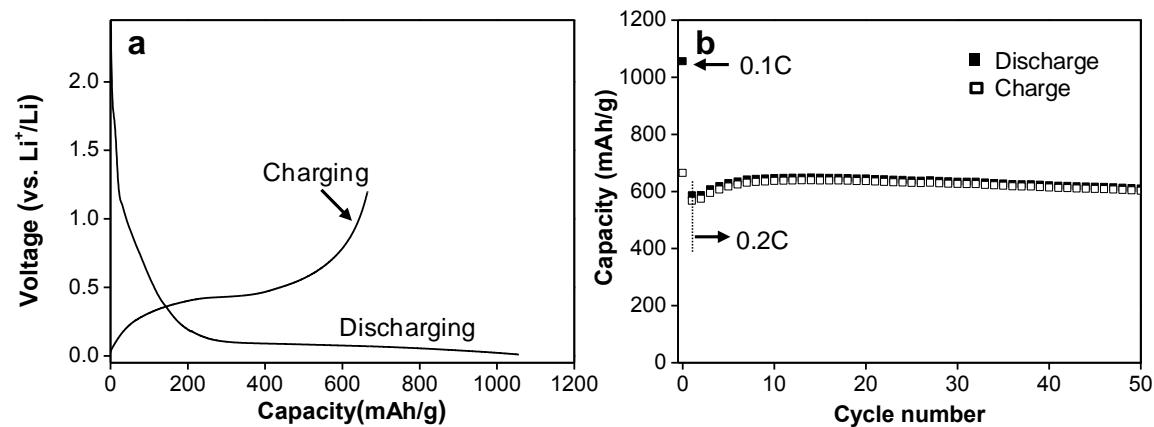
**Figure S3.** (a) SEM images and (b) EDAX profile of carbon-coated Si nanotubes.



**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.

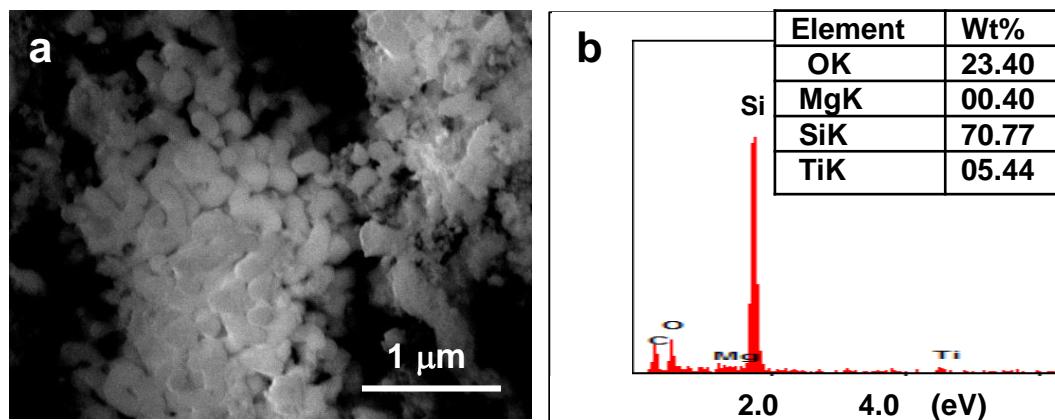


**Figure S5.** XRD patterns of as-synthesized CNT@TiC/T<sub>x</sub>S<sub>y</sub>@Si prepared by magnesiothermic reduction of TiO<sub>2</sub>/SiO<sub>2</sub> double layer coated CNTs. During magnesiothermic reaction, TiC was formed at the interface between CNT and TiO<sub>2</sub> due to additional reaction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