

## Supporting Information

# Carbon Dioxide as Green Carbon Source for Synthesis of Carbon Cages Encapsulating Porous Silicon as High Performance Lithium-ion Battery Anodes

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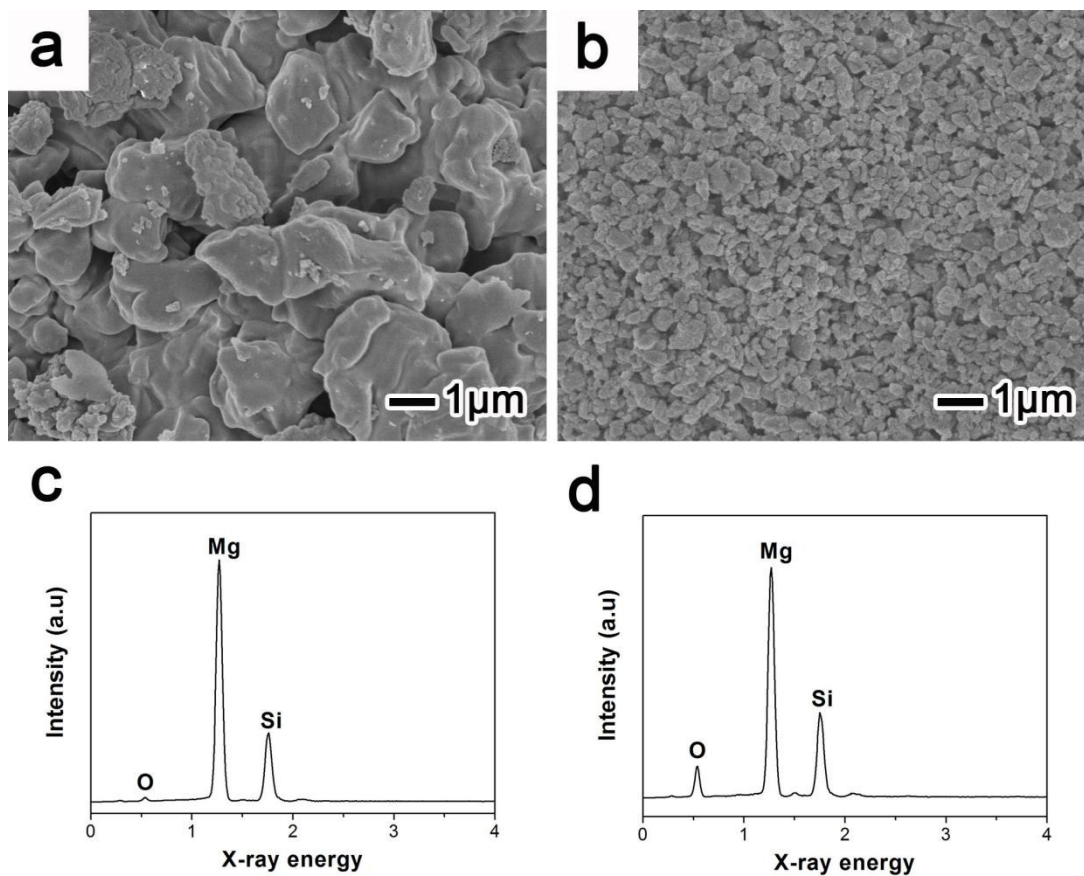


Figure S1. FESEM images of  $Mg_2Si$  before (a) and after (b) HEMM. The corresponding EDS patterns of  $Mg_2Si$  before (c) and after (d) HEMM.

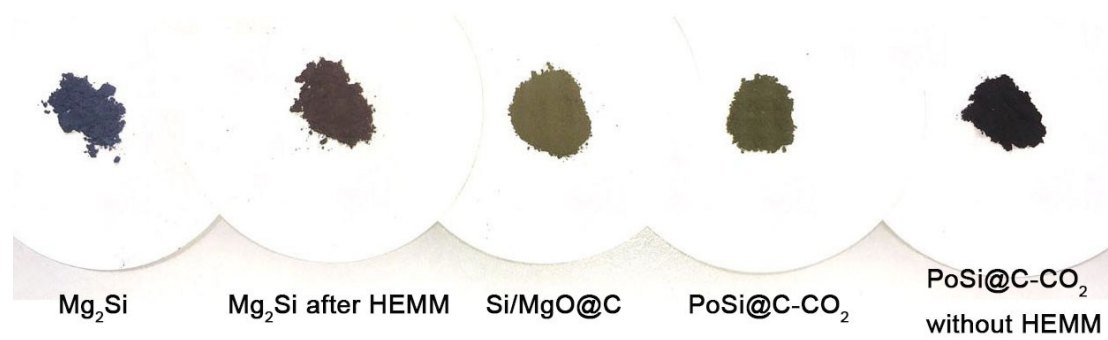


Figure S2. The color evolution of products along with the synthetic processes.

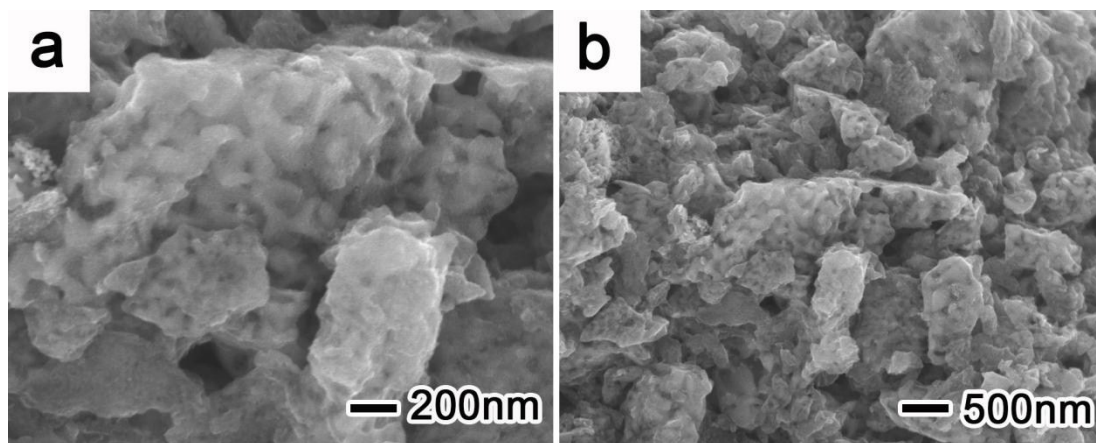


Figure S3. FESEM images of PoSi@C-CO<sub>2</sub>.

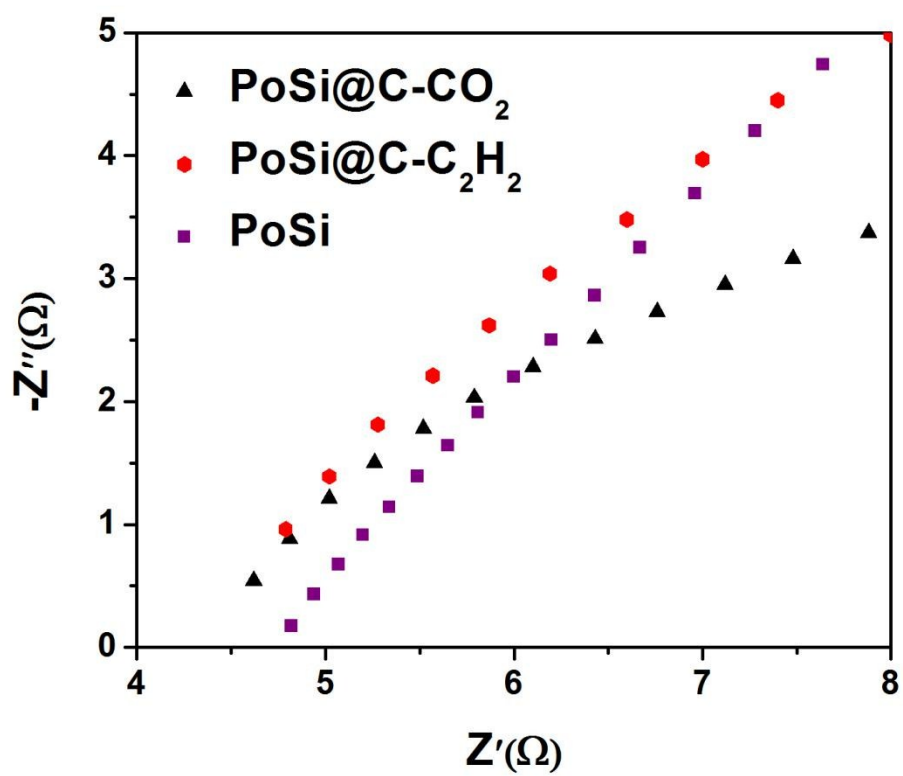


Figure S4. Enlarged Nyquist plots at high frequency of  $\text{PoSi@C-CO}_2$ ,  $\text{PoSi@C-C}_2\text{H}_2$  and  $\text{PoSi}$  electrodes.

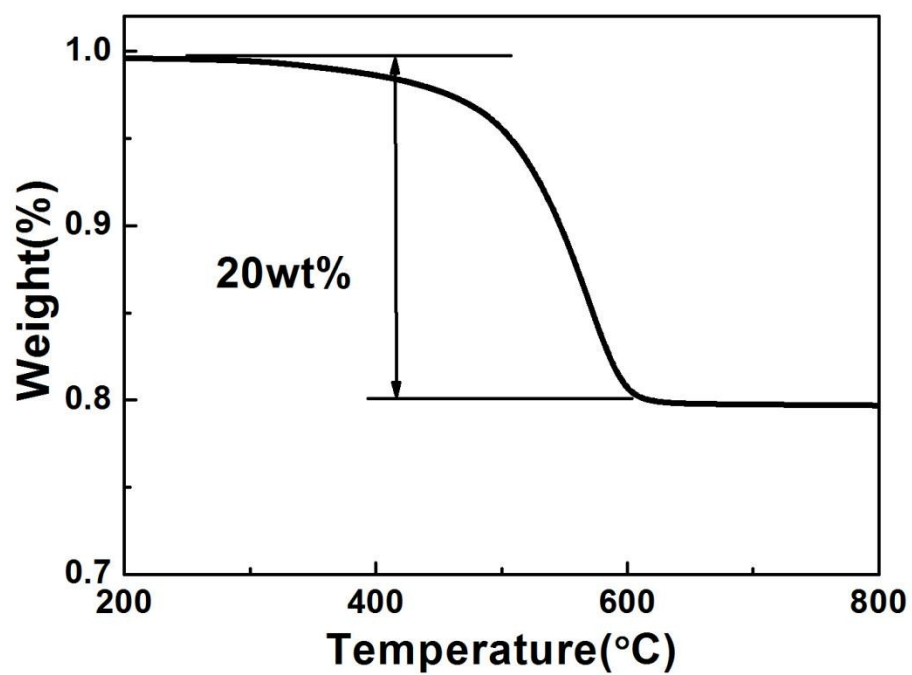


Figure. S5. TGA profile of the PoSi@C-C<sub>2</sub>H<sub>2</sub>.

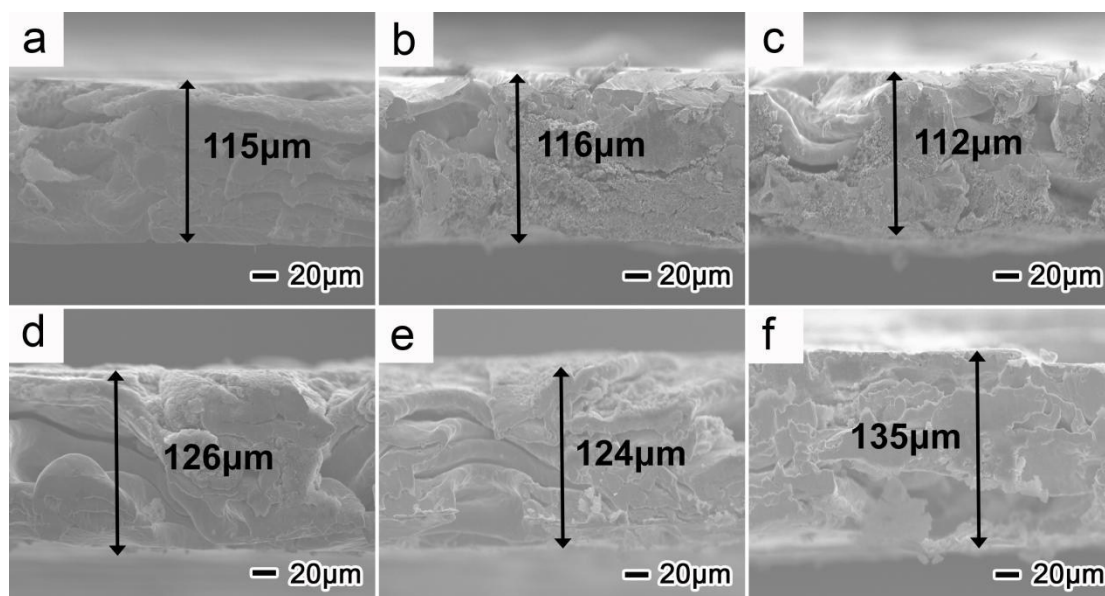


Figure. S6 FESEM images of different samples of PoSi@C-CO<sub>2</sub> electrode cross-sections before 1<sup>st</sup> lithation (a-c) and after the 60<sup>th</sup> cycle (d-f).

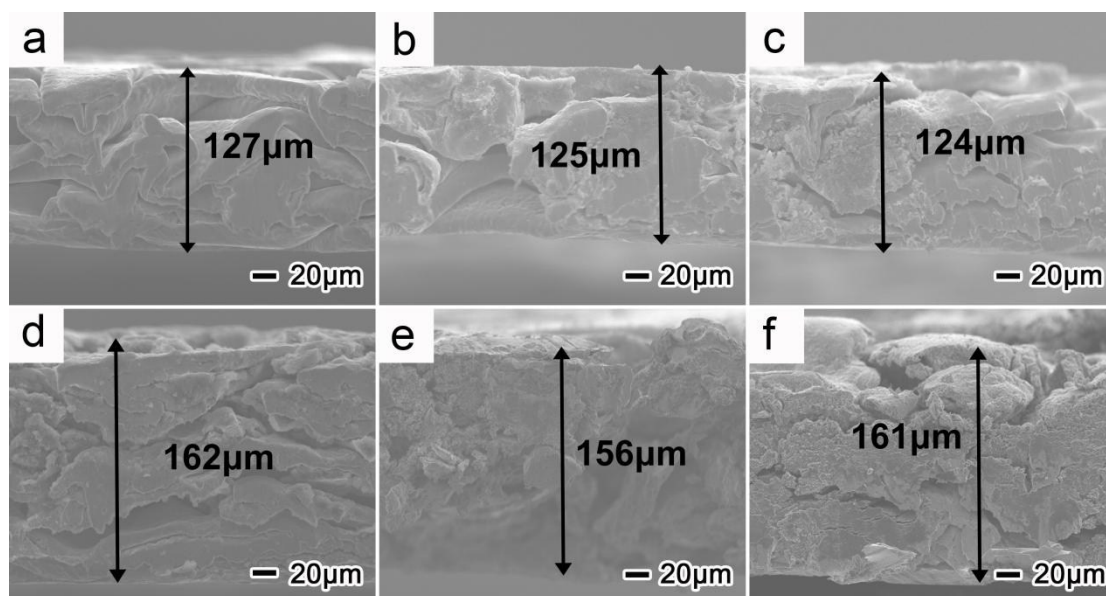


Figure. S7 FESEM images of different samples of PoSi@C-C<sub>2</sub>H<sub>2</sub> electrode cross-sections before 1<sup>st</sup> lithation (a-c) and after the 60<sup>th</sup> cycle (d-f).



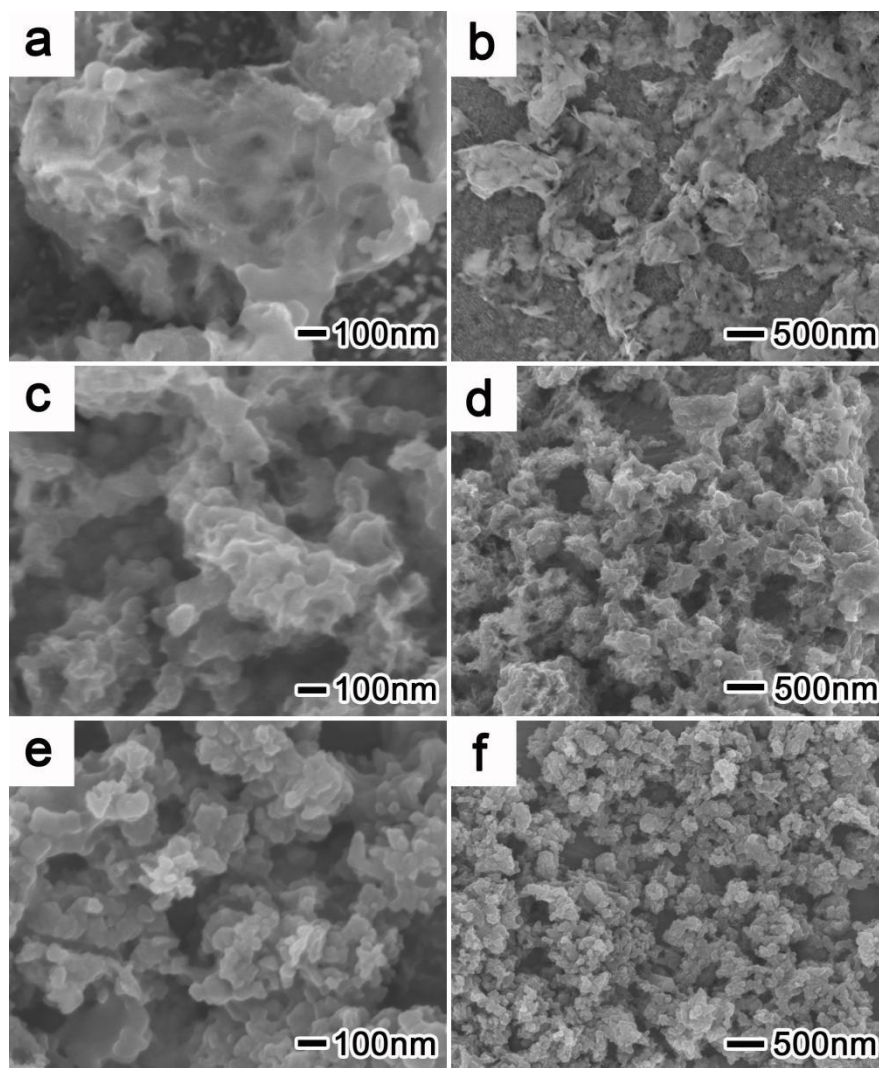


Figure S8. FESEM images of PoSi@C-CO<sub>2</sub> (a and b), PoSi@C-C<sub>2</sub>H<sub>2</sub> (c and d), PoSi (e and f) after 50 cycles.