# Supporting Information

## Synthesize Ternary and Microspheres Structure of $SiO_x$@$SnO_2$@C by Hydrothermal Method as Anode for High Performance Lithium-Ion Batteries

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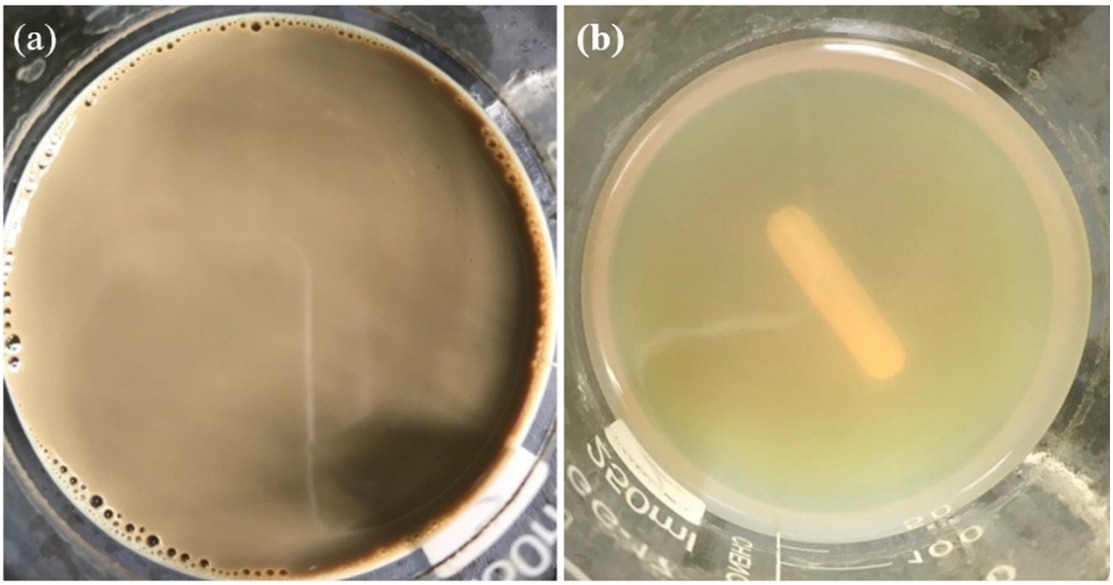


Figure S1. Color of the mixed solution at initial (a) and after aging for 4 h at 60 °C (b).

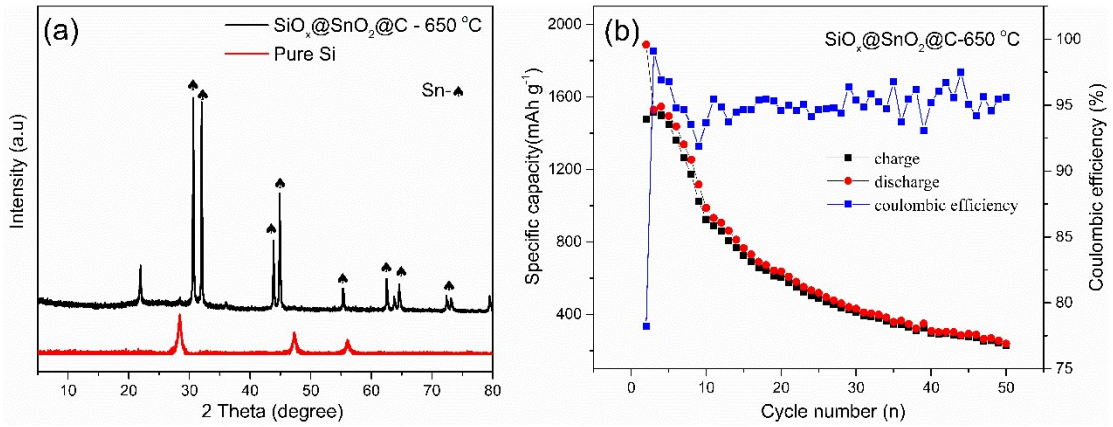


Figure S2. The XRD pattern of $SiO_x$@$SnO_2$@C carbonized at 650 °C for 3 h (a), and the corresponding cyclic

performance (b).

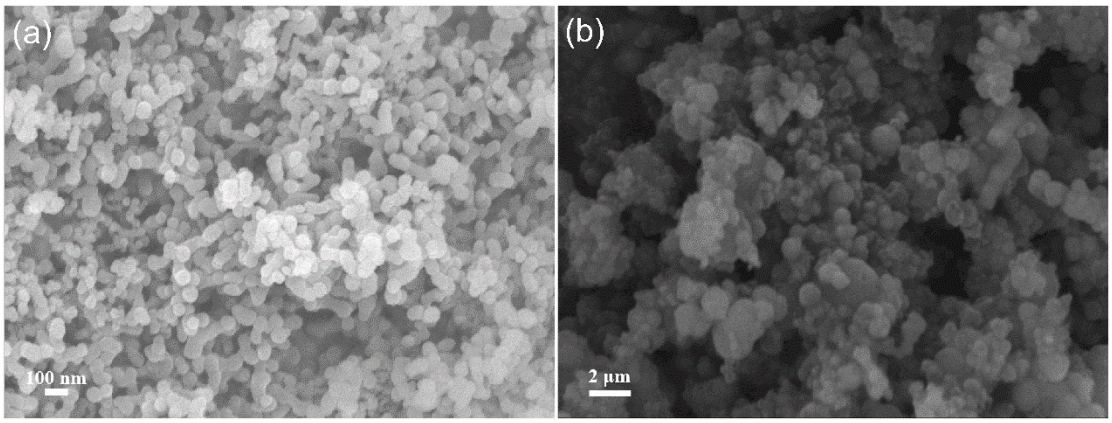


Figure S3. SEM images of pristine Si nanoparticles (a), and Si@C composites (b).

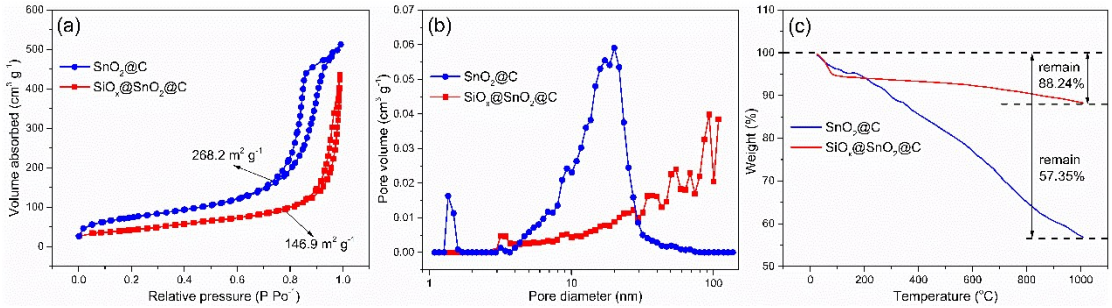


Figure S4. $N_2$ adsorption/desorption isotherms (a), DFT pore size distribution curves (b), TGA plots (c) of $SnO_2$@C and $SiO_x$@$SnO_2$@C composites, respectively.

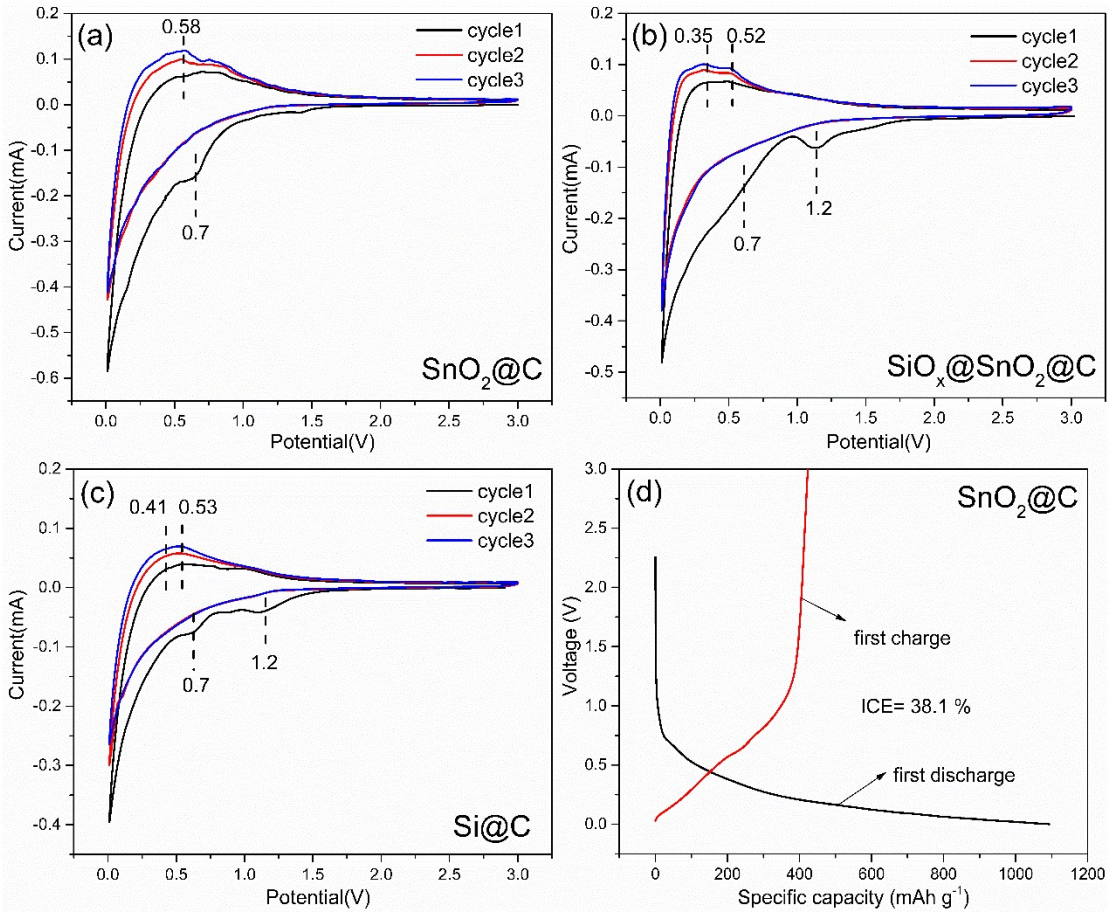


Figure S5. CV-curves of $SnO_2$@C (a), $SiO_x$@$SnO_2$@C (b) and Si@C (c) composites from 0.001 to 3 V at a scan rate of 0.1 mV $s^{-1}$ for the first three cycles, Charge and discharge voltage profiles of $SnO_2$@C for first cycle (d).

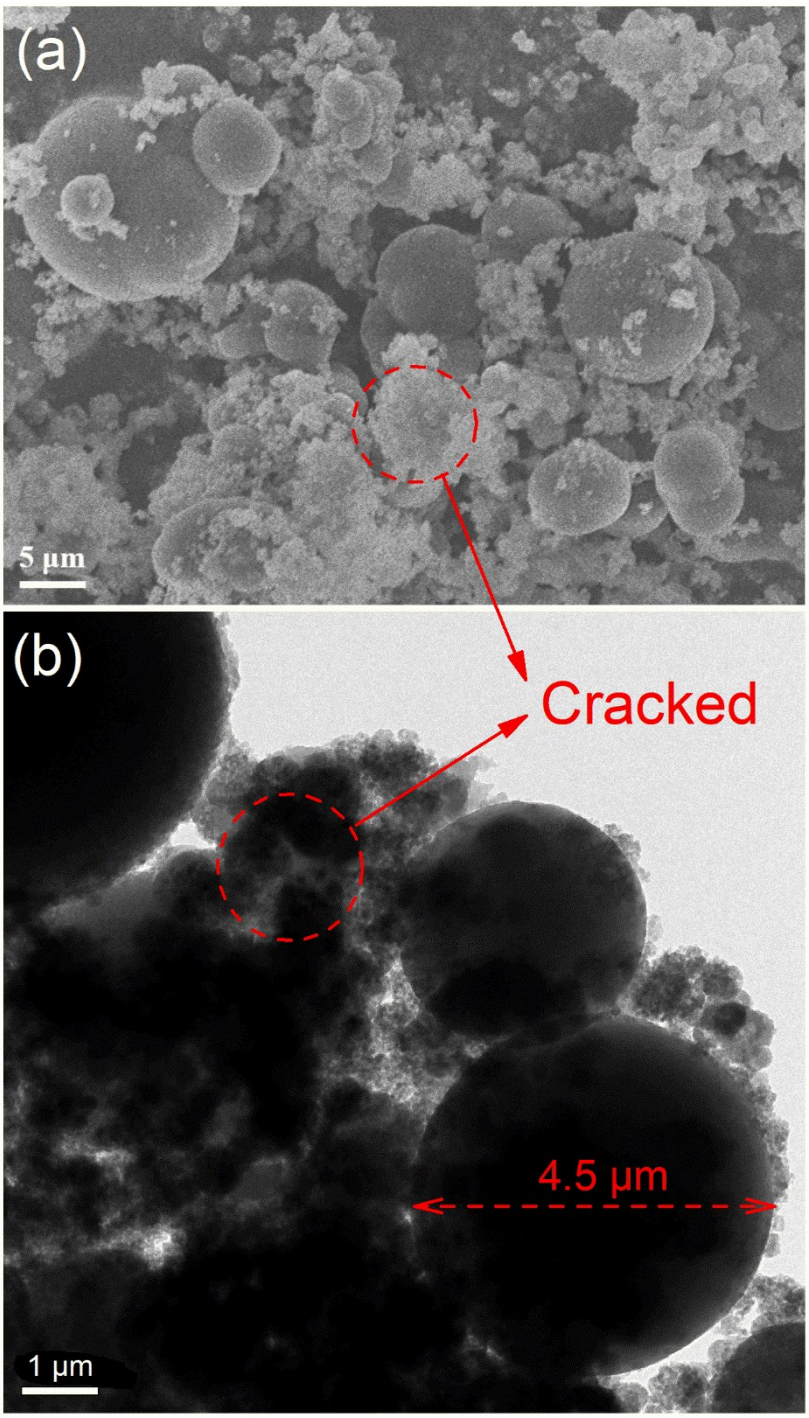


Figure S6. SEM image (a) and TEM image of $SiO_x$@$SnO_2$@C electrode after 300$^{th}$ charge/discharge.

Table S1 the $R_{ct}$ value and corresponding charge state of $SnO_2$, $SiO_x$@$SnO_2$@C and Si@C of initial and after 100 cycles.

| Sample | $R_{ct}$-1 (Ω) | $R_{ct}$-100 (Ω) | Charge state-1 (V) | Charge state-100 (V) |
|---|---|---|---|---|
| $SnO_2$ | 62 | 28 | 2.76 | 2.46 |
| $SiO_x$@$SnO_2$@C | 163 | 45 | 2.98 | 2.54 |
| Si@C | 70 | 42 | 3.03 | 1.62 |