Supporting Information

3D Graphene Network Encapsulating SnO$_2$ Hollow Spheres for High-performance Anode Material of Lithium-ion Batteries

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Figure S1. XPS survey spectra (a) of APTEOS modified H-SnO₂ and pure H-SnO₂ samples, and high resolution XPS spectrum of N 1s (b) for the APTEOS modified H-SnO₂ samples. The N 1s peak shows that the primary amines (NH₂, 399.3 eV) and secondary amines (N=C, 398.6 eV) along with oxidized species as amides (NHC=O, 400.9 eV) in the high resolution XPS spectrum. The abundant amino groups can serve as deposition places to coat graphene nanosheets, resulting in graphene fully enwrapped H-SnO₂ nanospheres by electrostatic adsorption.
Figure S2. Zeta potentials of APTEOS modified H-SnO$_2$ (black square) and graphene oxide (red circle) in aqueous solution at different pH values. The blue rectangle indicates that the assembly process can be spontaneous at pH 2 where the maximum electrostatic interactions are achieved between the APTEOS modified H-SnO$_2$ and graphene oxide.
Figure S3. Photographs of the assembly process of APTEOS modified H-SnO$_2$ and graphene oxide in aqueous solutions at pH 2.
Figure S4. The magnified a) FESEM and b) TEM images of the as-prepared H-SnO$_2$. 
**Figure S5.** a) FESEM and b) TEM images of the solid SnO\(_2\) nanospheres (S-SnO\(_2\)) prepared at 150 °C for 6 h. c) FESEM and d) TEM images of after self-assembled wrapping of interconnected graphene networks (S-SnO\(_2\)@rGO). e) FESEM and f) TEM images of graphene loading hollow SnO\(_2\) nanospheres (H-SnO\(_2\)/rGO).
Figure S6. a) XPS of C 1s and b) XPS Sn 3d fine scan spectrum of H-SnO$_2$@rGO.
Figure S7. The coulombic efficiency of the H-SnO$_2$@rGO electrode materials at a current density of 0.1 A g$^{-1}$. 
Figure S8. The electrochemical performance of rGO at a current density of 0.1 A g$^{-1}$. 
Figure S9. Cycling performance and Coulombic efficiency of S-SnO$_2$@rGO for 400 cycles at the current density of 1 A g$^{-1}$. 
Figure S10. a,b) Typical TEM image of a fully charged H-SnO$_2$@rGO electrode after 100 cycles at a current density of 100 mA g$^{-1}$. 
Table S1. Electrochemical performance comparison of H-SnO$_2$@rGO with previously reported graphene-based SnO$_2$ composites with different morphologies or compositions.

<table>
<thead>
<tr>
<th>Materials</th>
<th>Voltage range(V)</th>
<th>Current density (mA g$^{-1}$)</th>
<th>Cycle number</th>
<th>Specific capacity (mAh g$^{-1}$)</th>
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References