Supporting Information

3D Graphene Network Encapsulating SnO_2 Hollow Spheres for High-performance Anode Material of Lithium-ion Batteries

3D Graphene Network Encapsulating SnO_2 Hollow Spheres for High-performance Anode Material of Lithium-ion Batteries

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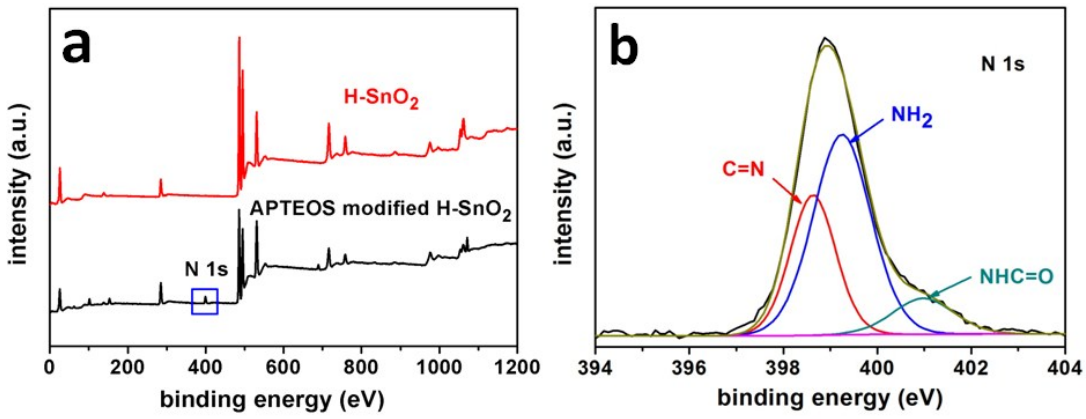

Figure S1. XPS survey spectra (a) of APTEOS modified H-SnO_2 and pure H-SnO_2 samples, and high resolution XPS spectrum of N 1s (b) for the APTEOS modified H-SnO_2 samples. The N 1s peak shows that the primary amines (NH_2, 399.3 eV) and secondary amines (N=C, 398.6 eV) along with oxidized species as 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-SnO_2 nanospheres by electrostatic adsorption.

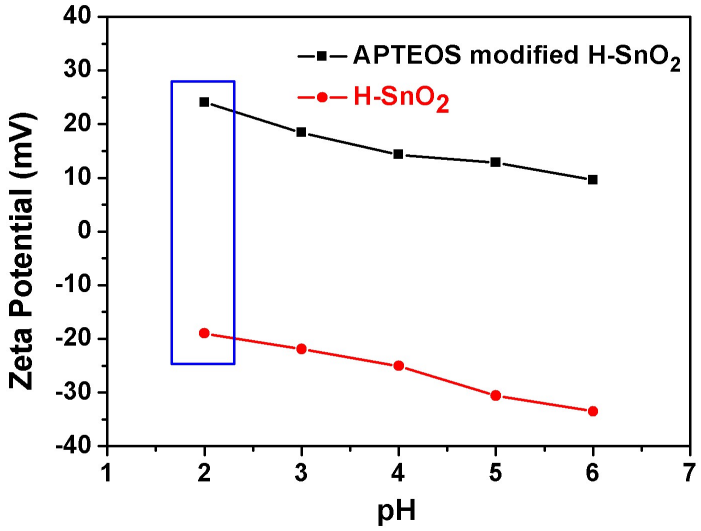

Figure S2. Zeta potentials of APTEOS modified H-SnO_2 (black square) and graphene oxide (red circle) in aqueous solution at different pH values. The blue rectangle indicates that the assembly process can be spontaneous at pH 2 where the maximum electrostatic interactions are achieved between the APTEOS 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.

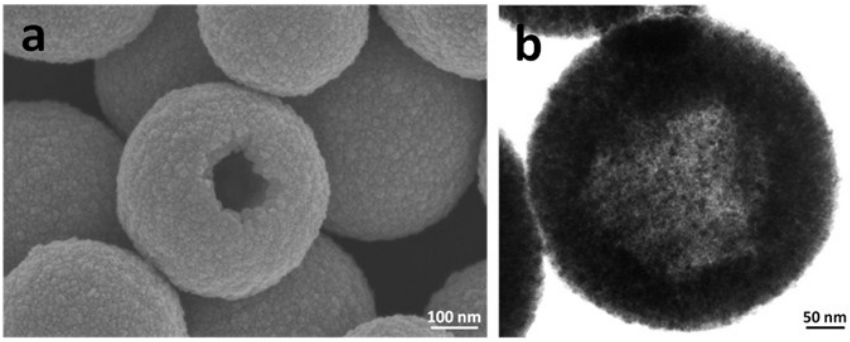

Figure S4. The magnified a) FESEM and b) TEM images of the as-prepared H-SnO_2.

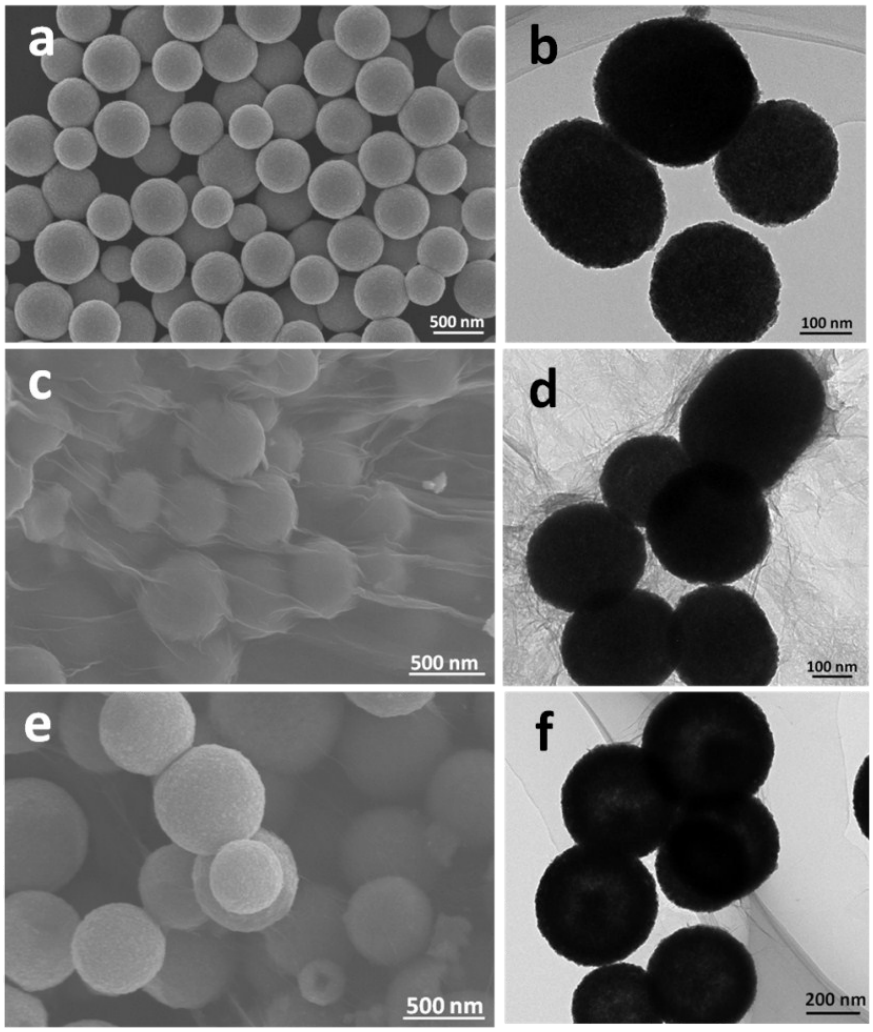

Figure S5. a) FESEM and b)TEM images of the solid SnO_2 nanospheres (S-SnO_2) prepared at 150 °C for 6 h. c) FESEM and d) TEM images of after self-assembled wrapping of interconnected graphene networks (S-SnO2@rGO). e) FESEM and f)TEM images of graphene loading hollow SnO_2 nanospheres (H-SnO_2/rGO).

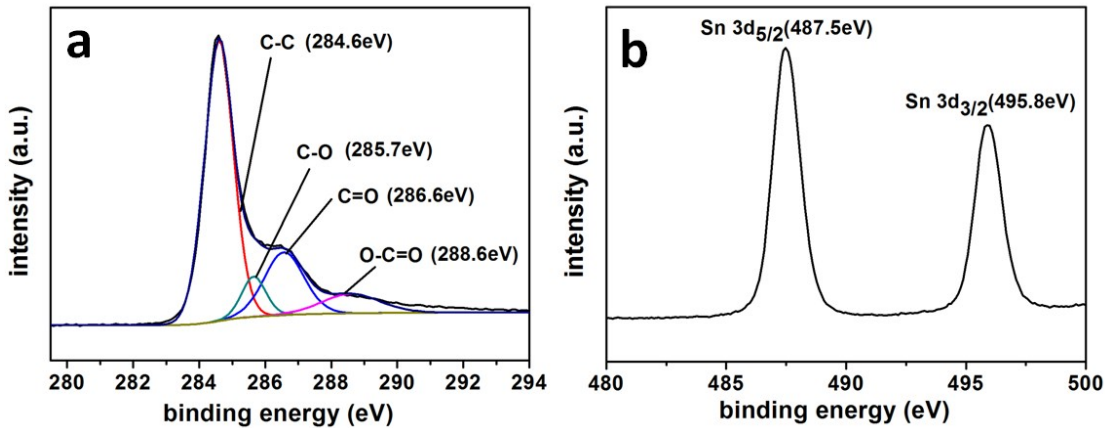

Figure S6. a) XPS of C 1s and b) XPS Sn 3d fine scan spectrum of H-SnO_2@rGO.

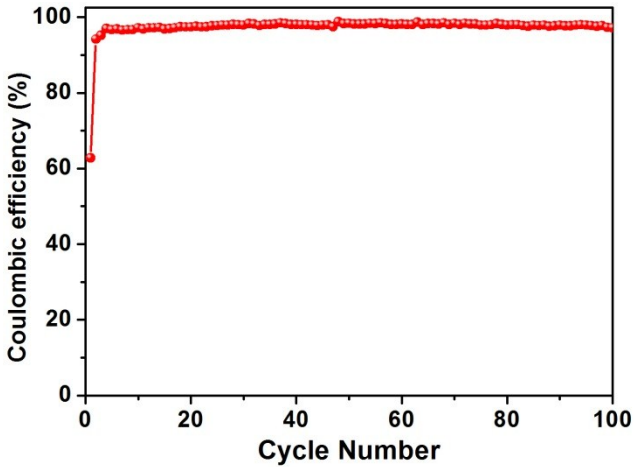

Figure S7. The coulombic efficiency of the H-SnO_2@rGO electrode materials at a current density of 0.1 A g^{-1}.

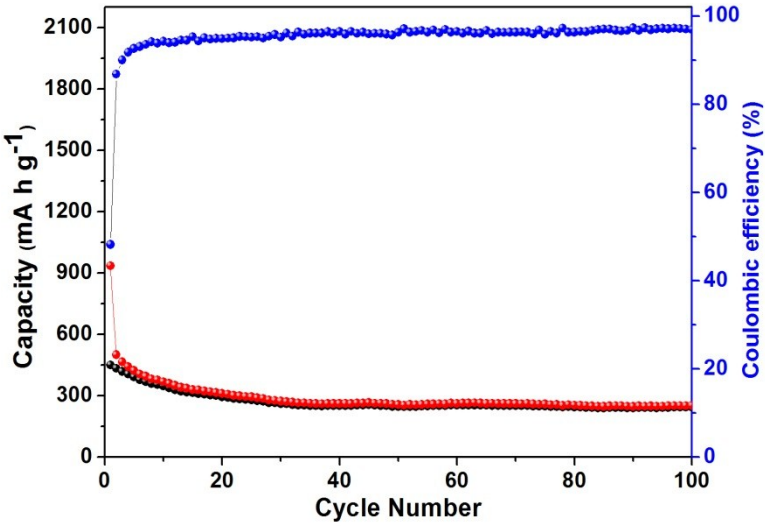

Figure S8. The electrochemical performance of rGO at a current density of 0.1 A g^{-1}.

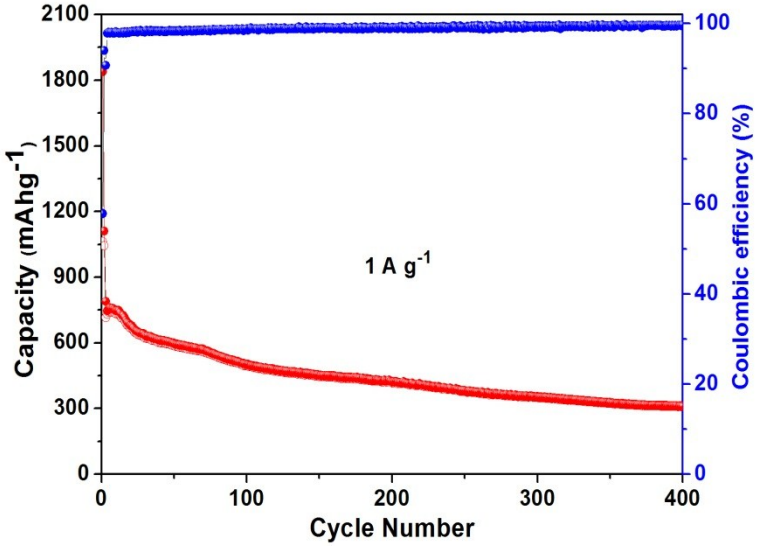

Figure S9. Cycling performance and Coulombic efficiency of S-SnO_2@rGO for 400 cycles at the current density of 1 A g^{-1}.

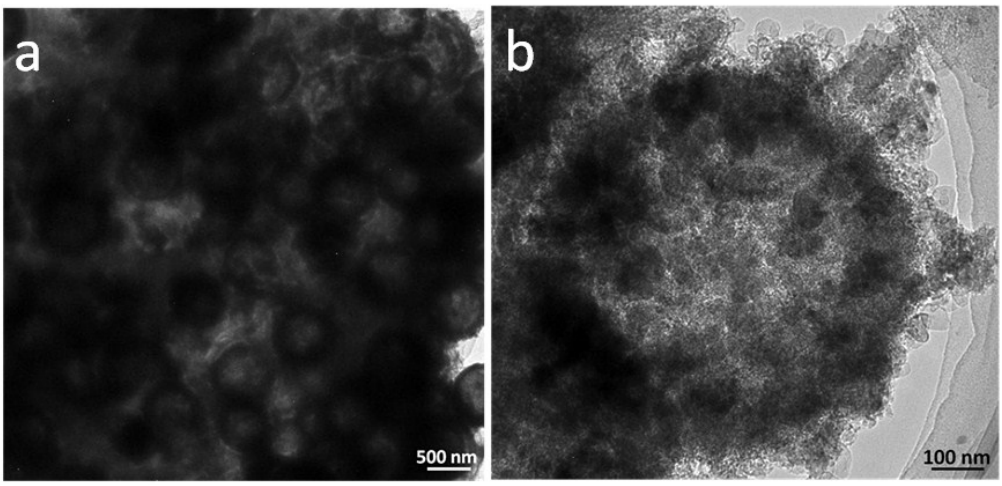

Figure S10. a,b) Typical TEM image of a fully charged H-SnO_2@rGO electrode after 100 cycles at a current density of 100 mA g^{-1}.

Table S1. Electrochemical performance comparison of H-SnO_2@rGO with previously reported graphene-based SnO_2 composites with different morphologies or compositions.

Materials	**Voltage range(V)**	**Current density (mA g^{-1})**	**Cycle number**	**Specific capacity (mAh g^{-1})**	**Reference**
H-SnO_2@rGO	0.01-3.0	100 1000	100 500	1107 552	Our Work
S-SnO_2@rGO	0.01-3.0	100	100	744	Our Work
Graphene-based mesoporous SnO_2	0.01-3.0	78	50	848	1
SnO_2/GNS	0.005-2.0	50	30	570	2
3D SnO_2/graphene	0.01-3.0	200	50	845	3
Dually fixed SnO_2/G@Pani	0.01-3.0	100	100	770	4
SnO_2–GO hybrid	0.005-2.5	100	200	800	5
Graphene nanoribbons/SnO_2	0.01-2.5	100	50	825	6
3D-G/SnO_2@C	0.005-3	100	100	820	7
N-doped G-SnO_2 Sandwich Papers	0.005-3	50	50	910	8
SnO_2 Quantum Dots@GO	0.01-3	100	100	1121	9
SnO_2/graphene	0.01-2.5	100	200	830	10

SnO_2@C@GS	0.01-2	200	100	830	11
SnO_2-HNS/G	0.005-3	500	300	696	12
Polyaniline @SnO_2 @Graphene	0.01-3	1000	100	560	13
SnO_2 nanosheets @graphene sheets	0.01-1.2	160	50	518	14
SnO_2/RGO/C foam	0.01-1.5	130	100	717	15
SnO_2 quantum dots/RGO	0.01-3	100	200	924	16
rGO/SnO_2	0.01-3	100	100	536	17
polydopamine-coated RGO/SnO_2	0.01-2	100	200	718	18
SnO_2@G@G	0.01-2	80	120	591	19
graphene/C-SnO_2	0.005-3	100	50	502	20

References

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