Supporting Information

Partially Phosphorized SnO_2/Graphene Nanocomposite for Highly Reversible Pseudocapacitive Lithium-Ion Storage

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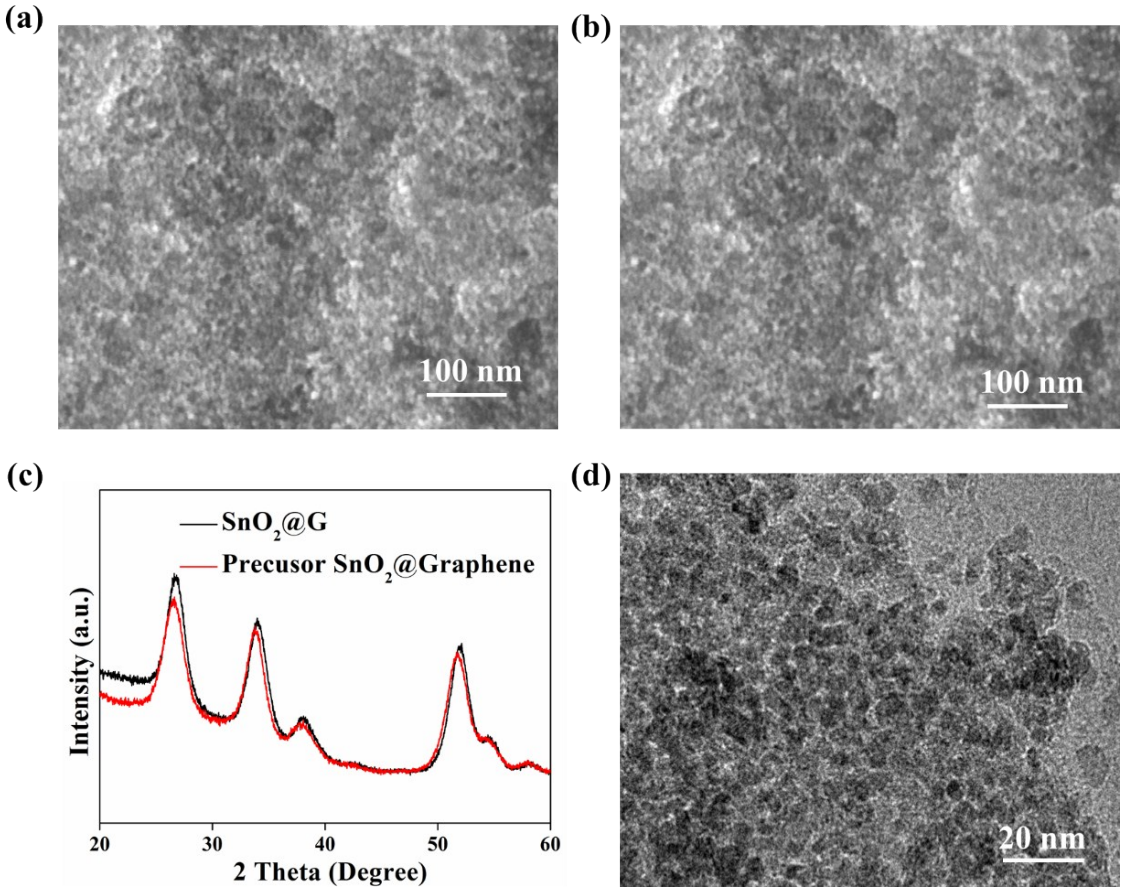

Figure S1. Scanning electron microscope (SEM) images of (a) SnO_2@G-Pre composite and (b) SnO_2@G composite after annealing; (c) XRD curves of SnO_2@G composite before and after annealing; (d) transmission electron microscope image (TEM) of SnO_2@G after annealing.

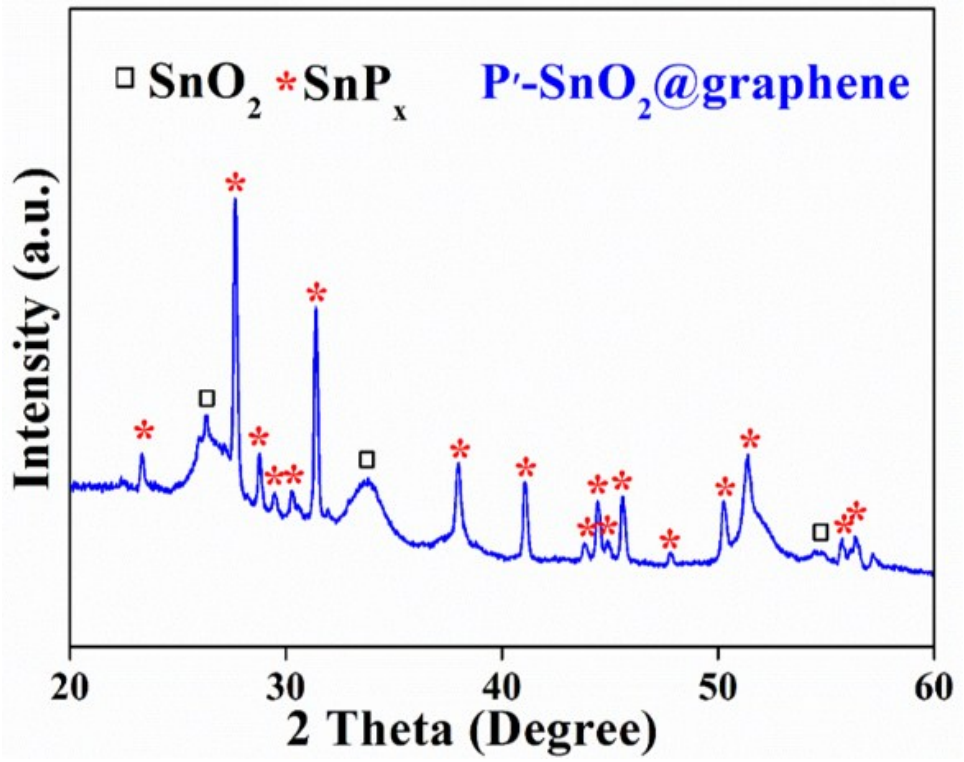

Figure S2. XRD pattern of P-SnO_2@G-10 phosphorized at low molar ratio of Sn and P (1:10).

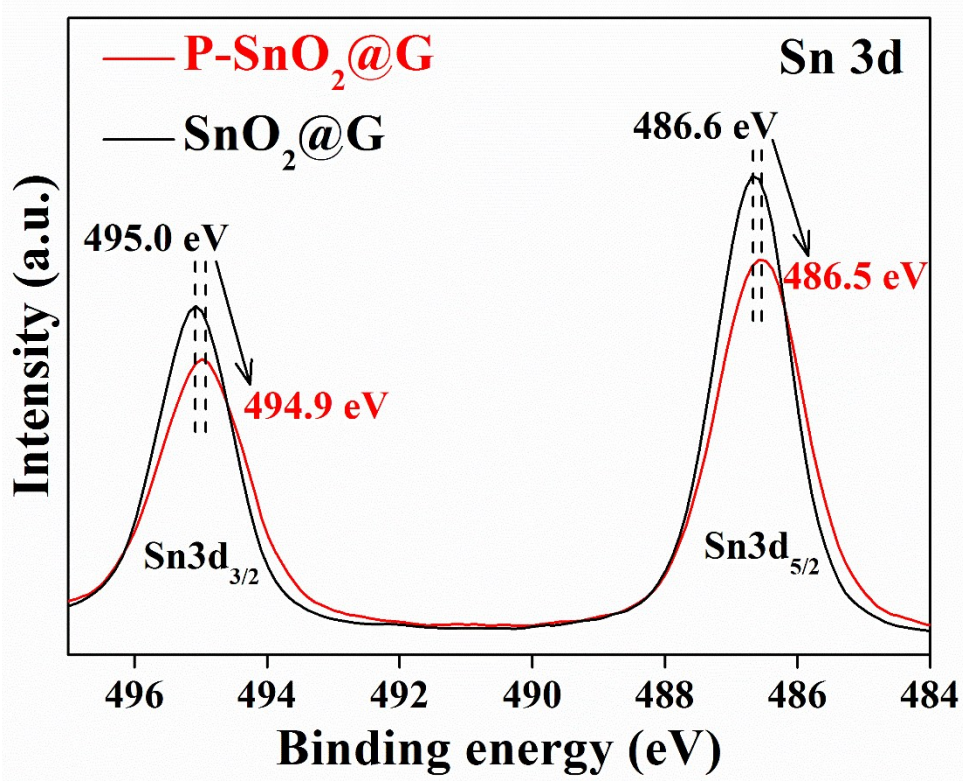

Figure S3. High-resolution XPS spectra of Sn 3d in SnO_2@G and P-SnO_2@G.

Table S1. The element composition of P-SnO_2@G estimated based on Energy dispersive spectrometer (EDS).

Element	Weight%	Atomic%
C	11.52	35.88
N	2.15	1.14
O	13.31	29.98
P	10.43	12.60
Sn	62.59	20.41

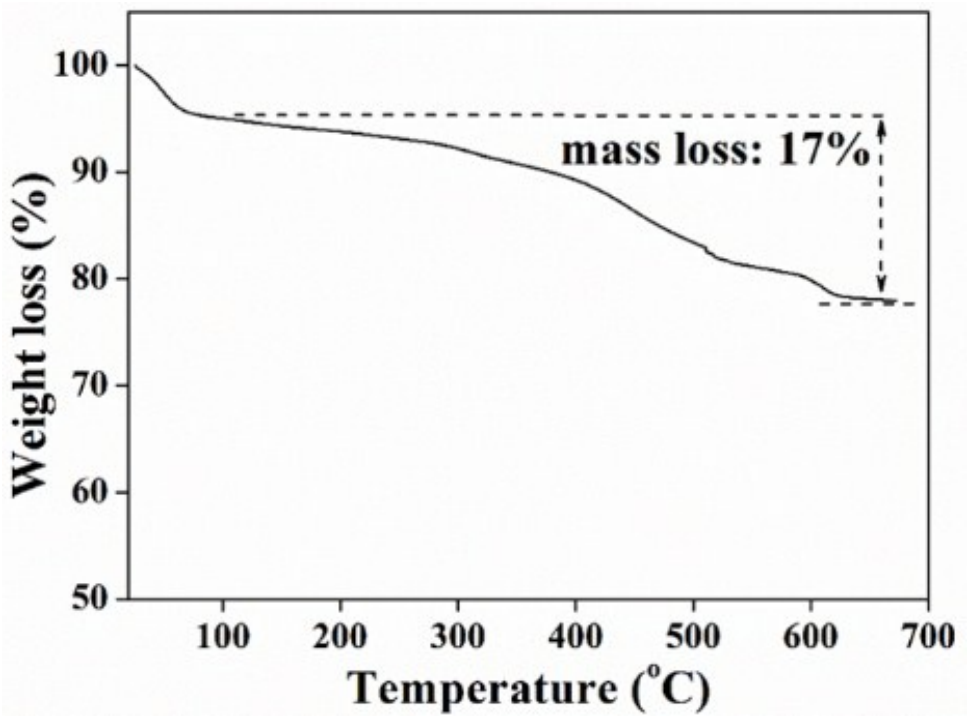

Figure S4. Thermogravimetric analysis curve of as-synthesized SnO_2@G-Pre composite

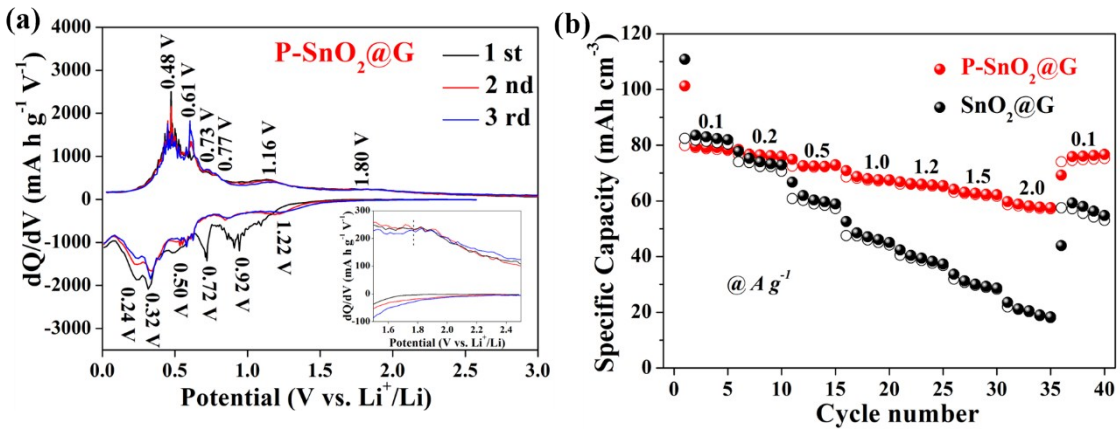

Figure S5. (a) Differential charge - discharge capacity plots of as-synthesized P-SnO_2@G composite electrode at a current density of 0.1 mA g^{-1} for the first three cycles; (b) Volumetric capability of SnO_2@G and P-SnO_2@G obtained at various current densities from 0.1 to 2 A g^{-1}, then back to 0.1 A g^{-1} in the potential window of 0.01 ~ 3.0 V.

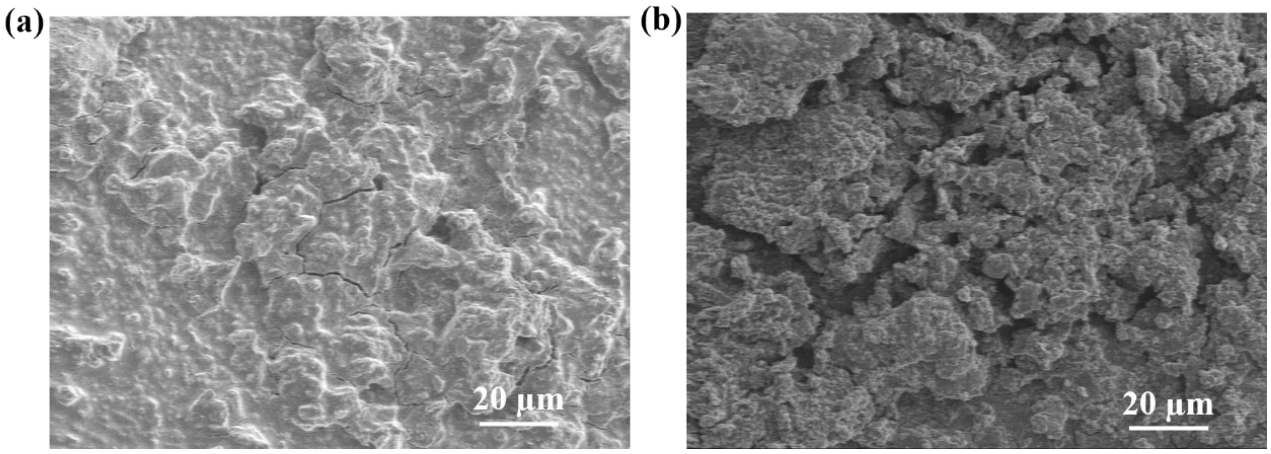

Figure S6. Ex situ SEM images of (a) P-SnO_2@G; (b) SnO_2@G after cycling

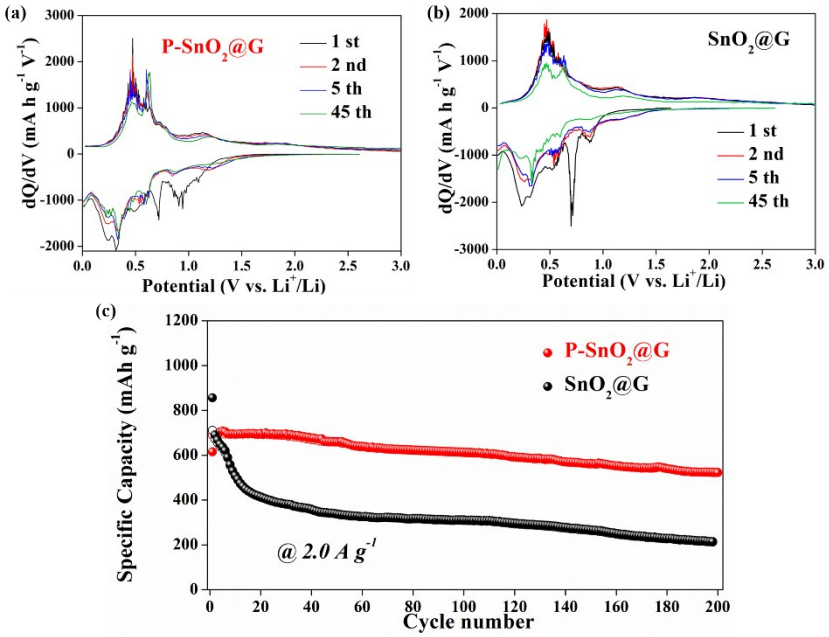

Figure S7. Differential discharge and charge capacity plots (DCPs) for the 1st, 2th, 5th and 45th cycles of (a) SnO_2@G; (b) P-SnO_2@G; (c) Cycling stability (200 cycles) of SnO_2@G and P-SnO_2@G at 2.0 A g^{-1} in the potential of 0.01 ~ 3.0 V.

Table S2. The R_s, R_f, and R_{ct} and Li^+ diffusion coefficients of SnO_2@G and P-SnO_2@G electrode after 50 cycles at current density of 1.0 A g^{-1}.

Sample	SnO_2@G	P-SnO_2@G
R_s (Ω)	1.43	4.17
R_f (Ω)	47.71	115.80
R_{ct} (Ω)	92.73	157.30
D_{Li+} (cm^2 s^{-1})	6.50×10^{-14}	1.36×10^{-13}

(Note: R_s represents the combined ohmic resistance of the battery; R_f is resistance of surface film; R_{ct} is the value of the charge transfer resistance, fitted from Figure 5a)

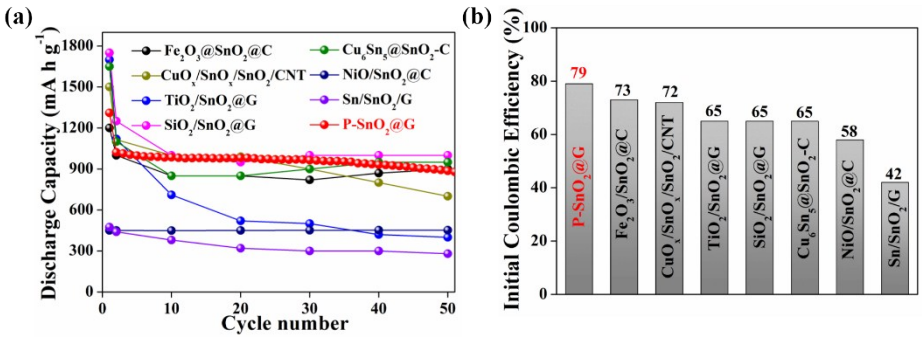

Figure S8. (a) Comparison of capacity retention and (b) initial coulombic efficiency of P-SnO_2@G (0.01-3 V, 0.1 A g^{-1}) with multiple components composite anodes including Fe_2O_3@SnO_2@C (0.01-3 V, 0.2 A g^{-1}), CuO_x/SnO_x/SnO_2/CNT (0.005-2.7 V, 0.1 A g^{-1}), TiO_2/SnO_2/C (0.01-3 V, 0.1 A g^{-1}), SiO_2/SnO_2@G (0.01-2.5 V, 0.5 A g^{-1}), Cu_6Sn_5@SnO_2-C (0.05-3V, 0.2 A g^{-1}), NiO/SnO_2/C (0.01-3 V, 0.8 A g^{-1}), Sn/SnO_2@C (0.05-1.5 V, 0.05 A g^{-1}). References is same with the main article.