# Arc-Discharge Synthesis of Dual-Carbonaceous Layers Coated Tin Nanoparticles with Tunable Structures and High Reversible Lithium Storage Capacity

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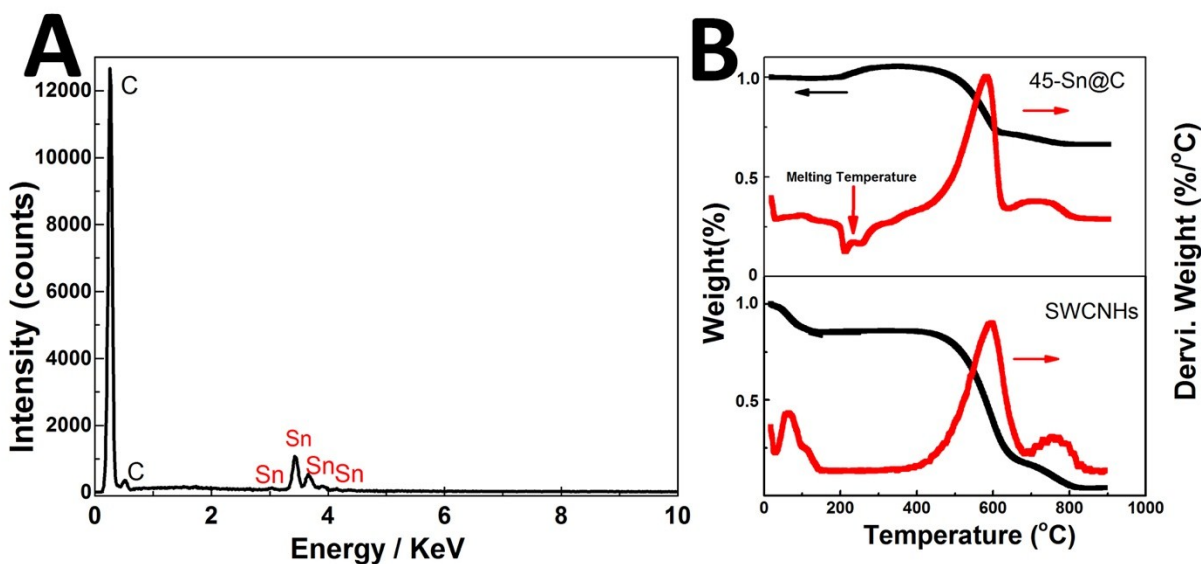
Fig. S1. (A). EDS of 45-Sn@C, the high intensity of C is attributed to the substrate used for SEM test; (B). TGA curves of 45-Sn@C and SWCNHs.
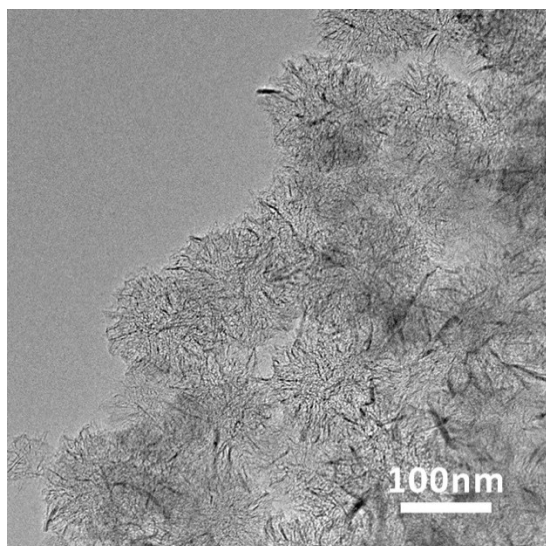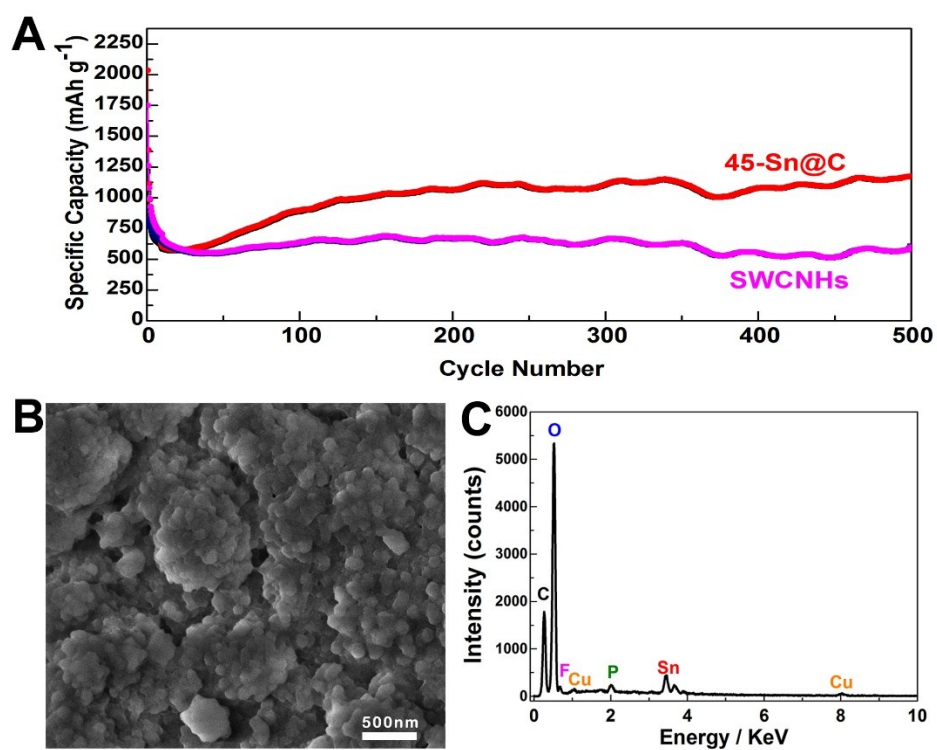
Fig. S2. TEM image of SWCNHs.

Fig. S3. (A). Cycle performance of SWCNHs and 45-Sn@C electrodes for 500 cycles at 372mA g^{-1} (1C); (B). SEM image of 45-Sn@C after 200 cycles; (C). EDS of 45-Sn@C, the P,F were from the electrolyte, and O is detected due to oxidation of anode being exposed to air, while Cu is the signal of copper foil.
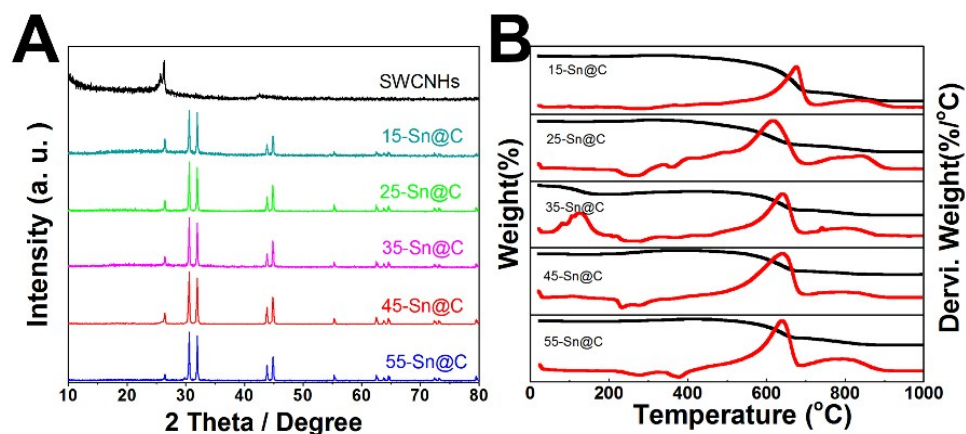
Fig. S4. (A) XRD pattern of all Sn@C composites; (B). TGA curves of all Sn@C composites.
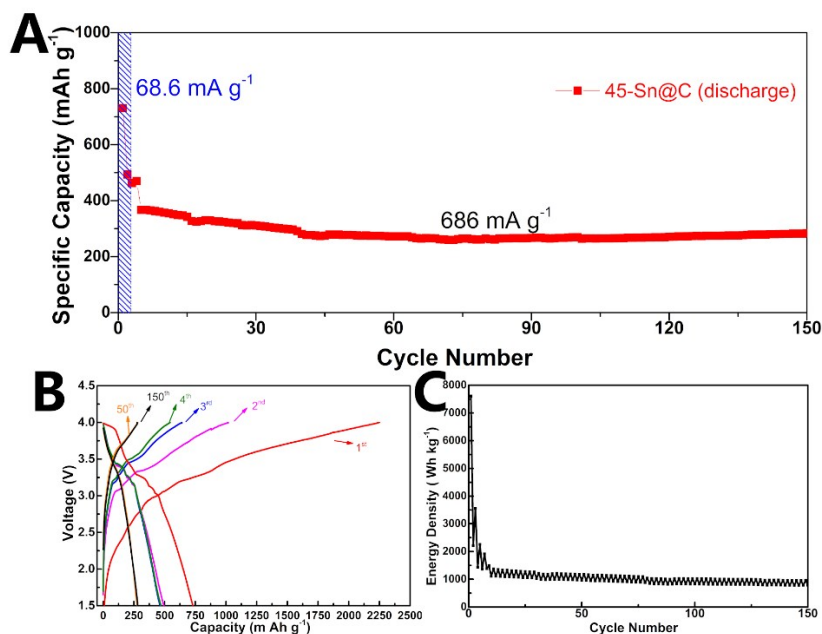

Fig. S5. (A). Discharge capacity & (B). Galvanostatic charge – discharge profiles & (C).Energy density of the 45-Sn@C anode versus cycle number in a full cell with an $Li_xNi_{0.8}Co_{0.15}Al_{0.05}O_y$ cathode between 1.5 and 4.0 V. The initial 3 cycles were operated at a charge/discharge rate of 68.6 mA g^{-1}, and then operated at a rate of 686 mA g^{-1}.

Table S1. The content of tin, specific surface area, and I_D/I_G values of all Sn@C samples.

Sample	Content of Sn (w.t %) [a]	S_{BET} (m^2/g) [b]	I_D/I_G [c]
15-Sn@C	17.3	212.1	1.43
25-Sn@C	28.9	130.5	1.42
35-Sn@C	35.2	133.9	1.48
45-Sn@C	47.6	148.8	1.50
55-Sn@C	62.2	18.2	1.57

[a]: determined by TGA analysis;

[b]: based on the Barrett - Joyner - Halenda (BJH) model;

[c]: calculated on the Gaussian model.