Supplementary Information

Carbon and graphene double protection strategy to improve the SnO_x electrode performance anodes for lithium-ion batteries

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Figure S1

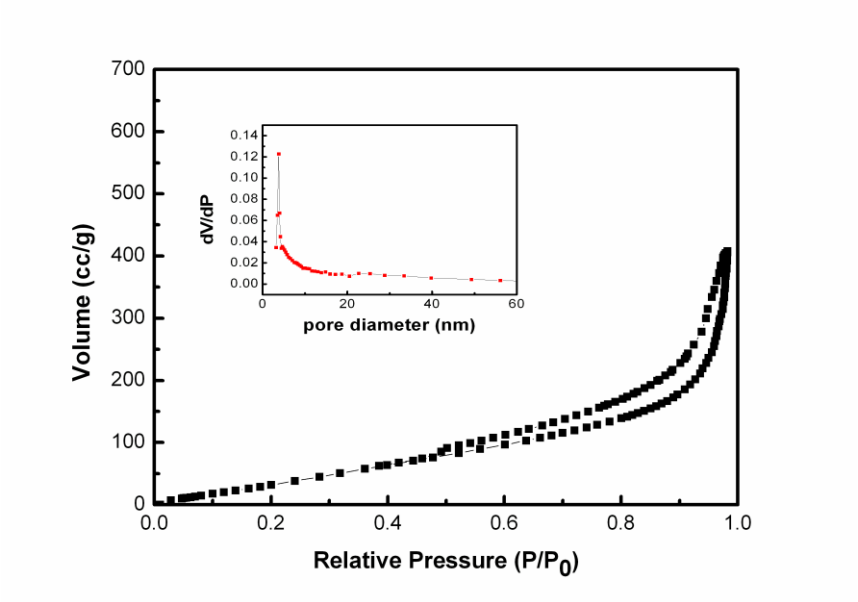

Figure S1. Nitrogen adsorption/desorption isotherms and the corresponding BJH distributions (inset) of the SnO_x@C@G composite. The average pore diameter of the sample is about 3.8 nm, determined by the BJH method.

Figure S2

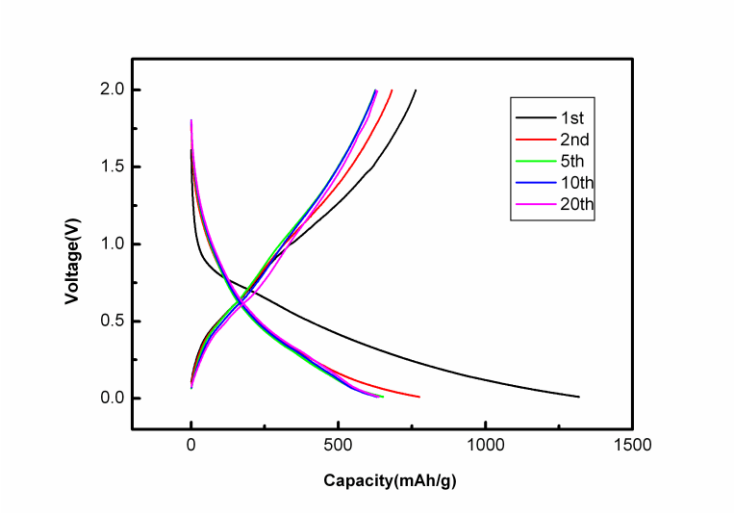

Figure S2. Charge and discharge curves of SnO_x@C@G composite obtained at the 1st, 2nd, 5th, 10th, 20th cycles at the current density of 70 mA g^{-1}.

Figure S3

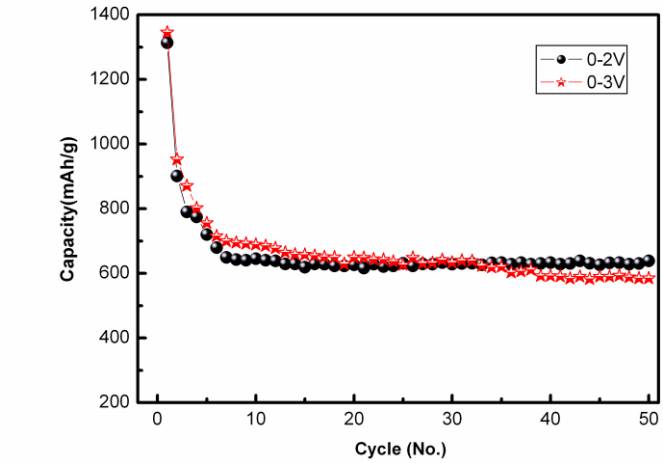

Figure S3. The cycling performances of SnO_x@C@G composite cycled between a voltage of 0.01-2 V and 0.01-3 V at the current density of 70 mA g^{-1}.

Fig S2 shows the charge and discharge profiles of the SnO_x@C@G composite with a voltage range of 0.01−2 V. It exhibits large first discharge and charge capacities of about 1313.1 and 849.8 mAh g^{-1}, corresponding to a Coulombic efficiency of about 64.7%. The cycling properties of SnO_x@C@G composite in the potential range of 0.01-2 V and 0.01-3 V are shown in Fig S3, the reversible capacity is about 630.8 mAh g^{-1} after 50 cycles. Compared with voltage range of 0.01-3 V, SnO_x@C@G composite with a voltage range of 0.01−2 V has lower first discharge capacity but better Cycle stability.

Figure S4

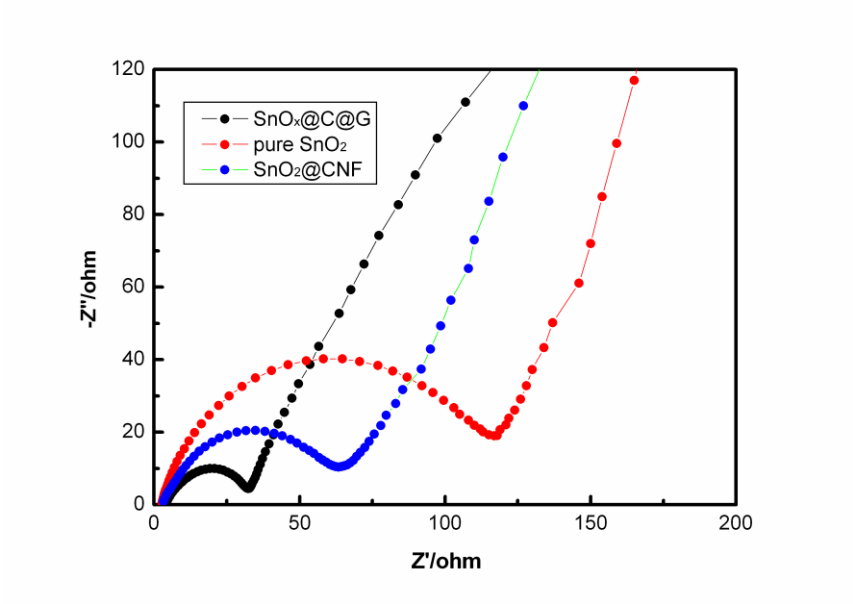

Figure S4 Electrochemical impedance spectra (EIS) for the cells of pure SnO_2 (red), SnO_x@CNF (blue) and SnO_x@C@G composite (black).