

Supporting Information

Advanced Sodium-Ion Battery Anode Constructed *via* Chemical Bonding between Phosphorus, Carbon Nanotube and Crosslinked Polymer Binder

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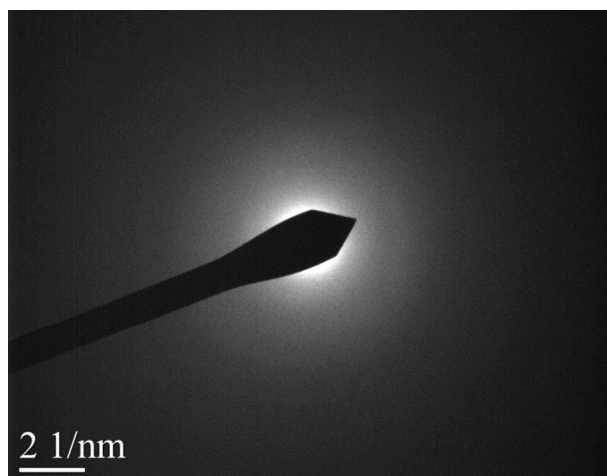


Figure S1. The selected area electron diffraction pattern of the P-CNT hybrid.

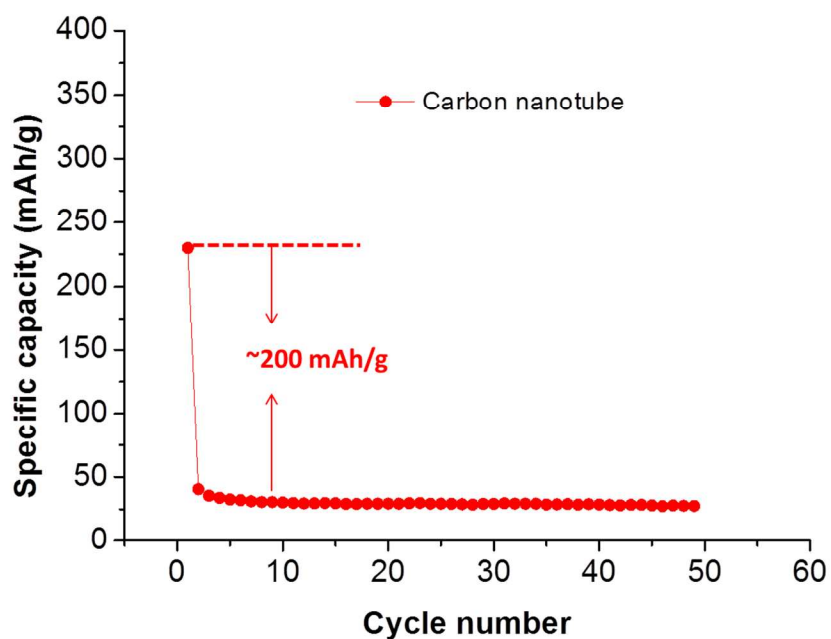


Figure S2. The specific capacity of functionalized carbon nanotube (CNT) in the voltage window of 2.0-0.01V *versus* Na/Na⁺. Different from the layer-structured graphene sheets which has a large initial irreversible capacity loss (~330 mAh/g, Nano Letter 2014, 14, 6329), much lower capacity loss was found for one-dimensional CNT. Thereby CNT is an ideal candidate for making phosphorus-carbon hybrid composite anode with high initial Coloumbic efficiency (ICE).

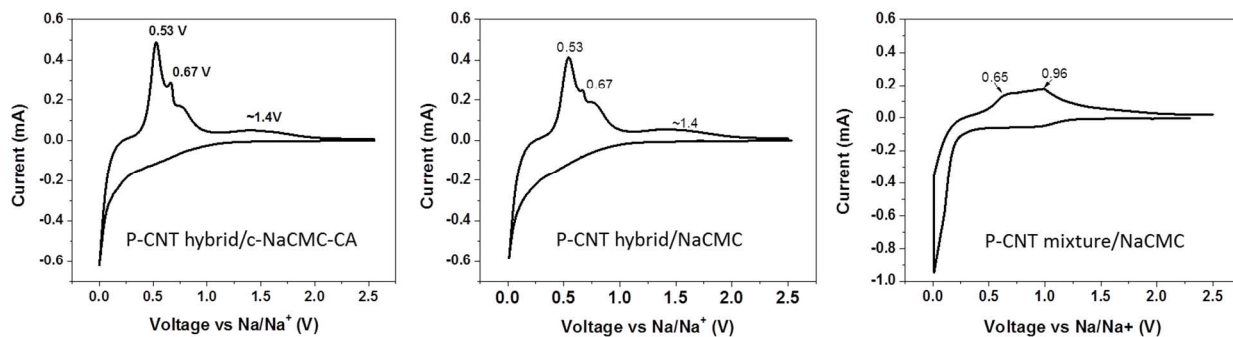


Figure S3. The cyclic voltammetry curves of the P-CNT hybrid/c-NaCMC-CA, P-CNT hybrid/NaCMC, and P-CNT mixture/NaCMC with a sweeping rate of 0.1mV/s.

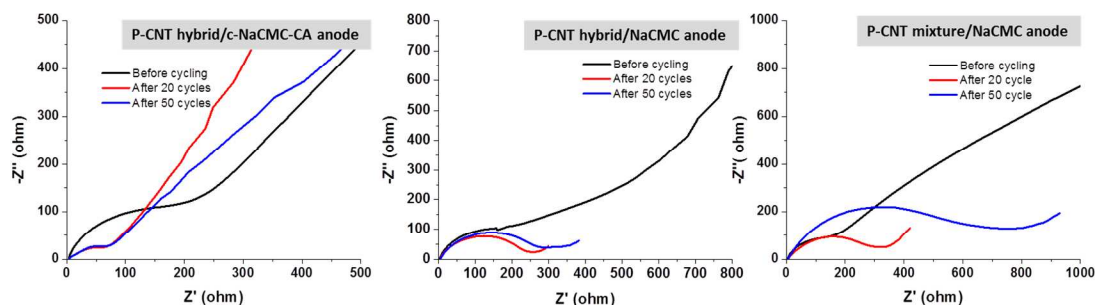


Figure S4. Nyquist plot of the P-based anode before and after cycling in the discharged state. The Nyquist plot comprises a semicircle at medium frequency region and a straight line at low frequency region. The semicircle corresponds to sodium ions passing through the solid-electrolyte- interphase (SEI) film and charge transfer between electrolyte and active material, and the low frequency straight line is attributed to Na^+ diffusion inside active material. The P-CNT/c-NaCMC-CA hybrid shows no noticeable changes in the EIS spectra upon cycling, suggesting the formation of relatively stable SEI layer and maintenance of the electrode structure. This observation is consistent with results from post-cycling SEM images (Figure 6), and also resembles good cycling stability of P-CNT/c-NaCMC-CA anode in Figure 5.