Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

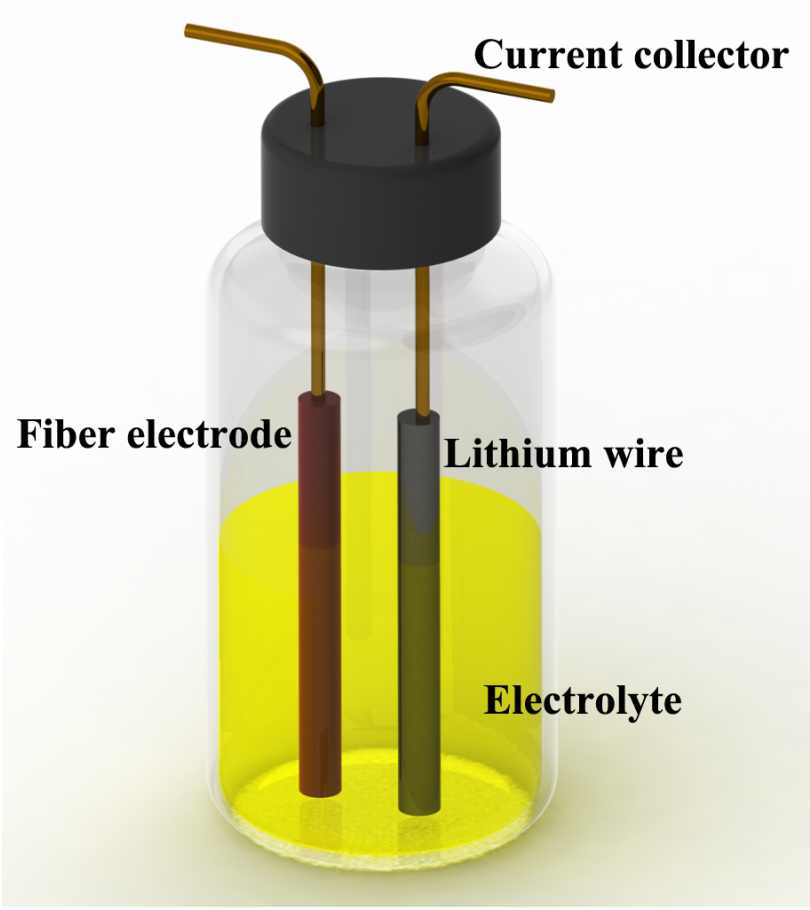

Figure S1. Test apparatus for the fiber-shaped electrode.

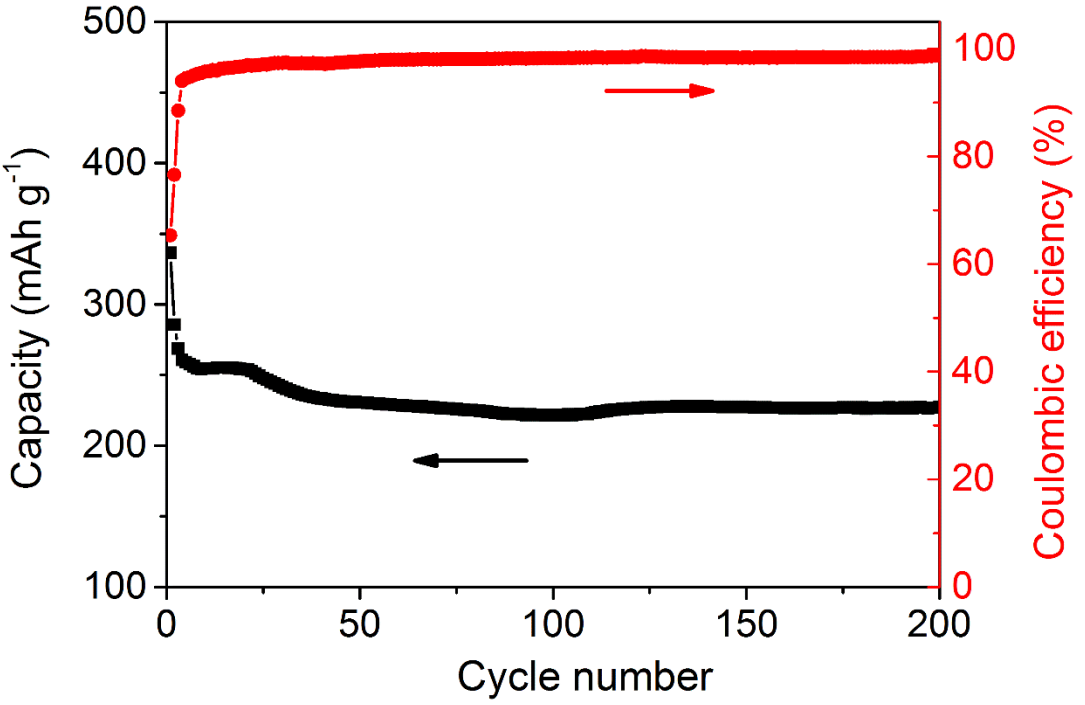

Figure S2. Long-life performance of a CNT fiber at a current density of 500 mA g^{-1}. Delithiation capacity was provided here.

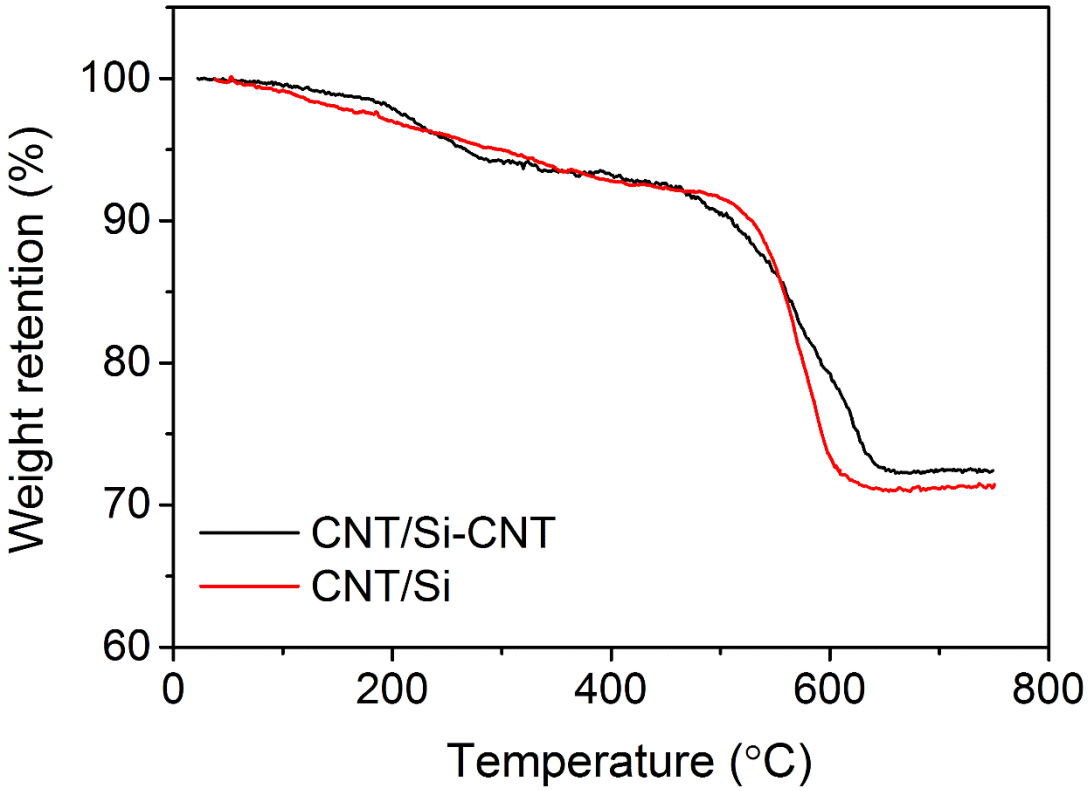

Figure S3. Thermogravimetric analysis of CNT/Si and CNT/Si-CNT fibers in air.

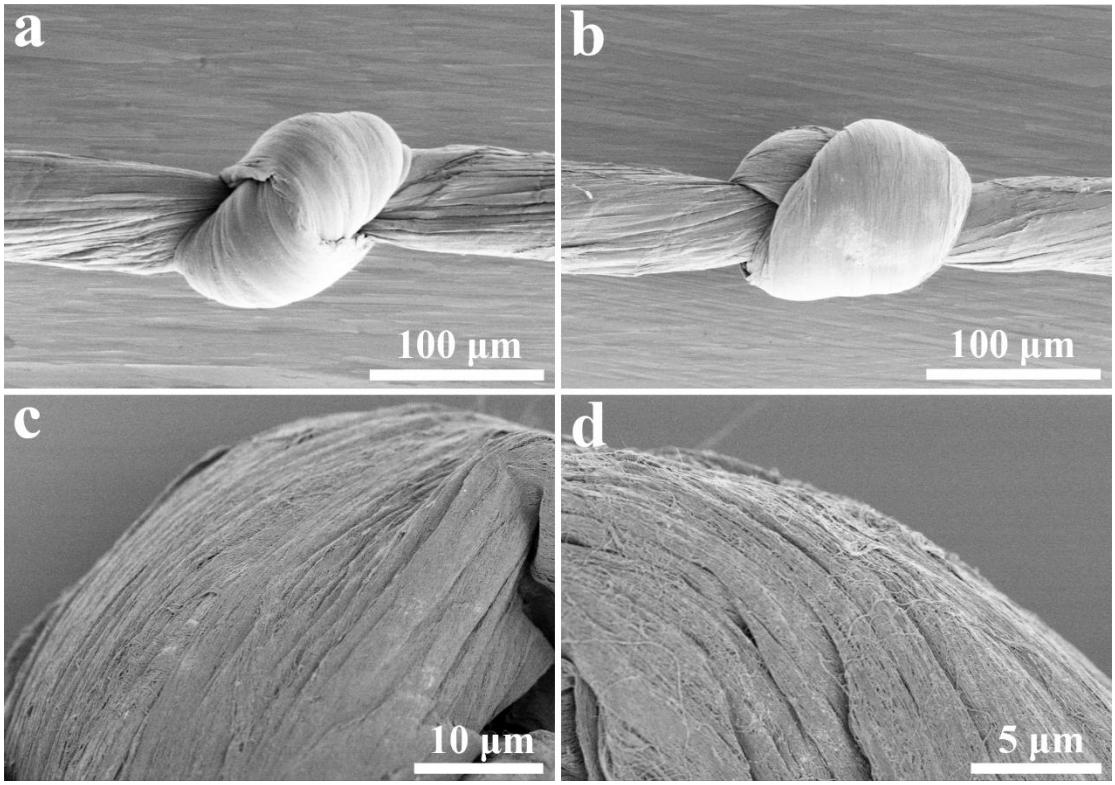

Figure S4. Knots made of CNT/Si fiber **(a)** and CNT/Si-CNT fiber **(b)**. No obvious damages were found for CNT/Si fiber **(c)** and CNT/Si-CNT fiber **(d)** when undergoing a large deformation.

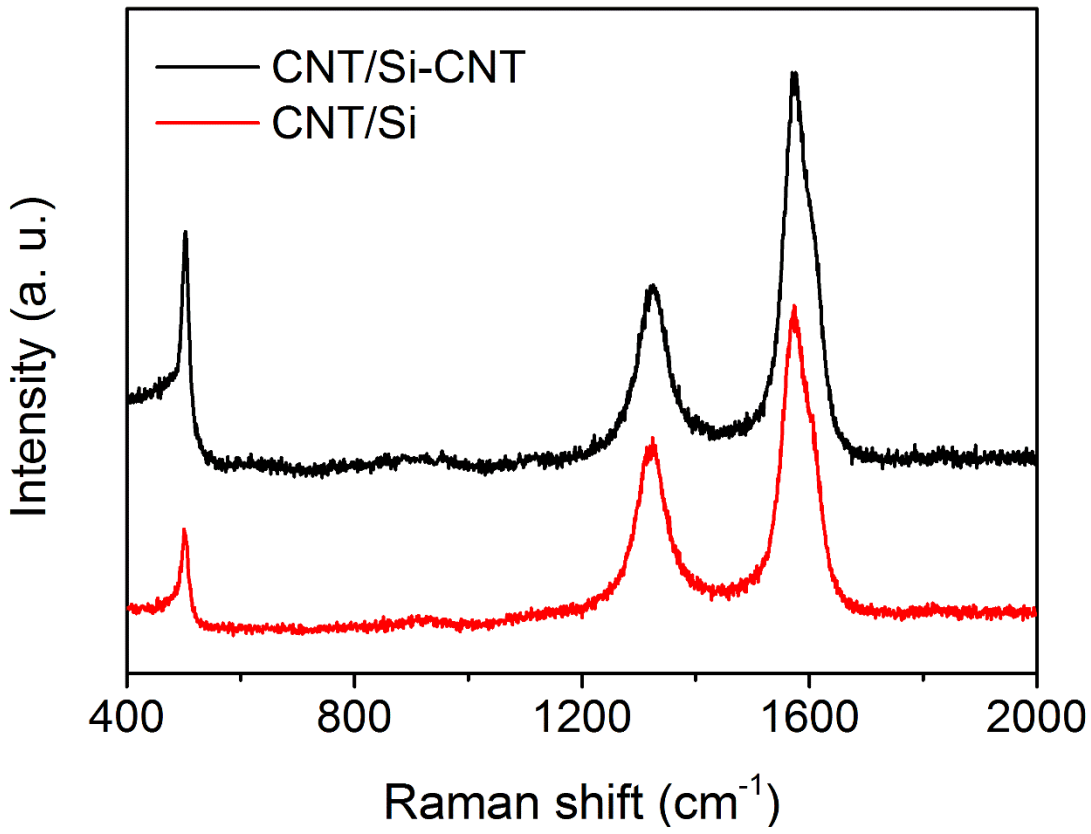

Figure S5. Raman spectra of CNT/Si and CNT/Si-CNT fibers.

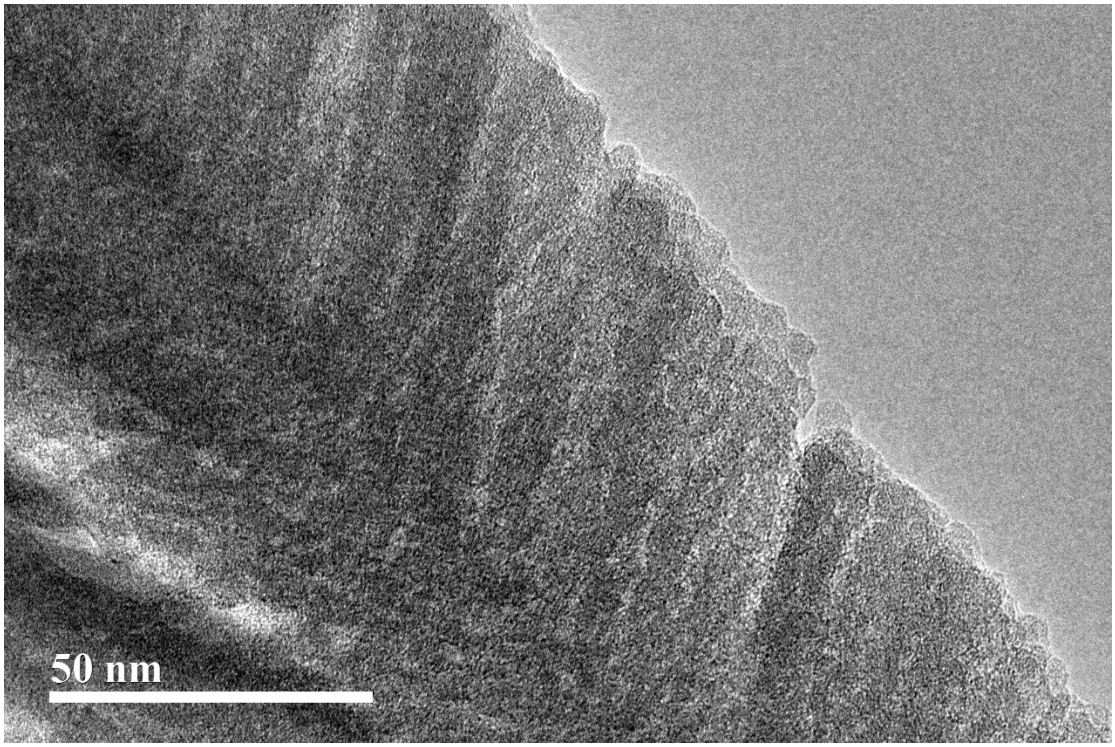

Figure S6. TEM image of a Si-coated CNT.

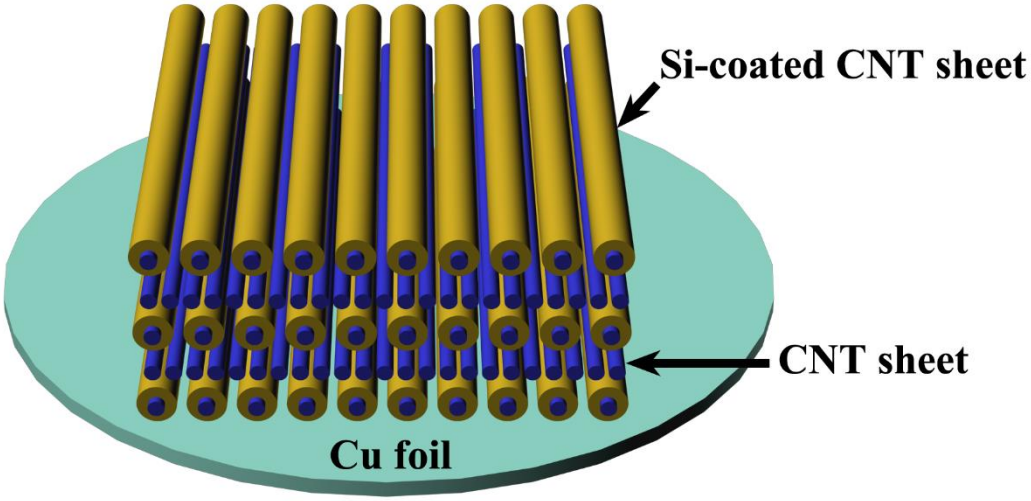

Figure S7. A planar electrode formed by alternately stacking CNT sheets and Si-coated CNT sheets on a copper foil.

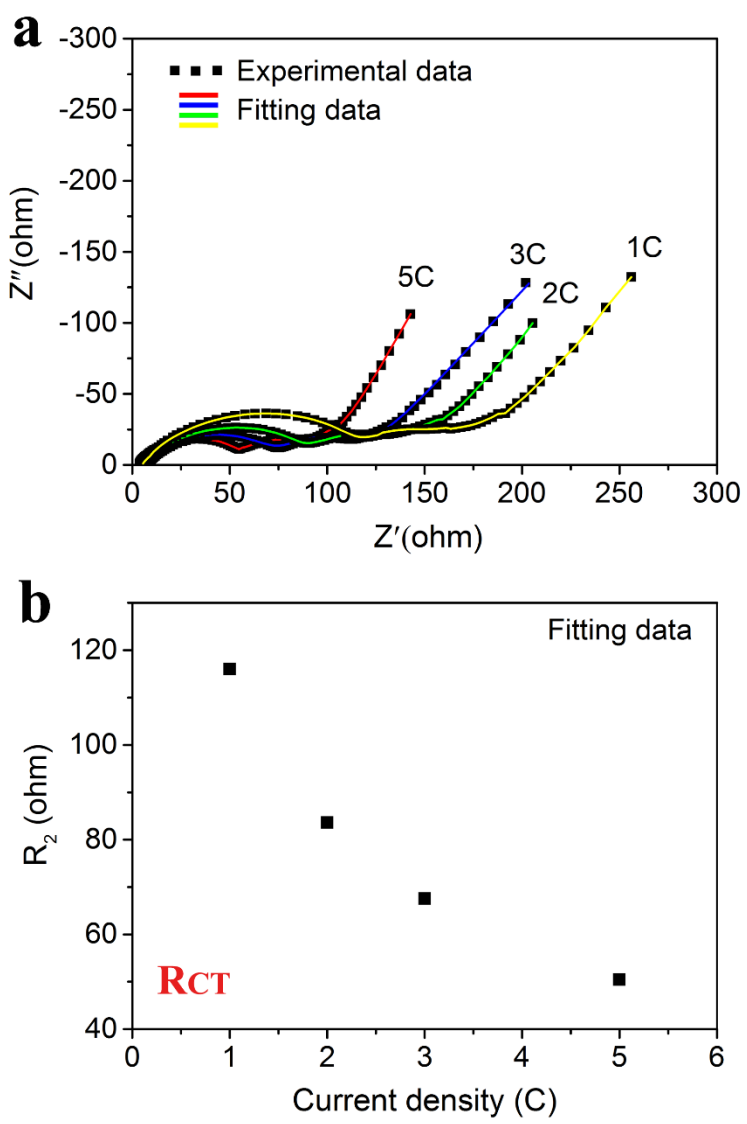

Figure S8. a. Nyquist plots of CNT/Si-CNT electrodes with different current densities at the end of lithiation after 50 cycles. **b.** Fitting data of R_{CT} for the CNT/Si-CNT electrodes corresponding to different current densities.

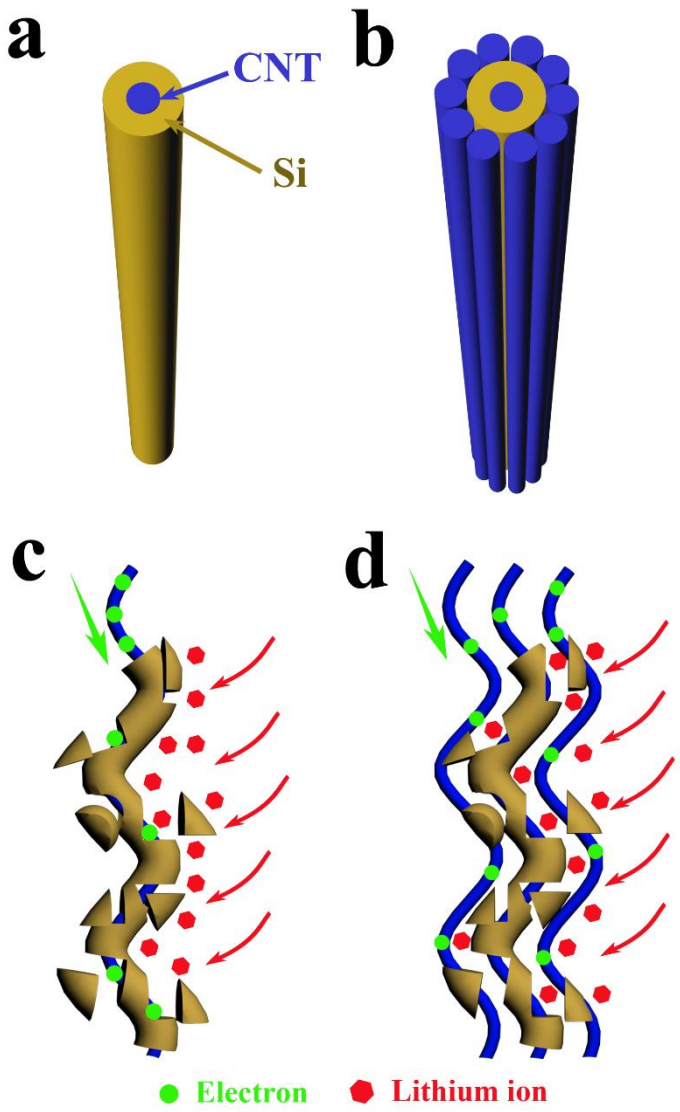

Figure S9. a and **b.** Schematic illustration of the contact between Si and CNT in CNT/Si and CNT/Si-CNT electrode, respectively. **c** and **d.** Schematic illustration of the failure behavior of CNT/Si and CNT/Si-CNT electrodes, respectively. The sandwiched CNT sheets can clamp the detached Si and enhance the electrochemical performance in the CNT/Si-CNT electrode.

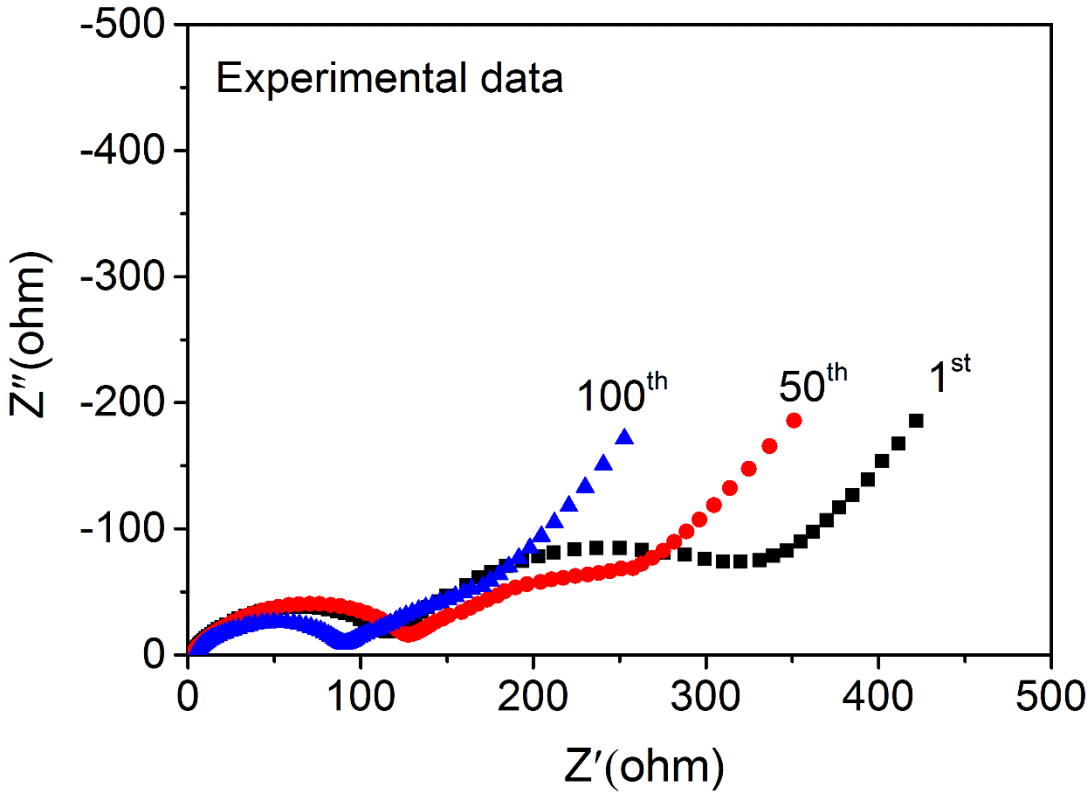

Figure S10. Nyquist plots of the CNT/Si-CNT electrode using the electrolyte of 1M $LiPF_6$ in a mixture of ethylene carbonate and diethyl carbonate (volume ratio of 1/1). The R_{INT} indicates the dominant failure mechanism, which is the loss of contact between CNT and Si.