Electronic Supporting information (ESI)

Fe_2O_3 nanoparticles coated on ferrocene-encapsulated single-walled carbon nanotubes as stable anode materials for long-term cycles

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S1. Raman spectra of the SWCNTs and Fc@SWCNTs

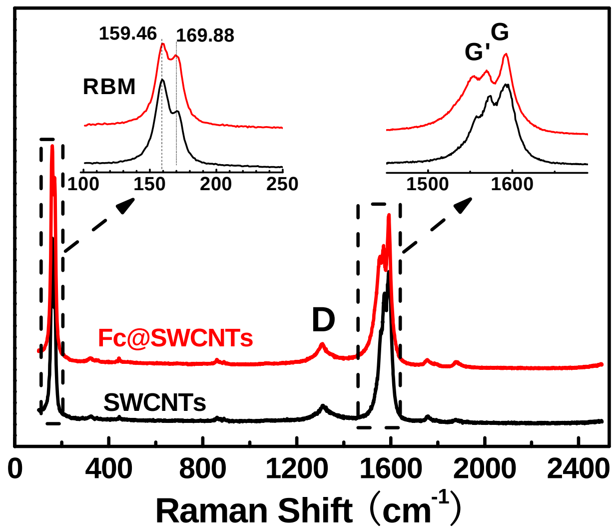

Fig. S1. Raman spectra of the SWCNTs and Fc@SWCNTs with the excitation wavelength of 785 nm. The insets show the enlarged RBM and G regions. After doping with Fc, the charge transfer for SWCNT carrier is enhanced obviously, which result is consistent with the Raman test shown in the following Fig. 2. Both RBM and G bands shifted slightly because of the charge transfer between Fc and host SWCNTs. The G band of the Fc@SWCNTs has a higher intensity, and the shoulder of G band (G' band) is broaden (see the inset in Fig. S1), indicating that the intercalation of Fc molecules into SWCNTs leads to n-doping. These would provide another proof to explain the improvement of conductivity for SWCNT carrier caused by Fc dopant.

S2. Cycling performance of Fe_2O_3/SWCNTs and Fe_2O_3 NPs

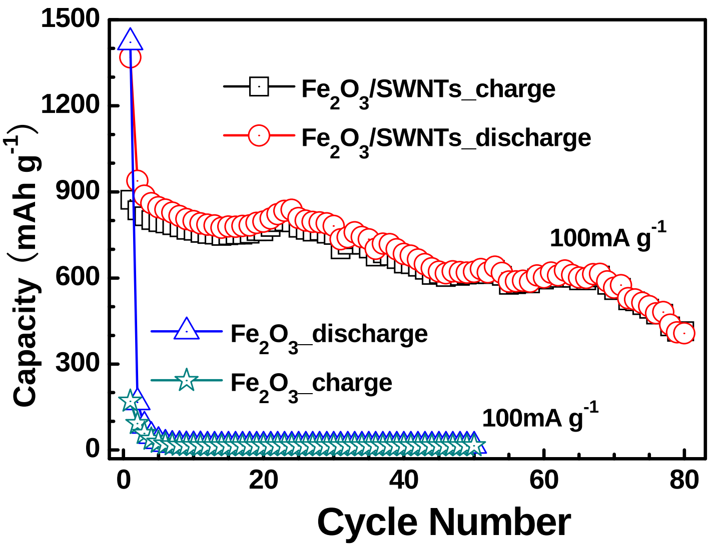

Fig. S2. Cycling performance of Fe_2O_3/SWCNT and Fe_2O_3 electrodes as a function of cycle number. Without carrier, Fe_2O_3 NP electrode sharply deteriorated due to the quick aggregation of NPs and the disconnection of the material. The capacity of Fe_2O_3 NPs dropped rapidly to 20 mAh g^{-1} only after 10 cycles. The capacity for Fe_2O_3/SWCNTs (measured at 100 mA g^{-1}) was about 400 mAh g^{-1} after 80 cycles, which is notably lower than that of Fe_2O_3/Fc@SWCNTs (960 $mAhg^{-1}$). The enhanced performance can be surely obtained by filling ferrocene.

S3. Electrochemical impedance spectra for Fe_2O_3/Fc@SWCNTs

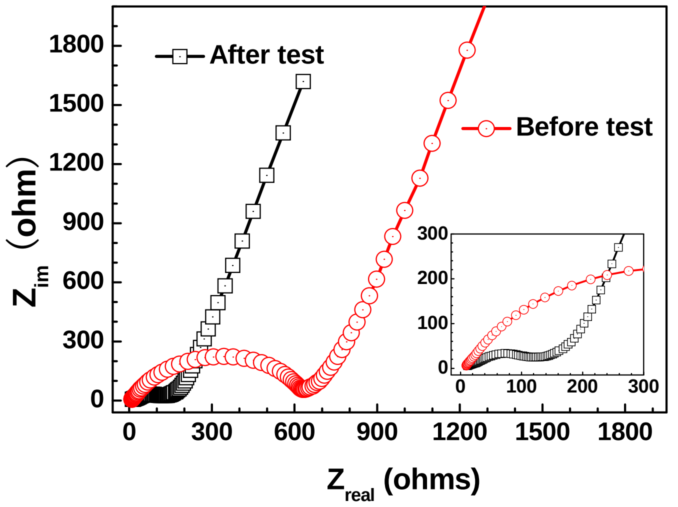

Fig. S3. The electrochemical impedance spectra for Fe_2O_3/Fc@SWCNT electrode before and after electrochemical test. Conductivity for this electrode remarkably enhanced after test, resulting in the improvement of electrochemical performance.