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Electronic Supplementary Information

Nanoporous Graphene/Single Wall Carbon Nanohorns Heterostructures of Enhanced Capacitance

K. P. Annamalai,[a] Jianping Gao,[a] Lile Liu, [a] Jun Mei,[b] Woonming Lau[b] and Yousheng Tao*[a,b,c]

[a]Key Laboratory of Design and Assembly of Functional Nanostructures, FJIRSM, Chinese Academy of Sciences (CAS), and Fujian Provincial Key Laboratory of Nanomaterials, Haixi Institutes of CAS, Fuzhou 350002, China

[b]Chengdu Green Energy and Green Manufacturing Technology R&D Centre, Chengdu, 610207, China.

[c]College of the Environment and Ecology, Xiamen University, Xiamen 361102, China

Email: taoys@tom.com

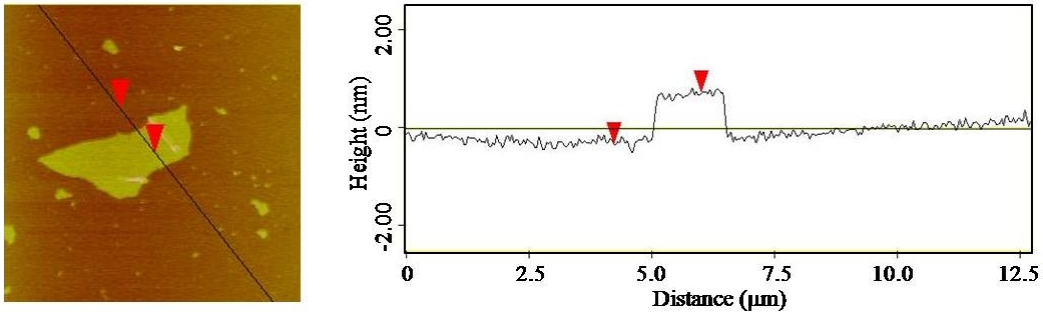

Figure S1. AFM scan of GO sheet, showing a layer height of less than 1 nm.

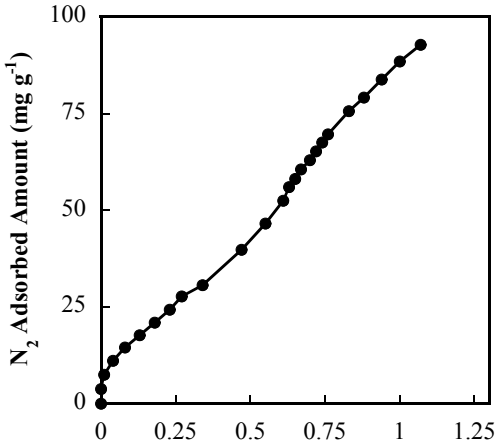

Figure S2. α_s-plot of the nitrogen isotherms of the G/SWCNHs nanohybrid at 77 K.

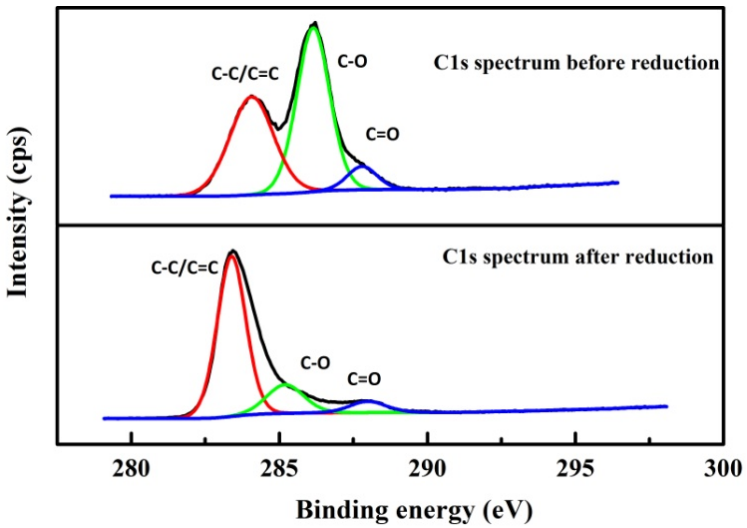

Figure S3. XPS C1s spectra of GO (top) and rGO (bottom). Peaks at 284.3, 286.7 and 288.5 eV were corresponding to C=C/C-C bond, C-O (such as epoxy and alkoxy groups) band and carboxyl functional groups, respectively. C1s XPS spectra clearly showed that after the

reduction C-O functional group peak was heavily suppressed; very low oxygen moieties after reduction indicated successful removal of oxygen functional groups. Atomic percentage of oxygen also supported this result. Before reduction, oxygen content (atomic percentage) was 37.7% and it decreased to 19.5% after reduction. It confirmed that hydrothermal reduction highly remove the oxygen functionalities from carbon surface.

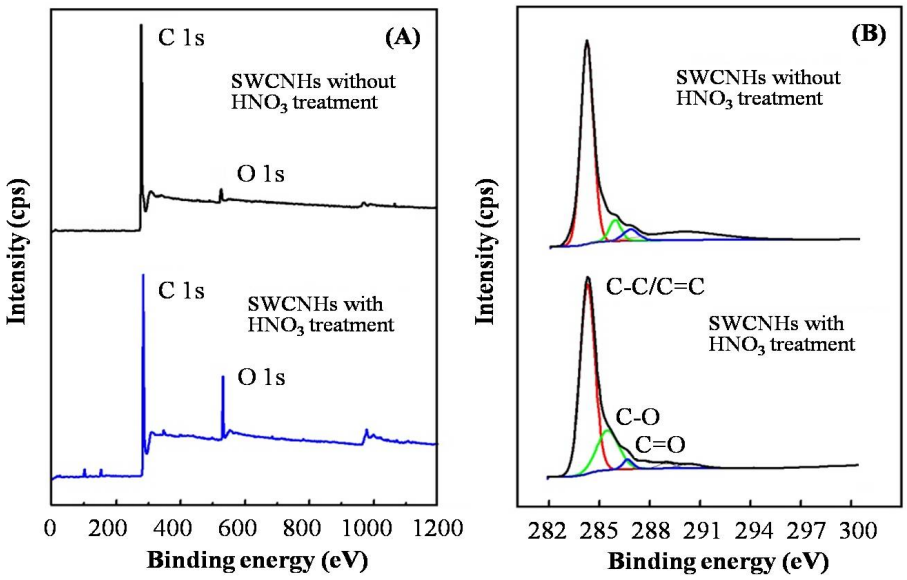

Figure S4. (A) XPS survey spectra and (B) XPS C1 spectra of SWCNHs with and without HNO_3 treatment. Peaks present in 284.1 and 531.9 eV belong to C 1s and O 1s peaks, respectively. It clearly describes that the oxygen content was increased in SWCNHs with HNO_3 treatment. The atomic ratio of O to C was increased from 0.04 to 0.14. As shown in Figure S4B, in the XPS C1s spectra of SWCNHs with HNO_3 treatment, C-O functional group peak was increased with comparison to SWCNHs without HNO_3 treatment.

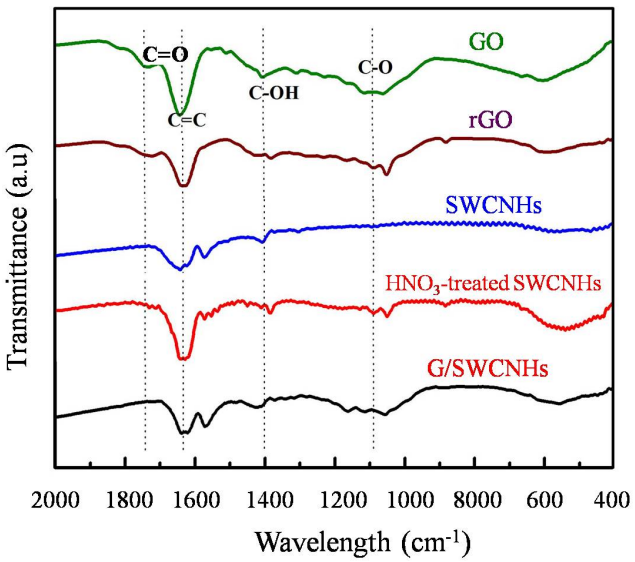

Figure S5. FT-IR spectra of G/SWCNHs nanohybrid and its indivial components (rGO and SWCNHs with HNO_3 tratment). GO and SWCNHs (without HNO_3 tratment) were also encluded for comparison purpose. 1725 cm^{-1} peak mainly belongs to C=O streching vibrations of carbonyl and carboxyl groups. 1640 and 1403 cm^{-1} peaks correspond to C=C and C-OH, respectively. Absorption band at 1108 cm^{-1} is for C-O streching vibrations of epxoyl and alkoxyl groups. In the case of SWCNHs with HNO_3 treatment, C-O streching vibrations was increased. While, lower intensities of carbonxyl or alkoxyl and hydroxyl group vibration indicates the reduced functional groups on the nanostructures of rGO and G/SWCNHs.

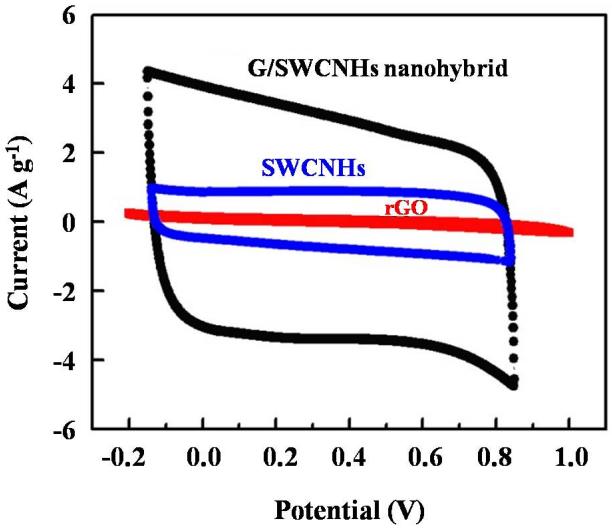

Figure S6. CV curves of G/SWCNHs nanohybrid with comparison to its individial components of rGO and SWCNHs in 1.0 M KOH aqueous electrolyte solution at 25 mV s^{-1} scan rate. Poor capacitance of rGO was mainly due to stakced layers which was not sutiable for ion diffusion and transportation. G/SWCNHs nanohybrid exhibited 211 F g^{-1} capacitance at 25 mV s^{-1} scan rate with comparison to mere 65 F g^{-1} capacitance of SWCNHs.