Electronic Supplementary Information:

$Mn_{0.5}Co_{2.5}O_4$ Nanofibers Sandwiched in Graphene Sheets for Efficient Supercapacitor Electrode Materials

Jinzuan Wang,[a] Jun Yang,*[b] Tao Huang[b] and Wenyan Yin*[ac]

[a]School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, Shanghai 200240, China.

[b]School of Chemistry and Chemical Engineering, Shanghai Jiao Tong University, Shanghai 200240, China.

[c]Innovative Institute of Electromagnetic Information and Electric Integration, College of Information Science and Electronic Engineering, Zhejiang University, Hangzhou 310058, China.

* yangj723@sjtu.edu.cn; wyyin@sjtu.edu.cn; wyyin@zju.edu.cn

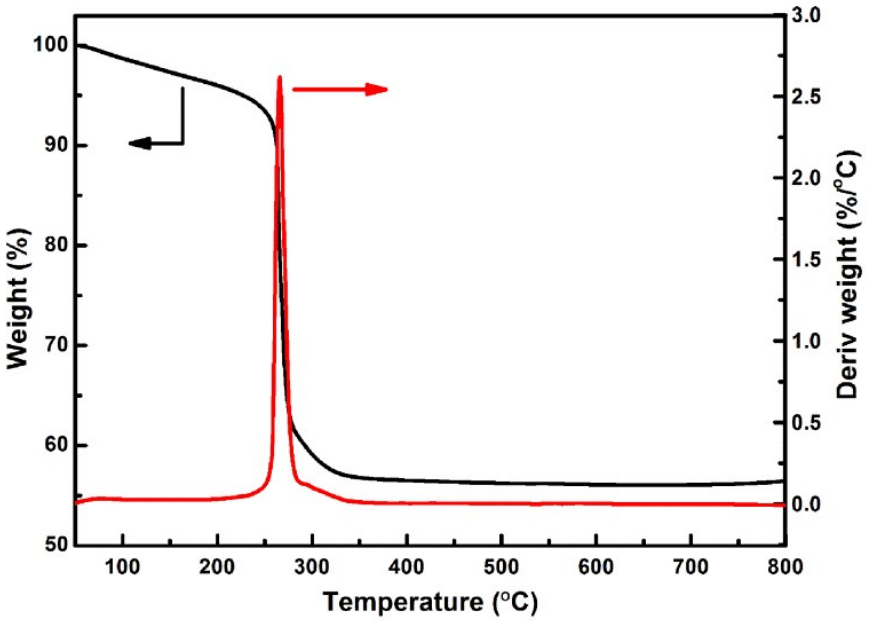

Fig. S1 Thermogravimetric analysis (TGA) curves of the MnCo@rGO precursor under air flow with a temperature ramp of 5 ^{o}C min^{-1}.

Table S1 Quantitative analysis of Co, Mn, O and C contents by ICP-AES, XPS and EA.

Samples	Co wt%	Mn wt%	O wt%	C wt%	Co/Mn ratio
ICP-AES	31.3	5.8			5.03
XPS	28.8	5.3	21.6	44.3	5.06
EA			20.1	43.5	

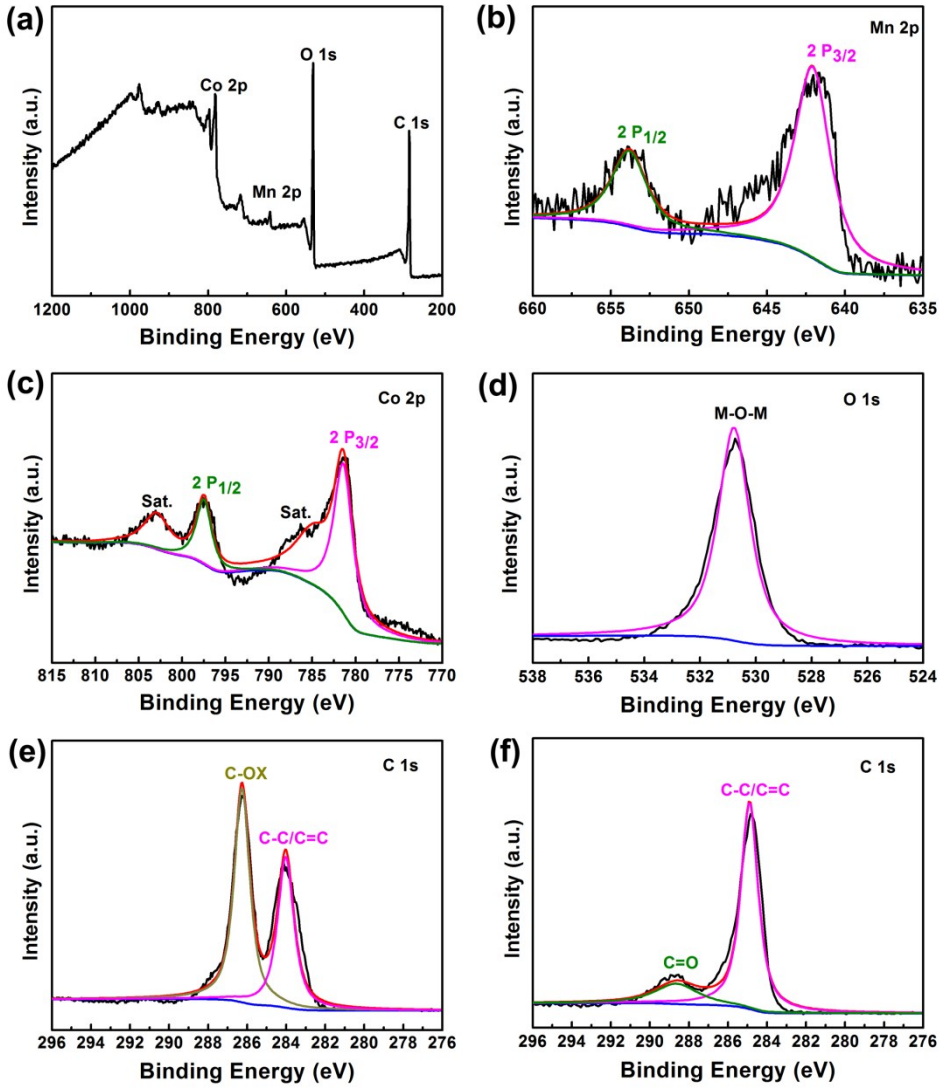

Fig. S2 (a) Full XPS spectra of the $Mn_{0.5}Co_{2.5}O_4$@G composite. (b) High-resolution Mn 2p XPS spectra of $Mn_{0.5}Co_{2.5}O_4$@G. (c) High-resolution Co 2p XPS spectra of $Mn_{0.5}Co_{2.5}O_4$@G. (Note for (b) and (c): the black line is the original signal, and the red curve is the result of the curve fit. Olive and magenta peaks correspond to $2p_{1/2}$ and $2p_{3/2}$ species, respectively, and blue peak corresponds to the associated satellite species, after de-convolution.) (d) High-resolution O 1s XPS spectra of $Mn_{0.5}Co_{2.5}O_4$@G. (Note for (d): the black line is the original signal, and the red curve is the result of the curve fit. Magenta peaks correspond to M-O-M species, and blue peak corresponds to the associated satellite species, after de-convolution.) (e) High-

resolution C 1s XPS spectra of GO. (Note for (e): the black line is the original signal, and the red curve is the result of the curve fit. Dark yellow and magenta peaks correspond to C-OX and C-C/C=C species, respectively, and blue peak corresponds to the associated satellite species, after de-convolution.) (f) High-resolution C 1s XPS spectra of $Mn_{0.5}Co_{2.5}O_4$@G. (Note for (f): the black line is the original signal, and the red curve is the result of the curve fit. Olive and magenta peaks correspond to C=O and C-C/C=C species, respectively, and blue peak corresponds to the associated satellite species, after de-convolution.)

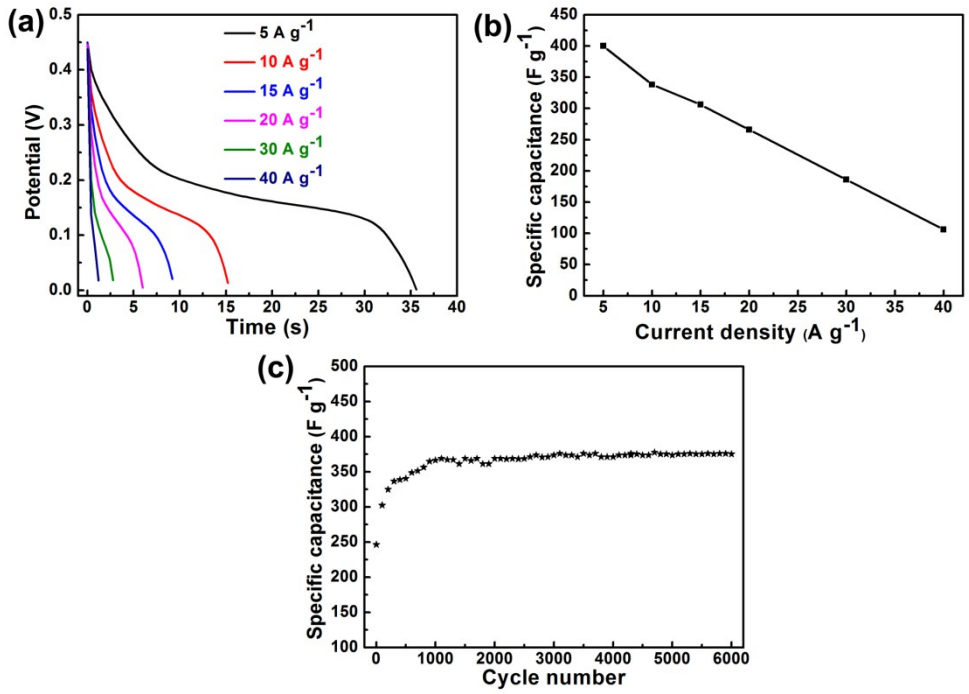

Fig. S3 Electrochemical characterization of the $MnCo_2O_4$ for supercapacitors. (a) Galvanostatic discharge curves at various current densities ranging from 5 to 40 A g^{-1}. (b) Specific capacitances derived from the discharging curves. (c) Cycling performance at the constant current density of 10 A g^{-1}.

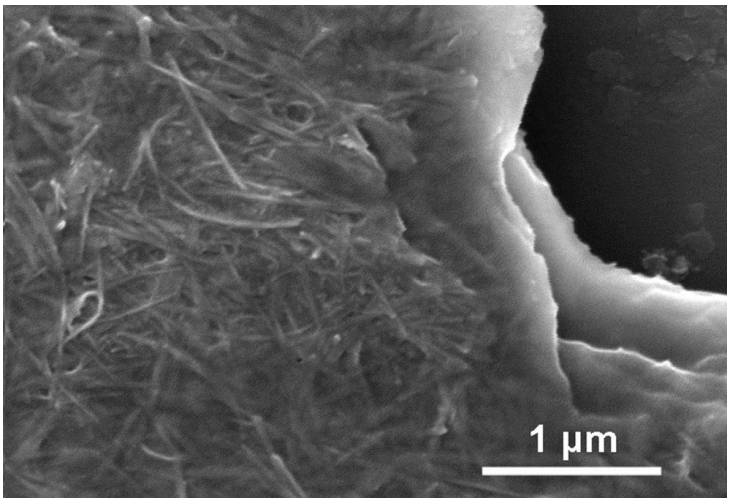

Fig. S4 SEM image of the $Mn_{0.5}Co_{2.5}O_4$@G composite after 5000 charge/discharge cycles.

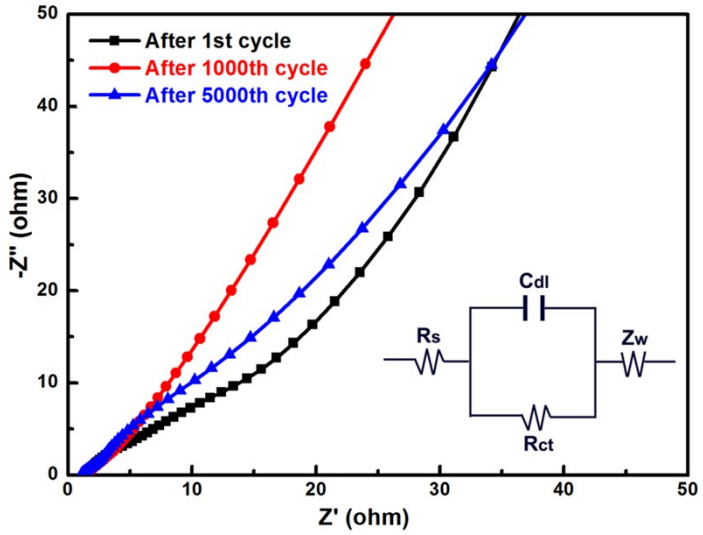

Fig. S5 (a) Nyquist plots of the the $Mn_{0.5}Co_{2.5}O_4$@G electrode after 1st, 1000th and 5000th cycle. The insets show the corresponding equivalent circuit model used for fitting impedance spectra. R_s is the solution resistance, R_{ct} is charge-transfer resistance caused by the Faradaic reactions, C_{dl} is double-layer capacitance on the electrode surface, and Z_w is the Warburg resistance related to the ion diffusion/transport in the electrolyte to the electrode surface.

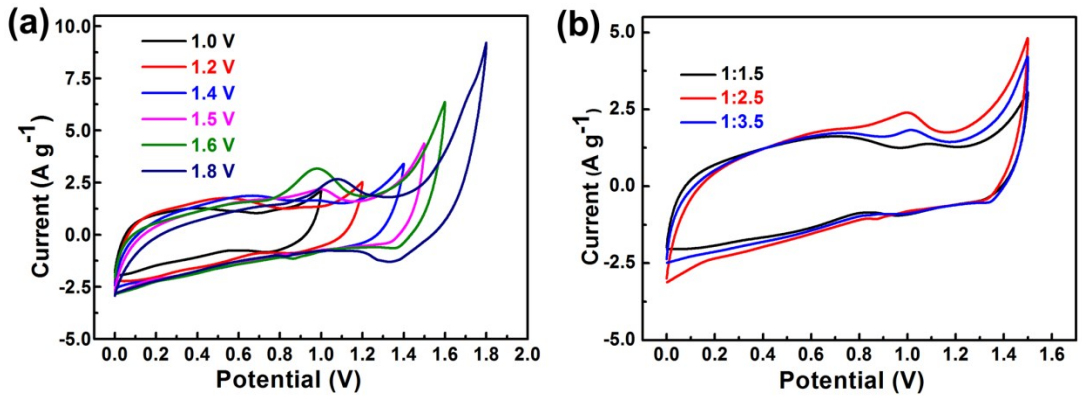

Fig. S6 (a) CV curves of the $Mn_{0.5}Co_{2.5}O_4$@G//AC device measured at different scan potential windows in 6.0 M KOH aqueous solution at a scan rate of 10 mV s^{-1}. (b) CV curves of the $Mn_{0.5}Co_{2.5}O_4$@G//AC device with different $Mn_{0.5}Co_{2.5}O_4$@G to AC weight ratios of 1:1.5, 1:2.5, and 1:3.5, respectively.

Electrochemical Characterization of the AC//AC and graphene//graphene symmetric superpcapacitors

The AC//AC symmetric supercapacitor was fabricated with two AC-based electrodes with the same AC mass loading, and the graphene//graphene symmetric supercapacitor was fabricated with two graphene-based electrodes with the same graphene mass loading. A series of electrochemical tests including cyclic voltammetry (CV) and galvanostatic discharge measurement were performed with the CHI 760D electrochemical workstation in an aqueous KOH electrolyte (6.0 M) with a commercial coin cell (LIR 2032).

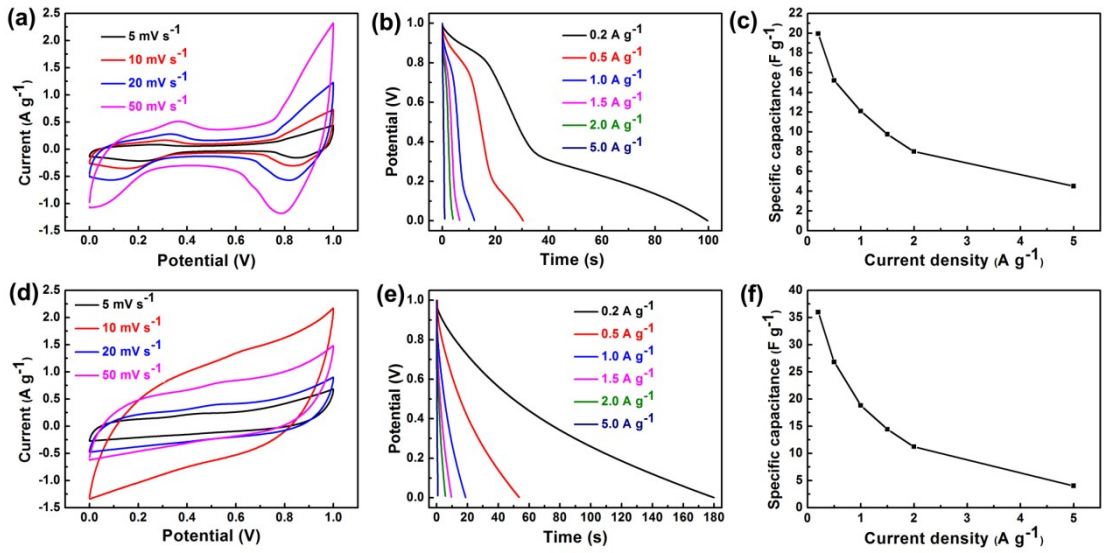

Fig. S7 CV curves of AC//AC (a) and graphene//graphene (d) symmetric supercapacitors at different scan rates. Galvanostatic discharge curves of AC//AC (b) and graphene//graphene (e) symmetric supercapacitors at different current densities. Specific capacitances of AC//AC (c) and graphene//graphene (f) symmetric supercapacitors at different current densities.