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

Supporting information

Experimental section

Materials: Fluorine-doped tin oxide conductive glass was obtained from Nippon Sheet Glass Co., Japan. Poly (ethylene naphthalate) was obtained from Peccell Co., Japan. Titanium dioxide slurry (DHS-TPP3 and DHS-TPP200, hydrothermal titanium dioxide dispersed in terpinol) and powder (DHS-SN1760-500) were obtained from Dalian Heptachroma Solartech Co., Ltd.

Calculation of the specific capacitance: The discharge capacitance of each cell was calculated according to the following equation: $C=2(I*\Delta t)/(m*\Delta V)$, where C is the specific capacitance, while I, Δt, m, and ΔV are discharge current, discharge time, electrode weight, and voltage variation in the time range, respectively.[S3]

Calculation of the entire energy conversion and storage efficiency of the integrated device: The entire energy conversion and storage efficiency is calculated by the equation of $\eta_{entire} = \eta \Delta V J S_1 t_1/(P_{in} S_2 \eta t_2)$, where η_{entire} is the entire energy conversion and storage efficiency, η is the photoelectric conversion efficiency, ΔV and t_1 are the voltage variation and discharging time during galvanostatic discharge, respectively. J is the constant galvanostatic discharge current density of 1.4 mA cm^{-2}, S_1 is the effective area of energy storage part, P_{in} is the incident light power density (100mW cm^{-2}), S_2 is the effective area of photoelectric conversion part and t_2 is the illumination time during photocharging.

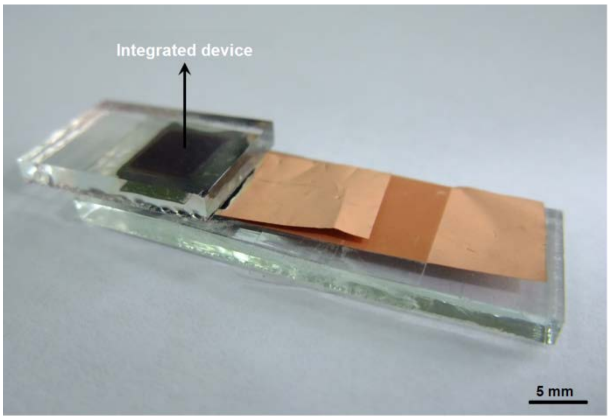

Fig. S1. Photograph of an integrated device with aligned MWCNT films as electrodes.

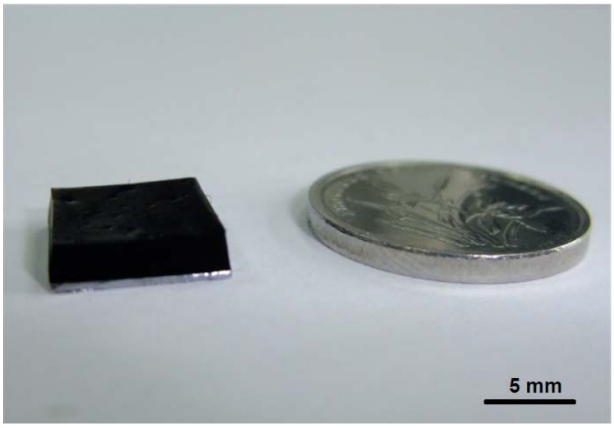

Fig. S2. Photograph of a MWCNT array compared with a coin with thickness of about 2 mm.

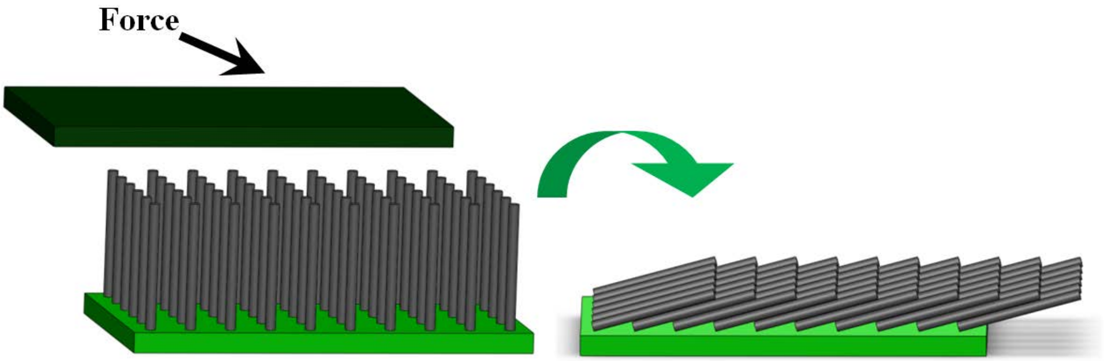

Fig. S3. Schematic illustration for the preparation of aligned MWCNT film.

Fig. S4. Photograph of a free-standing and aligned MWCNT film.

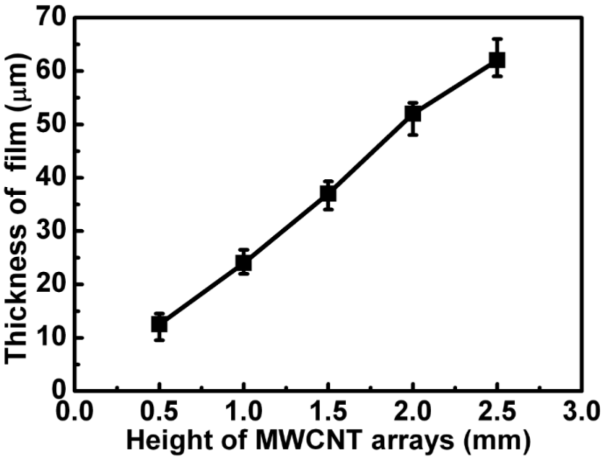

Fig. S5. Dependence of the thickness of MWCNT films on the height of MWCNT arrays.

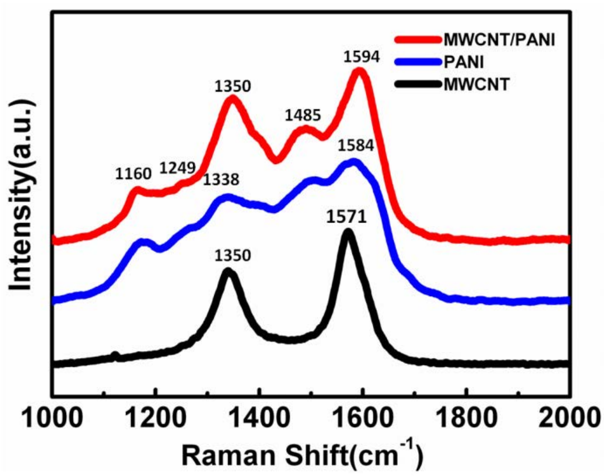

Fig. S6. Raman spectra of MWCNTs, PANI, and MWCNT/PANI composite.

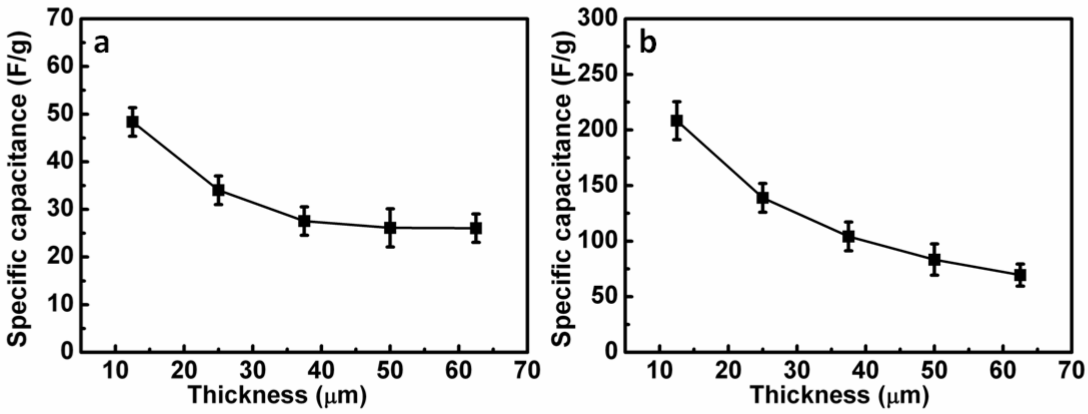

Fig. S7. Dependence of the specific capacitance on the thickness of MWCNT films. **a.** The specific capacitance of supercapacitor based on bare MWCNT films as electrodes with the increasing thickness from 10 to 50 μm. **b.** The specific capacitance of supercapacitor based on MWCNT/PANI composite films as electrodes with the increasing thickness from 10 to 50 μm. The same weight of PANI was used in all composite films.

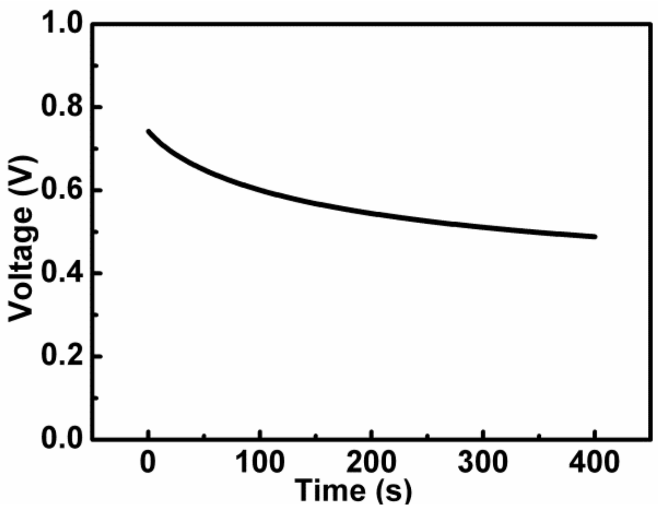

Fig. S8. Self discharge of the integrated device based on a MWCNT/PANI composite film.

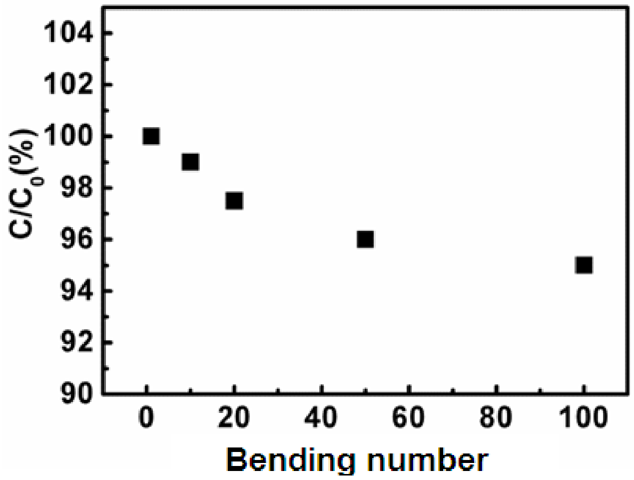

Fig. S9. Specific capacitances for the integrated device based on the MWCNT/PANI composite film during bending. Here C_0 and C correspond to specific capacitances before and after bending, respectively.

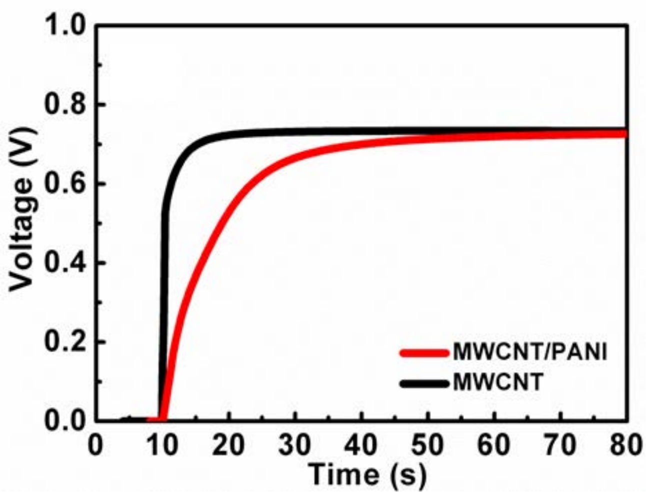

Fig. S10. The dynamic voltage of the photo-supercapacitor with bare MWCNT and MWCNT/PANI composite films as electrodes in PVA-H_3PO_4 electrolyte under AM1.5 illumination during the photocharging process.

References for the Supporting Information

S1. F. Li, J. J. Shi and X. Qin, *Chinese Sci. Bull.* **2009**, *54*, 3900-3905.

S2. S. Ito, S. M. Zakeeruddin, R. Humphry-Baker, P. Liska, R. Charvet, P. Comte, M. K. Nazeeruddin, P. Péchy, M. Takata, H. Miura, S. Uchida and M. Grätzel, *Adv. Mater.* **2006**, *18*, 1202-1205.

S3. C. Yu, C. Masarapu, J. Rong, B. Wei and H. Jiang, *Adv. Mater.* **2009**, *21*, 4793-4797.