Supporting Information

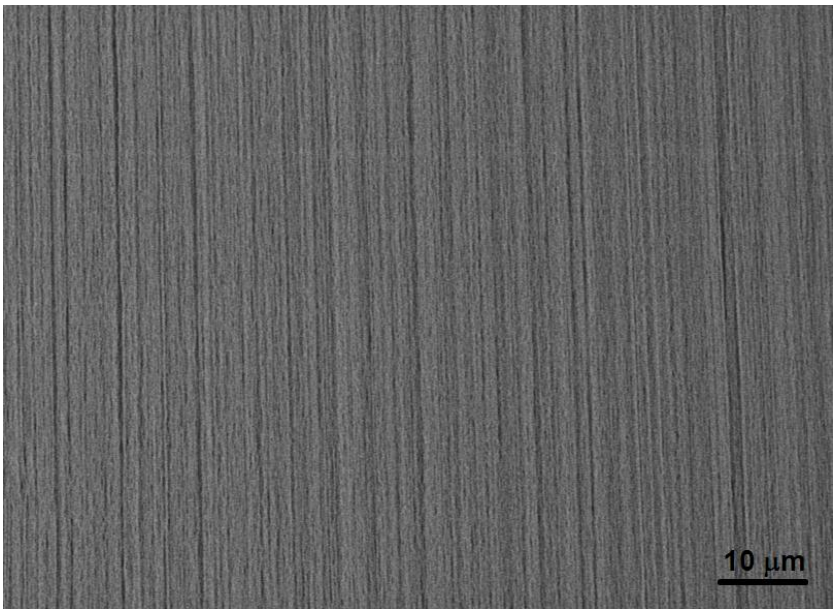

Figure S1. SEM image of a CNT array from a side view.

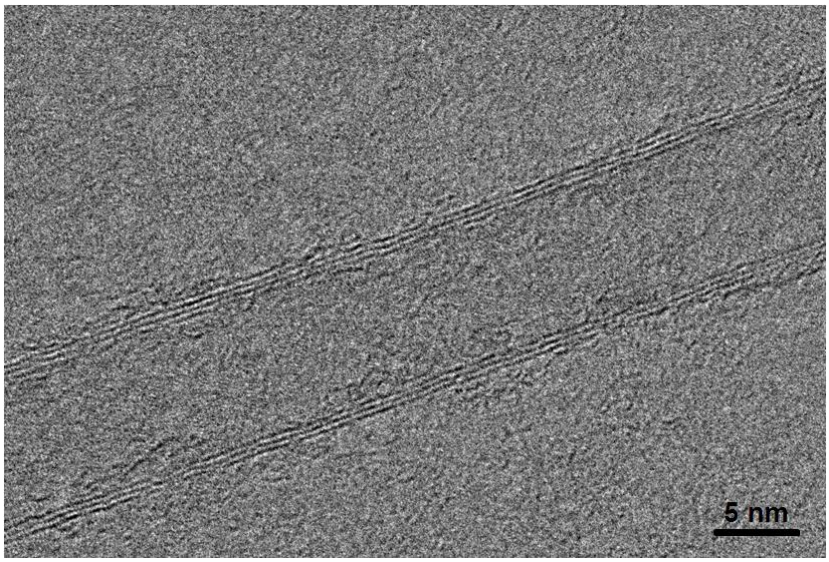

Figure S2. High-resolution TEM image of a CNT.

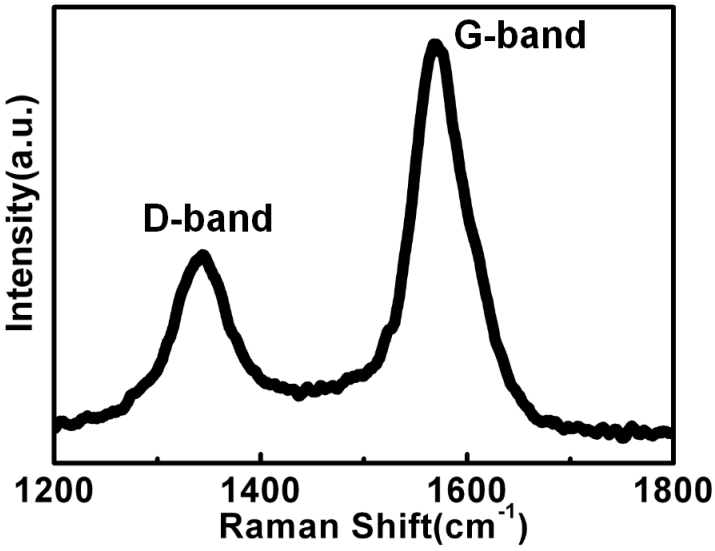

Figure S3. Raman spectrum of a CNT array.

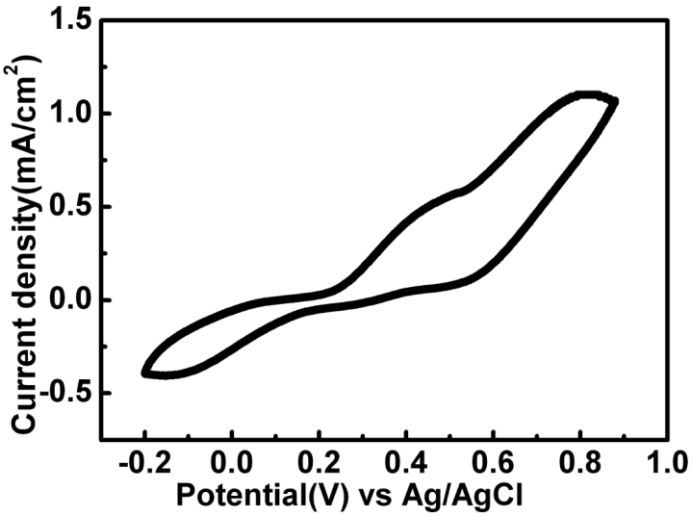

Figure S4. Electrocatalytic characterization by the cyclic voltammetry performed in 1 mM I_2, 10 mM LiI, and 0.1 M $LiClO_4$ acetonitrile solution with a scan rate of 100 mV s^{-1} on a three-electrode setup. Two oxidation/reduction peaks clearly show a catalytic activity derived from CNTs for reduction of I_3^-. The left and right peaks correspond to the oxidation/reduction of I^-/I_3^- and I_2/I_3^-, respectively (*Electrochim. Acta* 2008, 53, 2890).

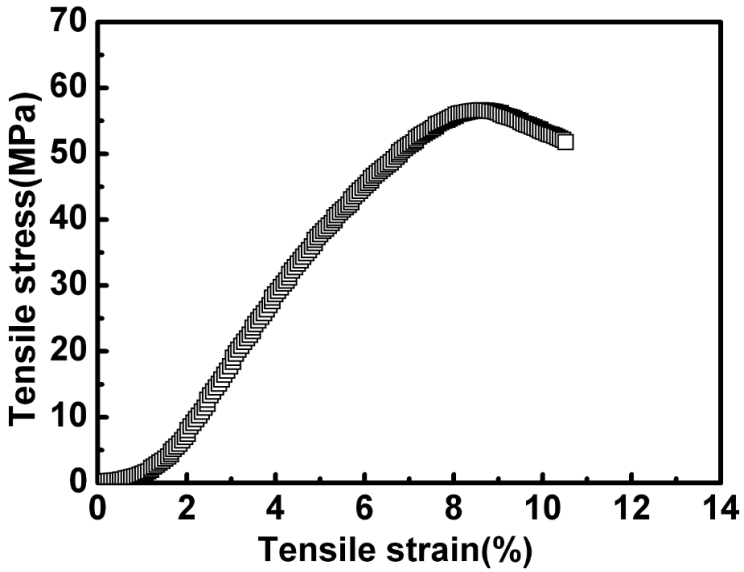

Figure S5. A typical tensile stress-stain curve of a perpendicularly aligned and penetrated CNT/resin composite film.

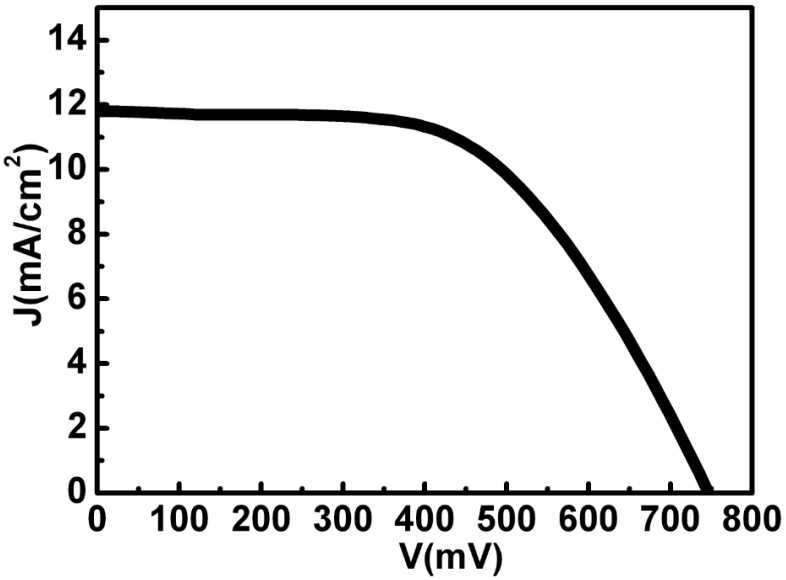

Figure S6. J-V curve of a dye-sensitized solar cell by using the platinum as counter electrode.

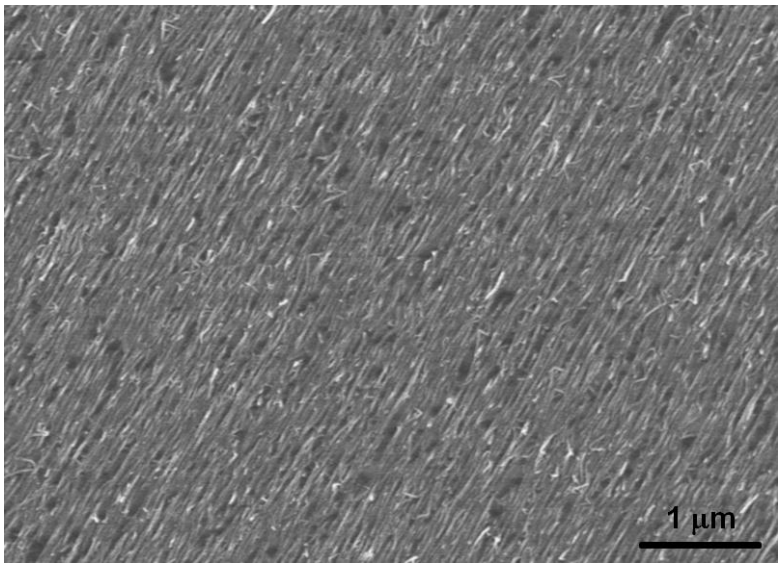

Figure S7. SEM images of aligned CNT/resin composite film derived from a pressed CNT array (improved for three times in CNT number density).

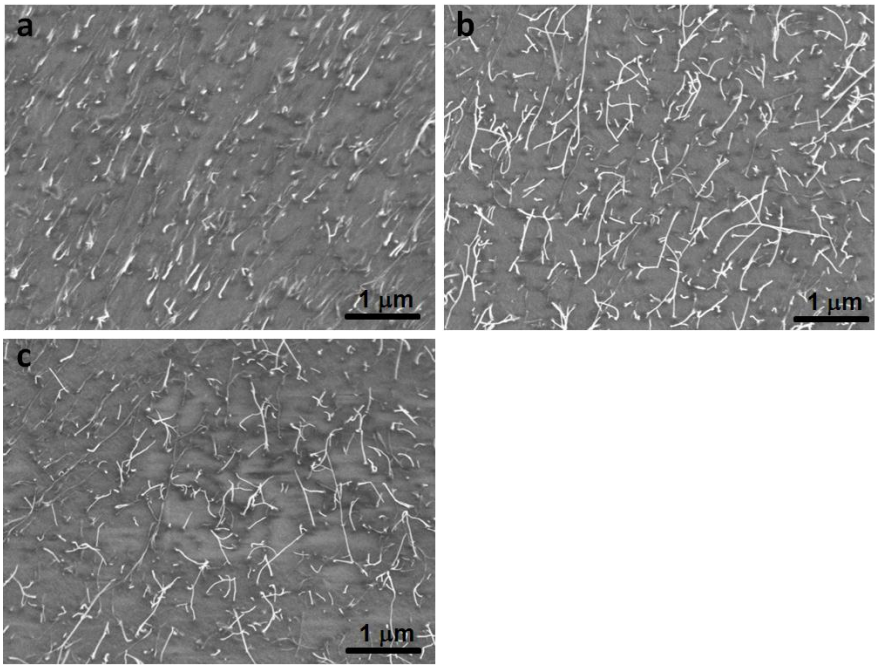

Figure S8. SEM images of aligned CNT/resin composite film after incorporating (**a**) polydiacetylene, (**b**) polyaniline, and (**c**) polypyrrole into pure CNT arrays.

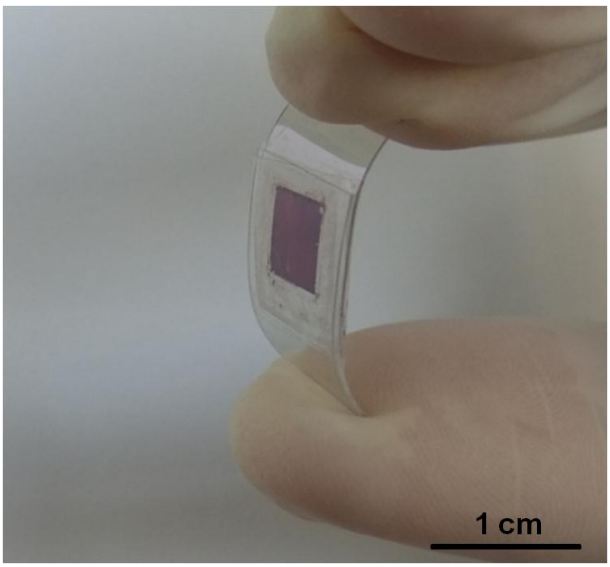

Figure S9. Photo of a flexible dye-sensitized solar cell by using the perpendicularly aligned and penetrated CNT/polymer composite film as counter electrode.

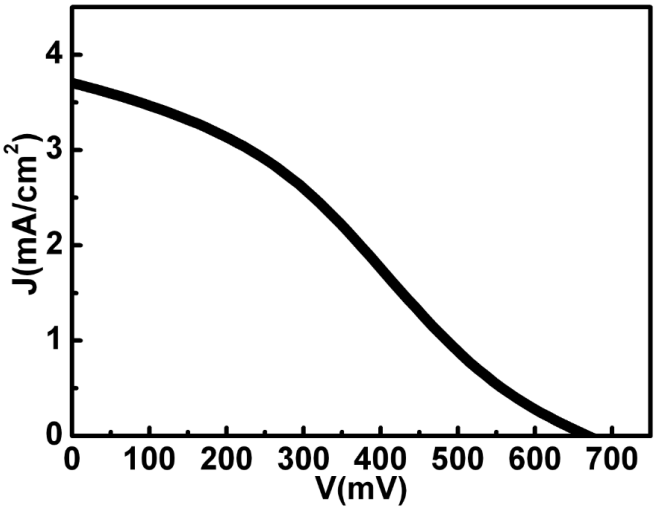

Figure S10. A typical J-V curve of a flexible dye-sensitized solar cell by a perpendicularly aligned and penetrated CNT/resin composite film as a counter electrode measured under AM1.5 illumination.

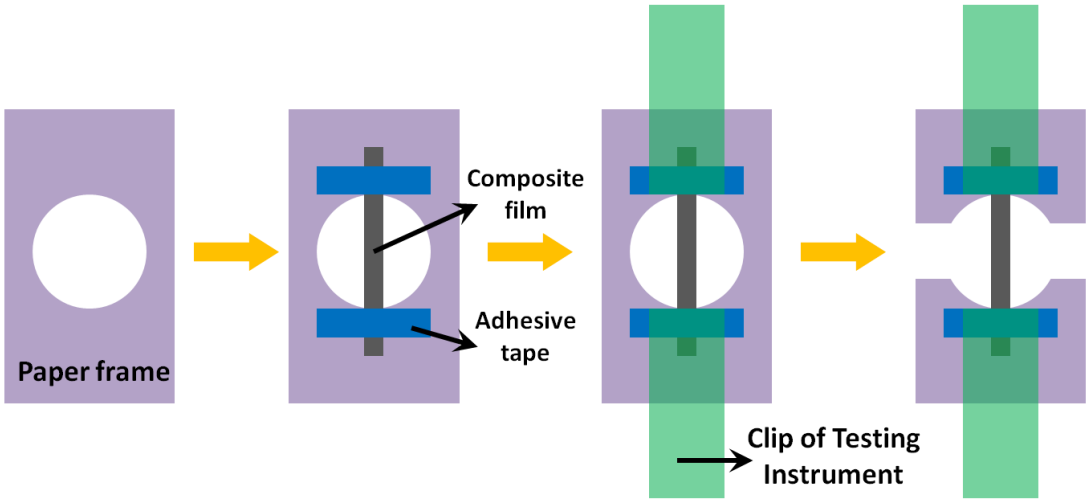

Figure S11. Schematic illustration to the mechanical measurement.