

## Supplementary Information for

### **Stretchable fluoroelastomer quasi-solid-state organic electrolyte for high-performance asymmetric flexible supercapacitor**

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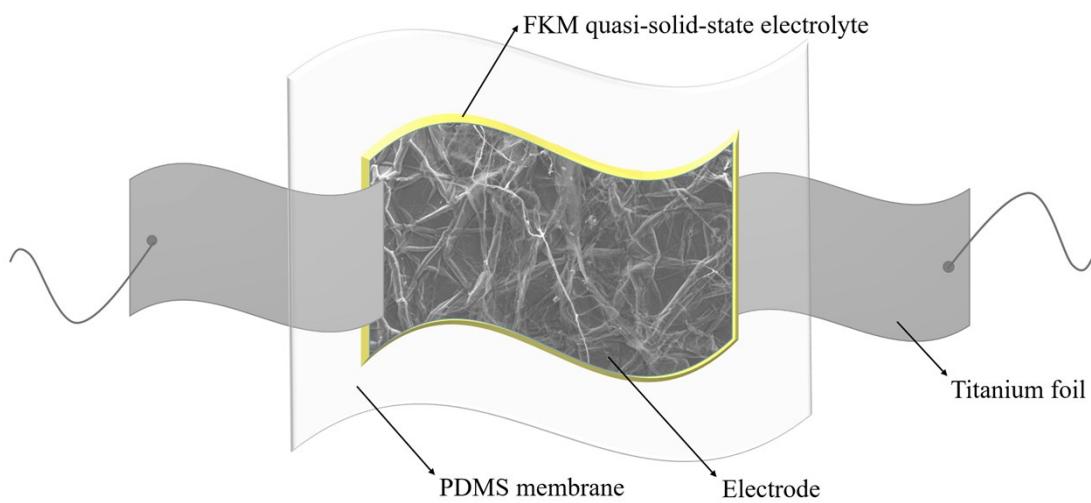
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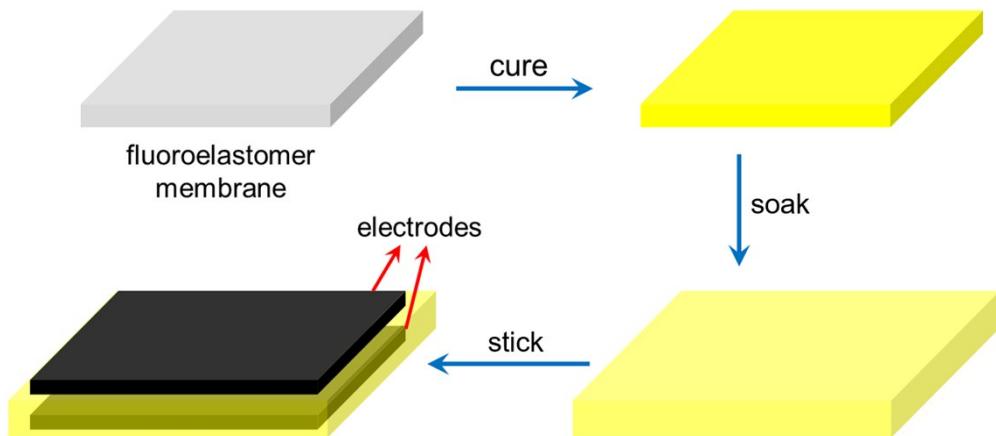
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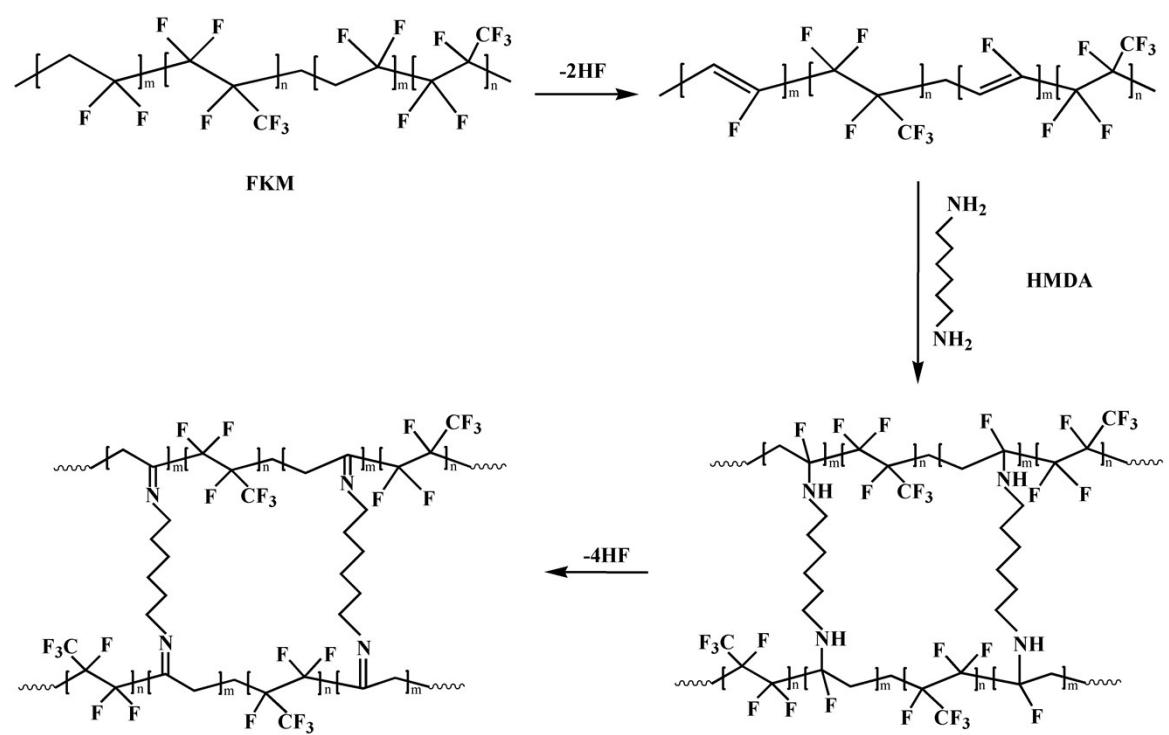
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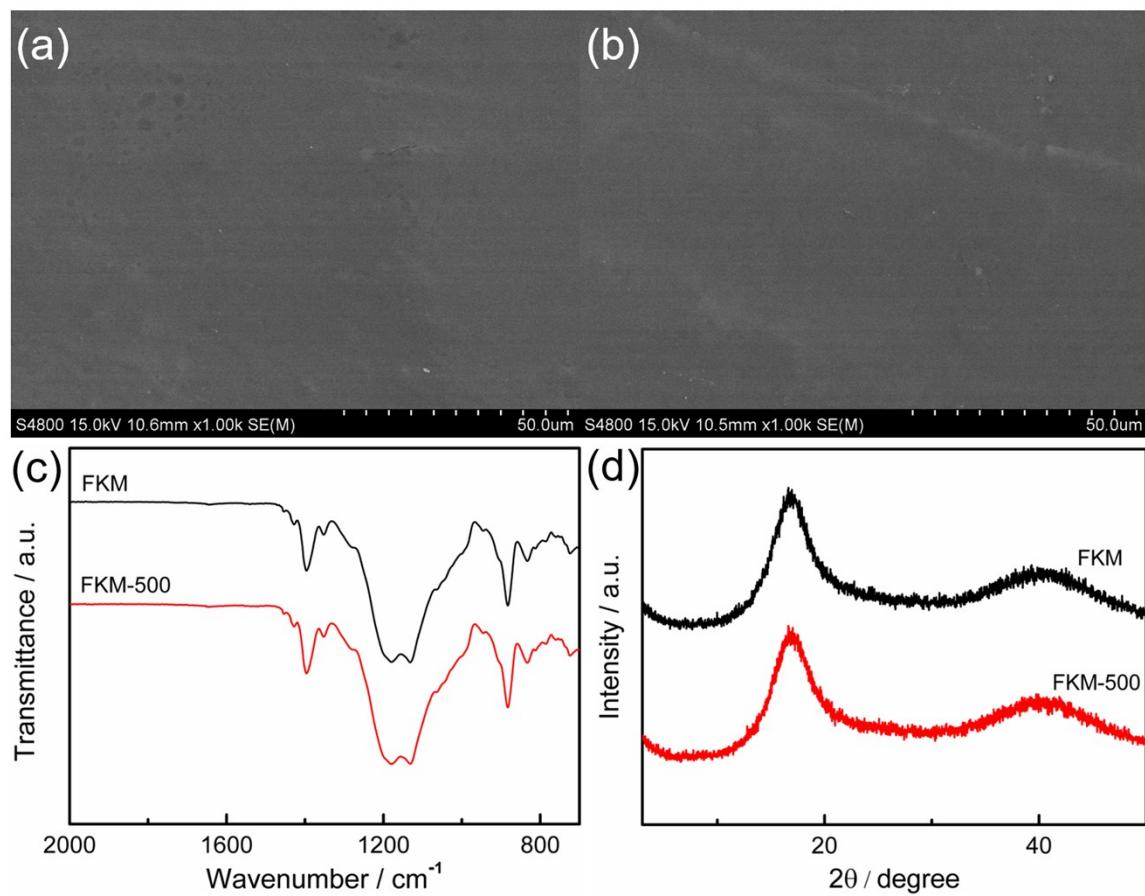
**Fig. S1.** Schematic configuration of CNT@PPy//FKM/Et<sub>4</sub>NBF<sub>4</sub>-AN//CNT@PDAA oAFSC (SC-1).



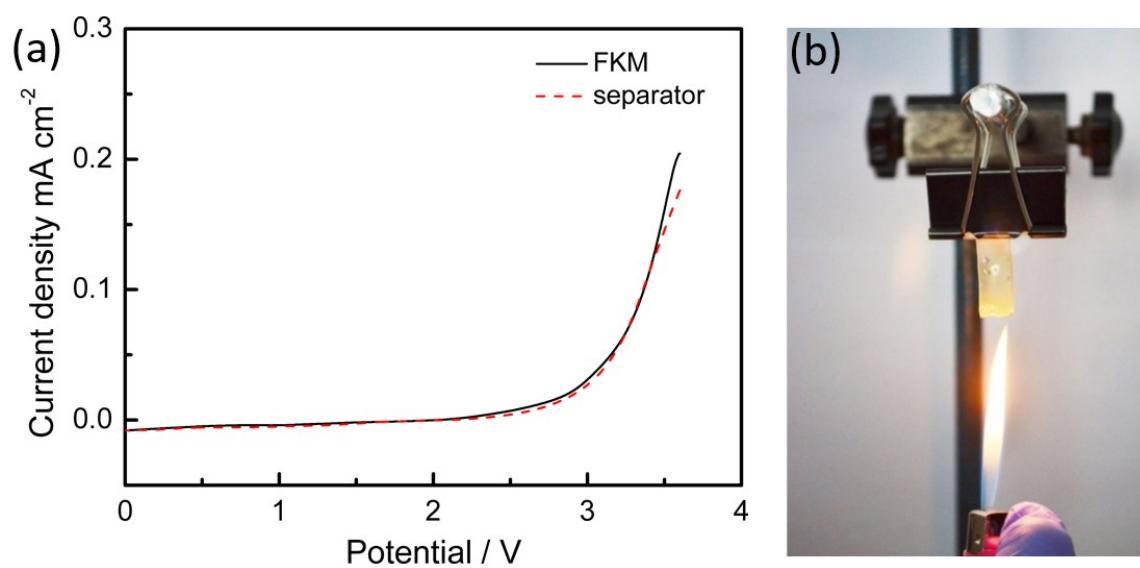
**Fig. S2.** Schematic diagram of the routine ‘cure-soak-stick’ assembly process of CNT@PPy//FKM/Et<sub>4</sub>NBF<sub>4</sub>-AN//CNT@PDAA oAFSC (SC-2).



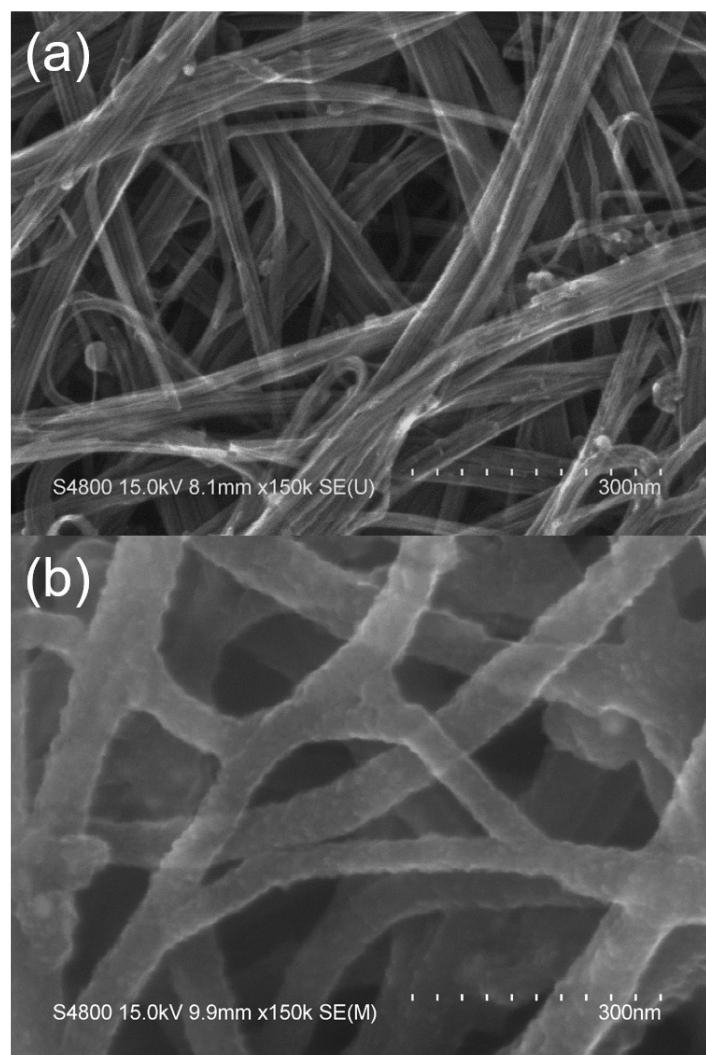
**Fig. S3.** Schematic diagram of the cross-linking mechanism between FKM and HMDA.



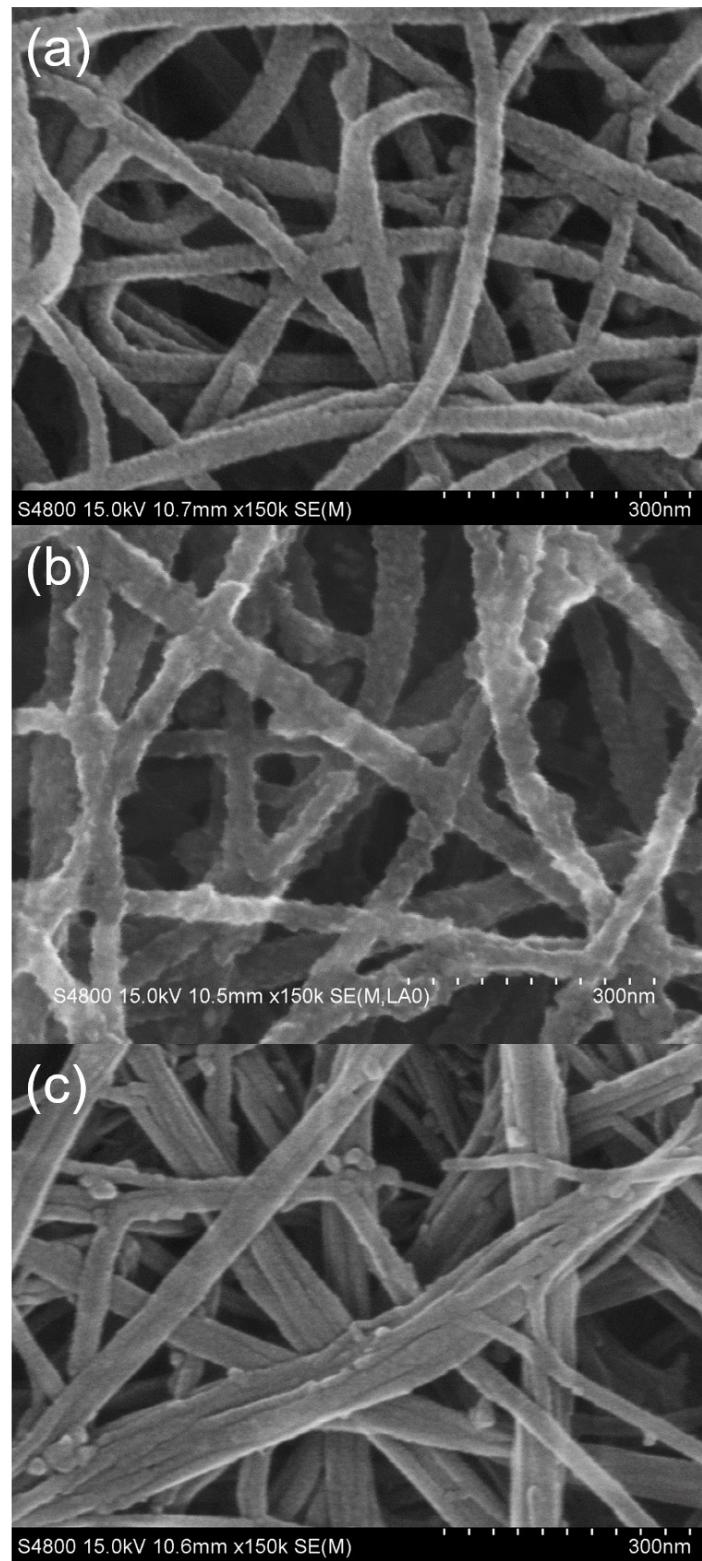
**Fig. S4.** FE-SEM images of FKM membranes with 0.5% HMDA (a) before and (b) after 500 cycles of stretching. (c) ATR-FTIR spectra and (d) XRD patterns of the FKM membranes with 0.5% HMDA before (FKM) and after 500 cycles of stretching (FKM-500)



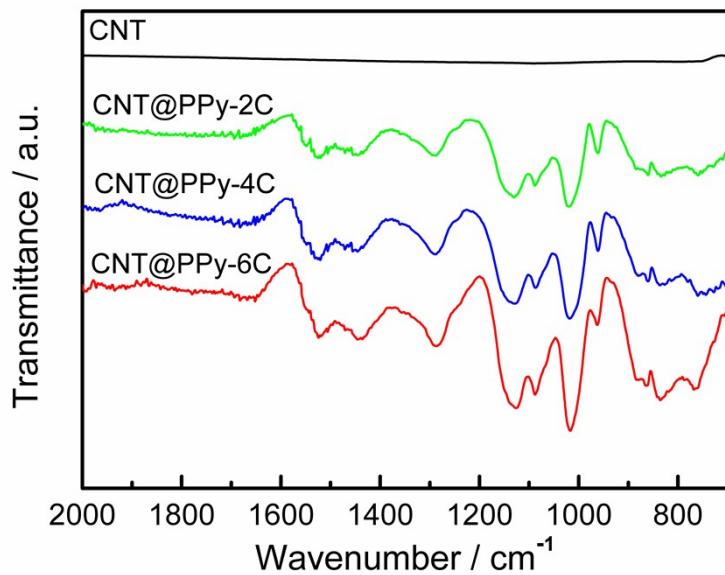
**Fig. S5.** (a) Linear sweep voltammograms of FKM/ $\text{Et}_4\text{NBF}_4$ -AN quasi-solid-state organic electrolyte and separator with  $\text{Et}_4\text{NBF}_4$ -AN electrolyte using stainless steel as working electrodes at  $5 \text{ mV s}^{-1}$ . (b) The flammability test of FKM/ $\text{Et}_4\text{NBF}_4$ -AN quasi-solid-state organic electrolyte.



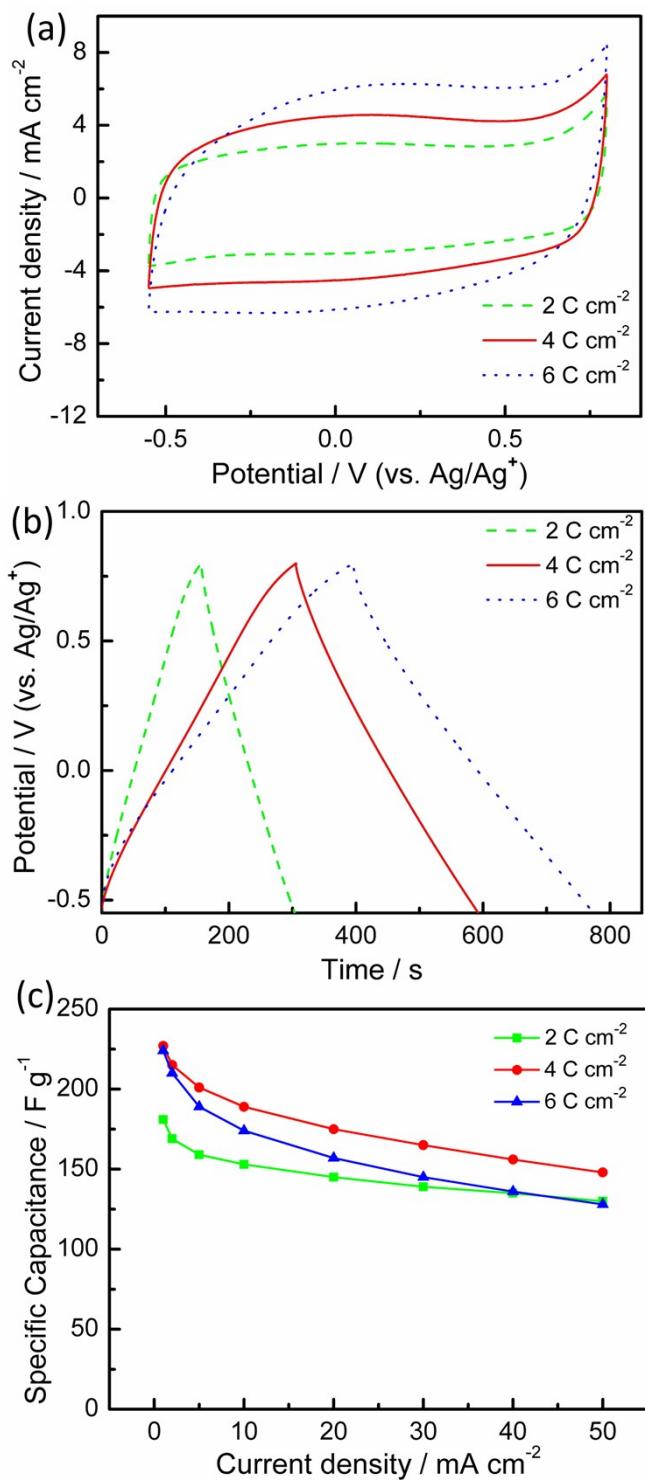
**Fig. S6.** FE-SEM images of (a) CNT paper and (b) CNT@PDAA



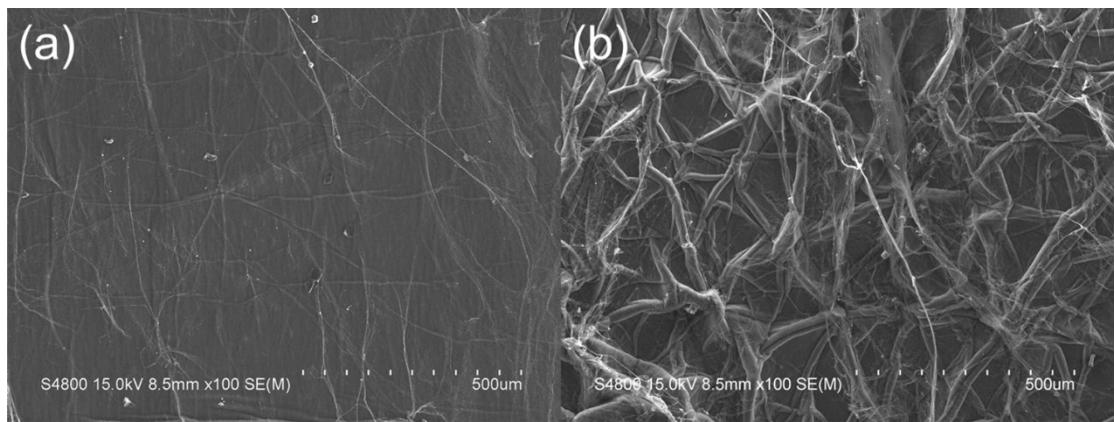
**Fig. S7.** FE-SEM images of CNT@PPy films grown for (a)  $2 \text{ C cm}^{-2}$ , (b)  $4 \text{ C cm}^{-2}$ , and (c)  $6 \text{ C cm}^{-2}$



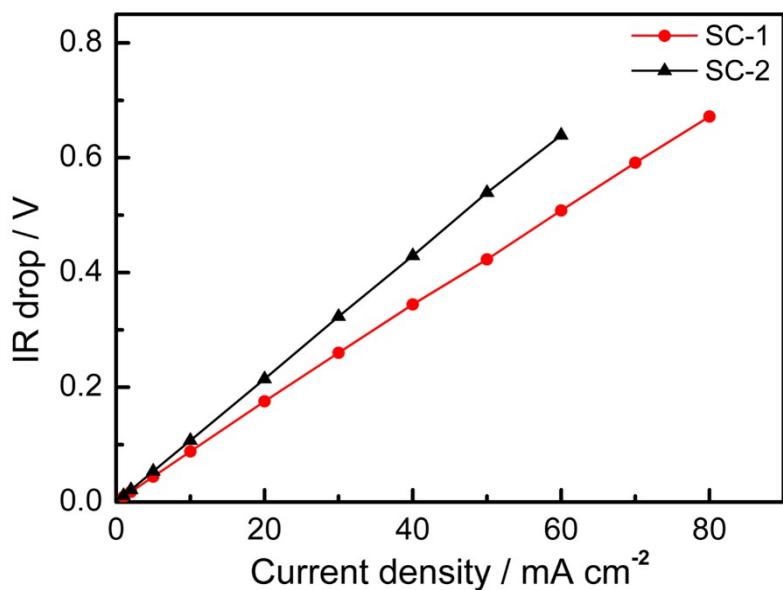
**Fig. S8.** ATR-FTIR spectra of pure CNT paper and CNT@PPy grown for 2, 4, 6 C cm<sup>-2</sup>



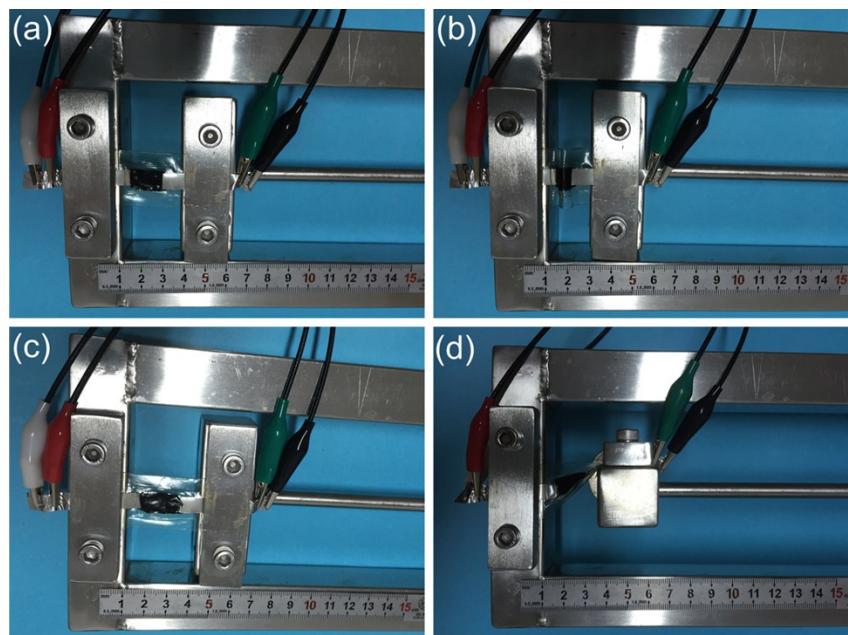
**Fig. S9.** (a) Cyclic voltammograms at  $20 \text{ mV s}^{-1}$ , (b) Galvanostatic charge/discharge curves at  $2 \text{ mA cm}^{-2}$  and (c) specific capacitance as a function of current densities from 1 to  $50 \text{ mA cm}^{-2}$  of CNT@PPy film electrodes with different polymerization charge densities in three-electrode mode.



**Fig. S10.** FE-SEM images of the film electrode in the assembly of SC-1: (a) the initially flat film form, (b) crumpled structure after the film is relaxed.



**Fig. S11.** IR drop as a function of current densities for CNT@PPy//FKM/Et<sub>4</sub>NBF<sub>4</sub>-AN//CNT@PDAA *o*AFSCs.



**Fig. S12.** Digital photos of CNT@PPy//FKM/Et<sub>4</sub>NBF<sub>4</sub>-AN//CNT@PDAA *o*AFSCs (SC-1) at (a) normal, (b) bended, (c) stretched and (d) twisted states.