Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Low Cost, High Performance Flexible Asymmetric Supercapacitor Based on Modified Filter Paper Together with an Ultra-Fast Packaging Technique

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Equation:

The specific capacitance (C) could be calculated as eqn. (1), (2) and (3) as follows:

$$C = \frac{\int \mathrm{i}(V)dV}{2s \cdot \nu \cdot \Delta V} \quad (1)$$

$$C = \frac{I \cdot \Delta \mathrm{t}}{m \cdot \Delta U} \quad (2)$$

$$C = \frac{I \cdot \Delta \mathrm{t}}{s \cdot \Delta U} \quad (3)$$

Where C is a specific capacitance (F g^{-1} or F cm^{-2}), $\int \mathrm{i}(V)dV$ is the integral areas of the CV curves, s is the geometry area of the electrode, ν is the scan rate, I is the applied current (*A*), Δt is the discharge time (s), ΔU is the potential window (*V*), *m* the mass of active material (g) and *s* is electrode area (cm^2).

The energy density (*E*) and power density (*P*) could be calculated as eqn. (4) and (5) as follows:

$$E = \frac{1}{2} CV^2 \quad (4)$$

$$P = \frac{E}{\Delta \mathrm{t}} \quad (5)$$

Where *E* is energy density (Wh kg^{-1}), *P* is power density (W kg^{-1}), *C* is a volume specific capacitance (F g^{-1}), *V* is the potential window (*V*), Δt is the discharge time (*s*).

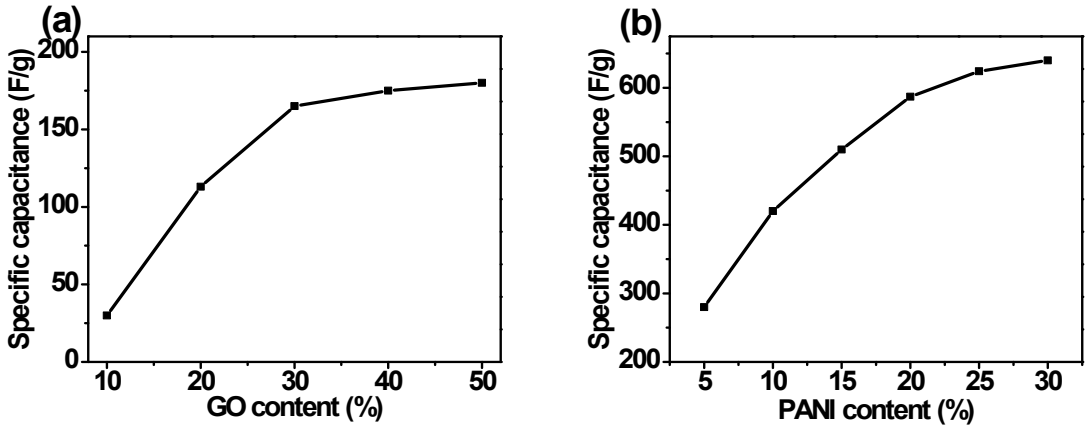

Figure S1. Specific capacitance of (a) PF-RGO electrodes with different contents of GO; (b) PF-RGO-PANI electrodes with different contents of PANI. GO Content (%) = $M_{GO}/(M_{GO}+M_{PF})$; PANI Content (%) = $M_{PANI}/(M_{GO}+M_{PF}+M_{PANI})$

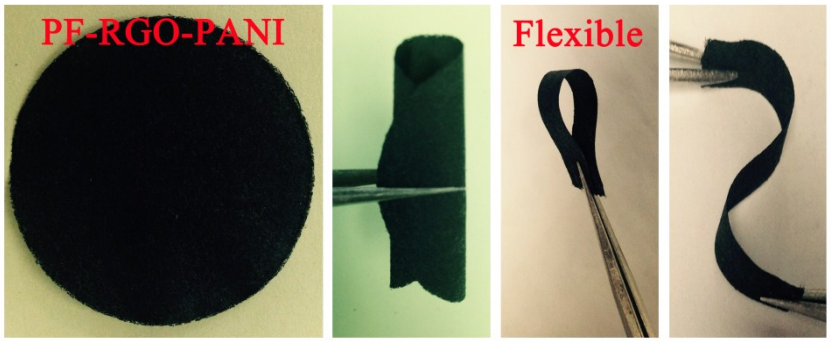

Figure S2. Flexible of PF-RGO-PANI electrodes

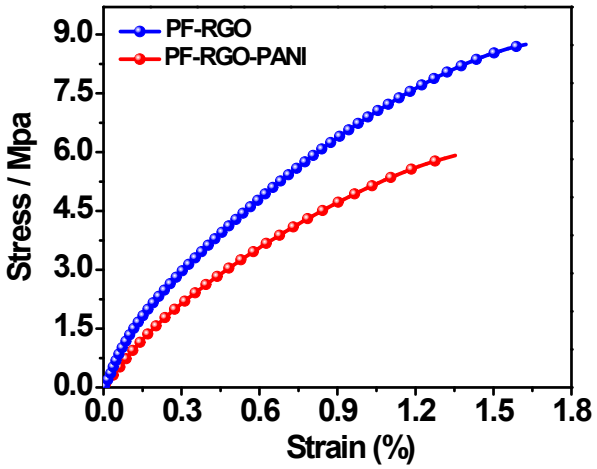

Figure S3. Stress-strain curves of PF-RGO and PF-RGO-PANI.

The mechanical flexibility of PF-RGO and PF-RGO-PANI films was examined by Dynamic thermal analysis (DMA), and the stress-strain curves were displayed in Figure S3. The PF-RGO film, in which the content of GO is 30 wt%, can sustain a stress as high as 8.75 MPa with a 1.75 % elongation, and the PF-RGO-PANI still behaviors good mechanical strength after the addition of 20 % PANI.

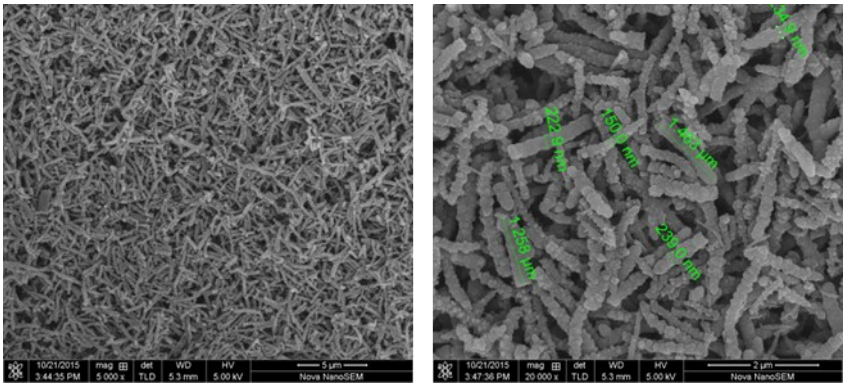

Figure S4.FE-SEM images of PANI nanorods.

Electrochemical synthesis of PANI on Indium tin oxide (ITO) glass (S = 2 cm^2) was performed at constant voltage density of 750 mV from aqueous solution of 1.0 M H_2SO_4 and 0.3 M aniline. And the obtained PANI nanorods were uniform of the size, which the diameter and length were about 200 nanometers and several microns, respectively.

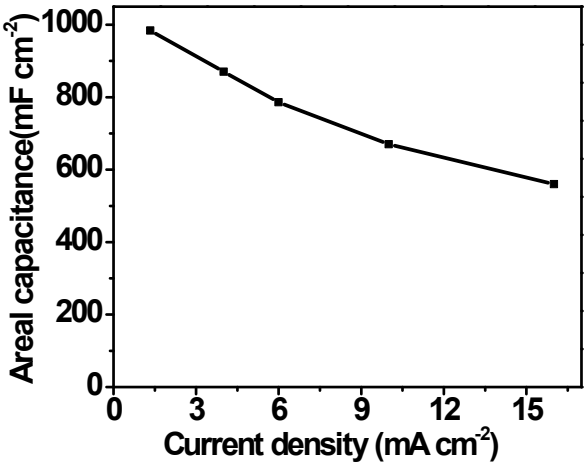

Figure S5. Areal capacitance calculated from the GCD curves as a function of current densities.

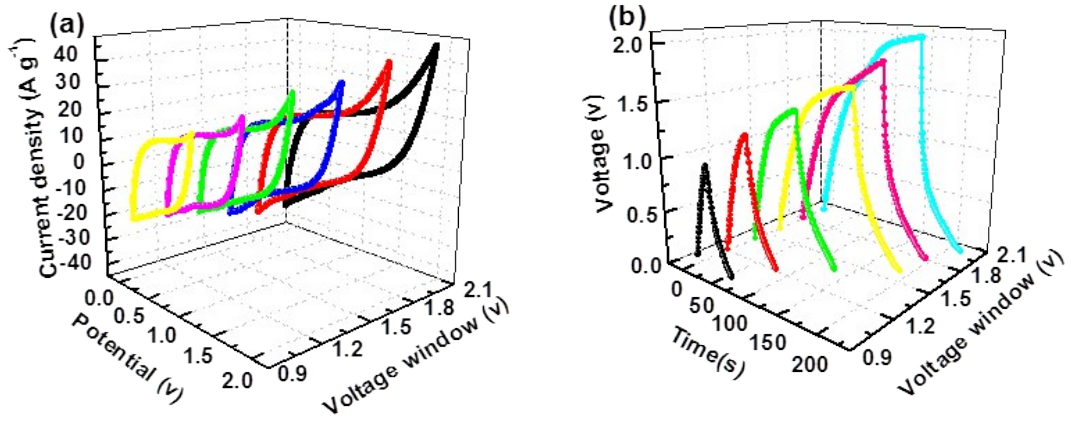

Figure S6. Capacitive behavior the FAAS: (a) CVs at a scan rates of 100 mV s^{-1} and (b) CDs at a current density of 3 A g^{-1} in different voltage windows (from 0 - 2.0V, as indicated).

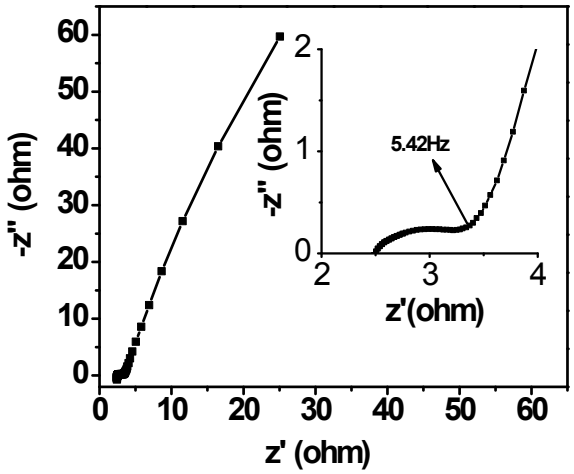

Figure S7. Niquist polts of the FAAS with a magnification of high frequency region in the inset.