

## **Supplementary Information**

# **Superacid-doped Polyaniline as a Soluble Polymeric Active Electrolyte for Supercapacitor**

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## ***Experimental***

### ***Preparation of PANI solution***

18.626 g aniline was added to 200 ml, 1.0 M HCl. 57.04 g APS was dissolved in 103 ml water and added dropwise to the aniline solution. The reaction was performed after 3 hours under the ice water bath. The product was filtered and washed with deionized water and absolute ethanol. The filter cake was stirred in 200 ml, 20% aqueous ammonia for one day, washed again, and finally dried in the oven. The dried PANI powder was dissolved in NMP, forming a homogeneous PANI solution.

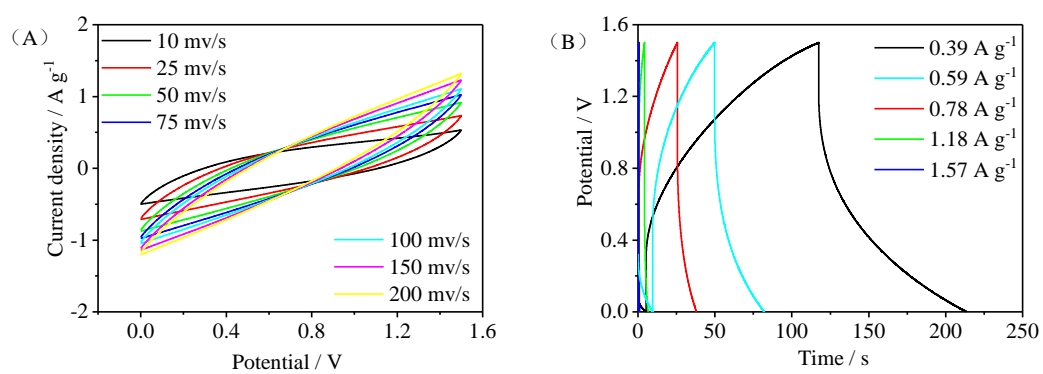


Fig. S1. The electrochemical performance of device 2. (A) The CV curves; (B) The GCD curves.

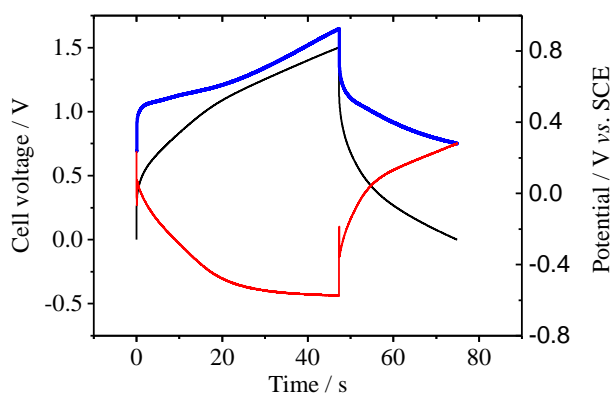


Fig. S2. GCD curves of single electrode of the device 1. Current density: anode,  $2.76 \text{ A g}^{-1}$ ; cathode,  $2 \text{ A g}^{-1}$ .

The electrode process of each electrode in device 1 during GCD was investigated in a three-electrode configuration system. The equilibrium potential of each electrode is approximately  $0.3 \text{ V vs. SCE}$ , which corresponds to the electrode potential of the first redox reaction of PANI. When the device is charged from  $0 \text{ V}$  to  $1.5 \text{ V}$ , the potential of the anode rises from  $0.3 \text{ V}$  to  $\sim 0.9 \text{ V vs. SCE}$ , and the potential of the cathode decreases from  $\sim 0.3 \text{ V}$  to  $\sim -0.6 \text{ V vs. SCE}$ . The capacitance of the cathode mainly derived from the electric double layer capacitance. But on the anode, PANI undergoes a reversible redox reaction, whose depolarization makes the anode potential change slowly during GCD, giving a large pseudocapacitance.

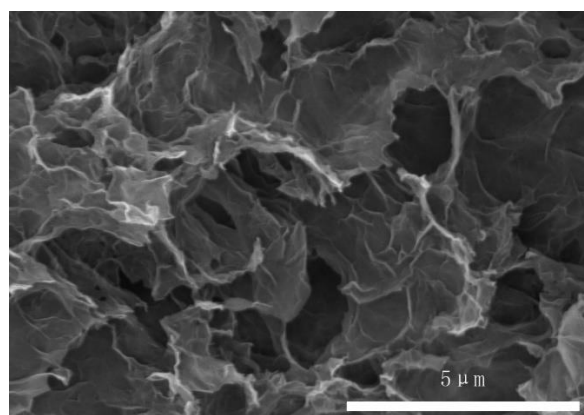


Fig. S3. SEM image of RGOH.

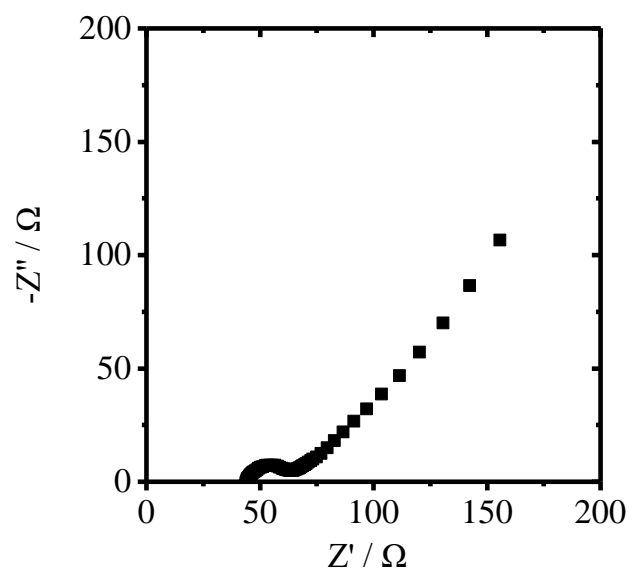


Fig. S4. Nyquist plot of Device 2.