

Supporting information

Flexible Patterned Micro-Electrochemical Capacitors based on PEDOT

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Experimental Section

Electronic ink preparation:

The electronic ink was prepared diluting 35 mL of the 1.3 wt.% PEDOT:PSS (PH1000, H.C.Starck) dispersion in distilled water to a final volume of 50 mL, which contained 5% TEG (Triethylene glycol), a little DMEA (N,N-Dimethylethanolamine), 2% APU (Polyurethane), 0.025% triton x-100 and 0.2% PEO (Plasma electrolytic oxidation). The mixture was filtered with a 0.22 μm filter (cellulose acetate). In order to obtain the necessary surface tension for printing 0.426 g of Tween 80 (6.500 mM solution) was added into the dispersion.

Flexible electrode fabrication:

The pattern was transfer into flexible substract without template by digital flatbed printer DFP-08A2+ (Springsun, China). The size and shape of pattern was shown in Figure 1a. The pattern included two parallel “L”. The work electrode area was $1 \times 2 \text{ mm}^2$ and the width of contact wire was 2 mm. The 2 mm^2 of work area was designed to investigate the electrochemical performance. Herein, the process of fabrication, the printing head chosen the Epson 1290 (8 colours *180 nozzles), the nozzle size and distance was display in Figure S1. The distinguishability chosen 1440 dpi. The product was heated to 160°C and maintained for 24 h.

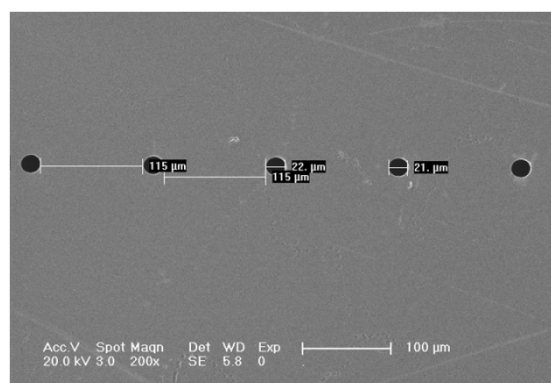


Figure S1 the size and distance of nozzle.

Apparatus:

Atomic force microscope (AFM) images were obtained with a microscope (Seiko Instruments Industry Co., Tokyo, Japan). Scanning electron microscopy (SEM) measurements were conducted with an XL30 ESEM FEG field emission scanning electron microscope. Cyclic voltammetry (CV) measurements were carried with CHI 660D Electrochemical Workstation (CHI). Electrochemical impedance spectroscopy (EIS) experiments were carried out on a Parstat 2273 advanced electrochemical systems in the frequency range mainly from 100 kHz to 10 mHz with an ac signal amplitude of 5 mV. Conductivity was measured under ambient laboratory conditions using a standard four-probe method (Suzhou Baishen SZT-2A four-probe meter).

Electrochemical measurements:

All electrochemical measurements were done in a three-electrode setup: The flexible PEDOT:PSS film as the working and counter electrode, Ag/AgCl electrode as reference electrodes. The measurements were carried out in a 1 M KCl aqueous electrolyte at room temperature. Cyclic voltammograms (CV) and galvanostatic charge/discharge were measured by a CHI 660D electrochemical workstation. CV tests were done between 0-1.0 V (vs. Ag/AgCl) at different scan rates. Galvanostatic charge/discharge curves were measured at different current densities of 1, 5, 10, 20 and 50 mA cm^{-2}

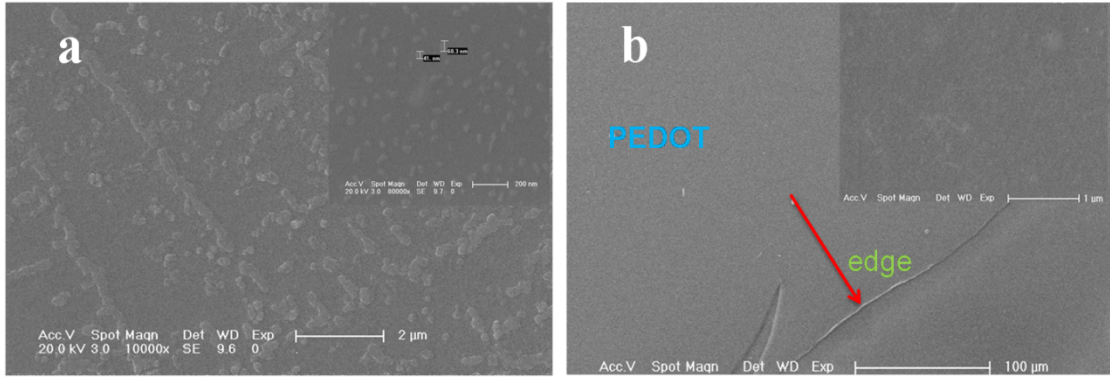


Figure S2. SEM image of the PEDOT:PSS film before and after composition adjustment of the ink.

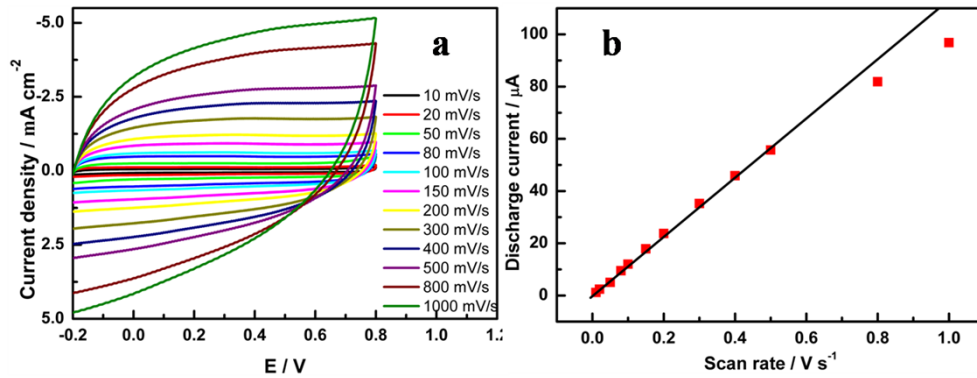


Figure S3. a) Cyclic voltammetry at different scan rate and the relationship between the discharge current and the scan rates (b).

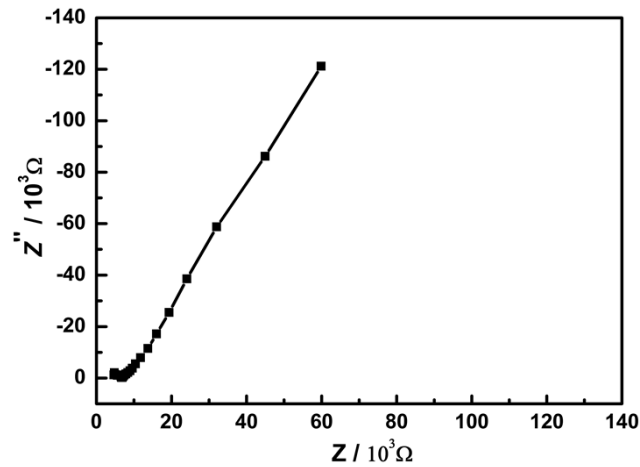


Figure S4. Nyquist plots of flexible MECs recorded in 1 M KCl solution in a frequency range from 10 mHz to 100 kHz with a potential amplitude of 5 mV.