Crosslinked PEDOT:PSS Organic Electrochemical Transistors on Interdigitated Electrodes with Improved Stability

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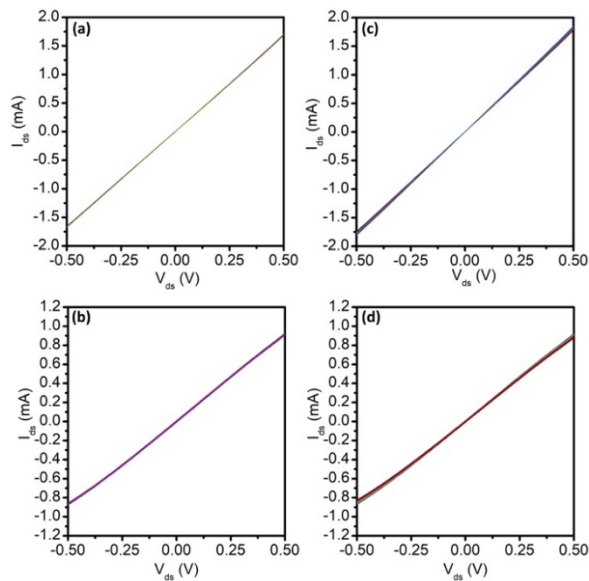
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Figure S1. *I-V* curves of PEDOT:PSS films in PBS buffer containing 0.1 M NaCl for 10 consecutive measurements. (a) Pristine PEDOT:PSS measured every 10 s.(b) Pristine PEDOT:PSS measured every 5 minutes. (c) Crosslinked PEDOT:PSS measured every 10 s. (d) Crosslinked PEDOT:PSS measured every 5 minutes.
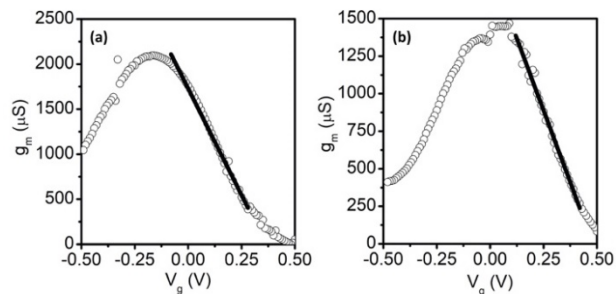

Figure S2. Transconductance of PEDOT:PSS OECTs as a function of gate bias (V_g). Mobility estimations of both pristine (a) and crosslinked (b) OECTs can be achieved by fitting the slopes of transconductance curves.
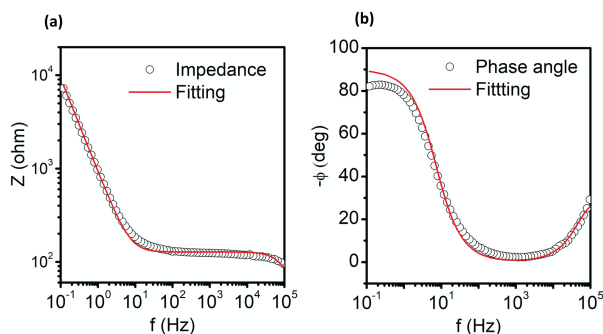
Figure S3. Bode plots of electrochemical impedance spectroscopy for PEDOT:PSS film. (a) Impedance *Z*. (b) Phase angle. Electrochemical impedance spectroscopy (EIS) for determination of capacitance was conducted in a CHI 660A electrochemical workstation from 10 kHz to 0.1 Hz. PEDOT:PSS film is deposited on FTO glass substrate via spin-coating at 3000 rpm. The surface area of the film is about 0.7 cm^2 and film thickness is about 60 nm. EIS data was measured in 0.1M NaCl aqueous solution, using Ag/AgCl as the reference electrode and a Pt mesh as the counter electrode. DC offset potential was chosen to be zero and an AC amplitude of 10 mV is used. To fit the EIS data, equivalent circuit like R$_s$C or Rs(Rp||C) was adopted. The volumetric capacitance (C*) of PEDOT:PSS is determined to be about 40 F/cm^3.
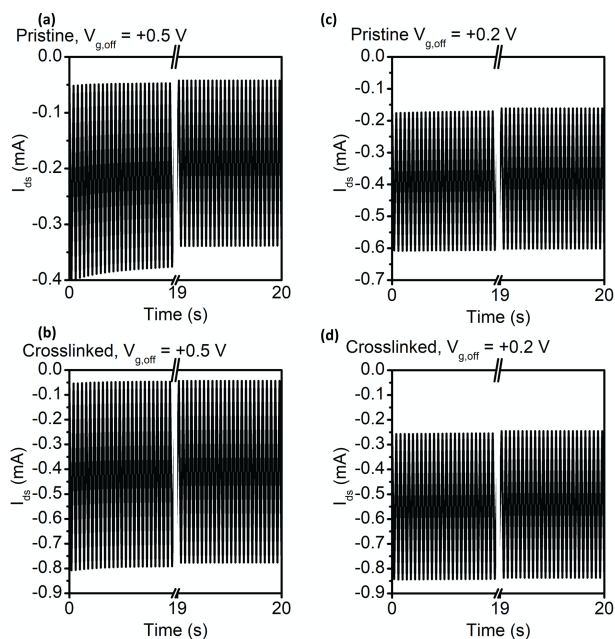
Figure S4. Zoomed-in views of the first 50 cycles (0-1s) and last 50 cycles (19-20s) of corresponding results on pulsed gate bias stability in Figure 6. (a) Pristine, $V_{g, off}$ = +0.5 V. (b) Crosslinked, $V_{g, off}$ = +0.5 V. (c) Pristine, $V_{g, off}$ = +0.2 V. (d) Crosslinked, $V_{g, off}$ = +0.2 V. Note that $V_{g, on}$ = –0.5 V and V_{ds} = –0.5 V are for all cases.
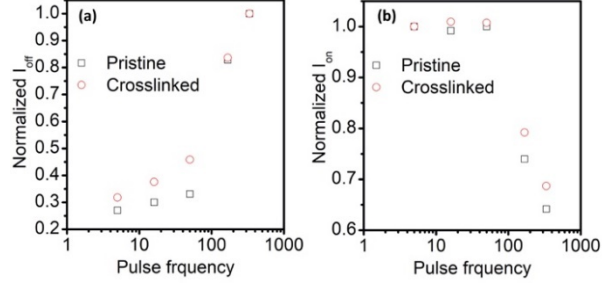

Figure S5. Normalized drain current response as a function of pulse frequency. (a) Normalized "on" state current (I_{on}). (b) Normalized "off" state current (I_{off}). Note that in pulse experiments, $V_{g, off}$ = +0.2 V, $V_{g, on}$ = -0.5 V, V_{ds} = -0.5 V.
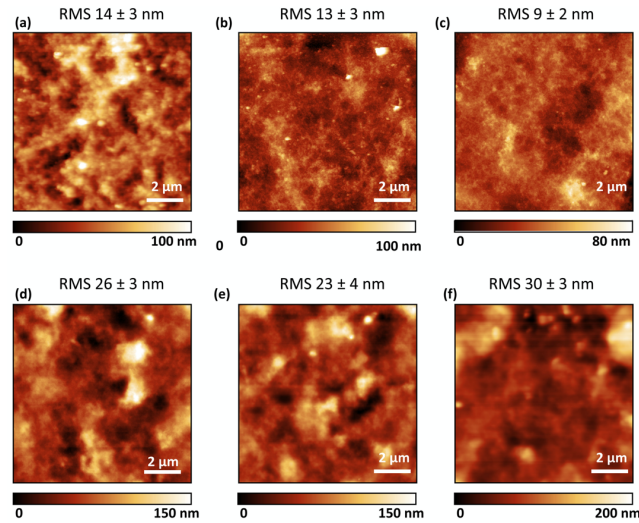

Figure S6. Atomic force microscopy topography images of PEDOT:PSS films. (a) Pristine film. (b) Pristine film soaked in PBS buffer for 30 mins. (c) Prisitne film after 500 on/off cycles at V_g = +0.5 V to -0.5 V, V_{ds} = -0.5 V. (d) Crosslinked film. (e) Crosslinked film soaked in PBS buffer for 30 mins. (f) Crosslinked film

after 500 on/off cycles at V_g = +0.5 V to -0.5 V, V_{ds} = -0.5 V. All samples were blow dried by N_2 before AFM measurement.