Electronic Supplementary Material (ESI) for Lab on a Chip

[Supporting Information]

Manipulating Location, Polarity, and Outgrowth Length of Neuron-like Pheochromocytoma (PC-12) Cells on Patterned Organic Electrode Arrays

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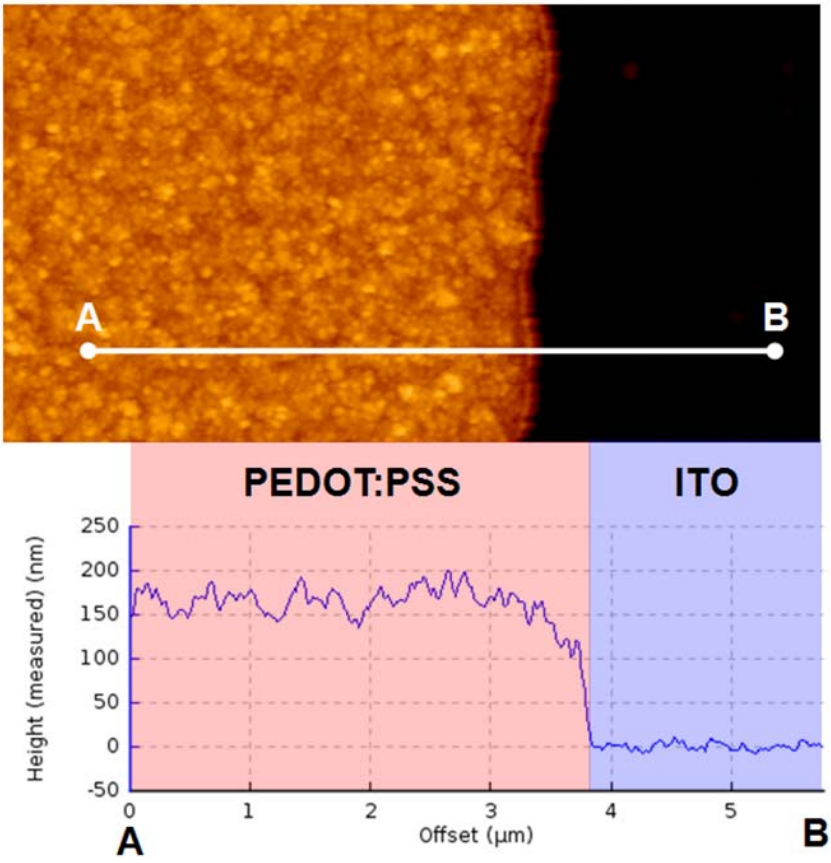

Figure S1. AFM image of electrodeposited PEDOT:PSS thin films on ITO substrates.

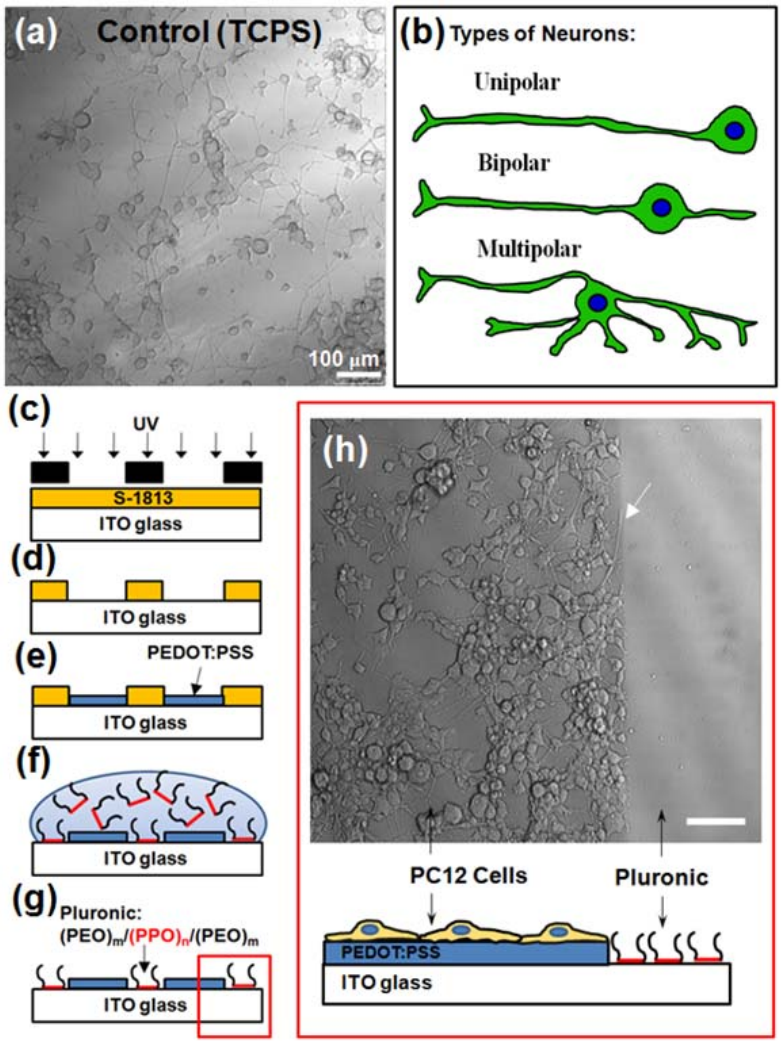

Figure S2. (a) Differential interference contrast (DIC) image of PC-12 cells on TCPS. (b) Possible morphologies of differentiated PC-12 cells. (c–g) Schematic representation of the fabrication of PEDOT microelectrode arrays with anti-adhesive Pluronic F108 coatings. (c) A standard photolithographic process is used to define the electrodes. (d) After development, the patterned ITO glass is subjected to electrochemical polymerization to produce PEDOT electrodes. (e) PEDOT:PSS electrodes are formed on the unprotected areas of the ITO glass. (f) After removal of the S1813 photoresist, an aqueous solution containing Pluronic F108 is dropped on the devices. (g) Pluronic F108 binds to the areas of the ITO glass that are free of PEDOT:PSS. (h) DIC image of PC-12 cells on the PEDOT electrodes and on the areas coated with Pluronic F108. Schematic representation of cell adhesion on the cells is illustrated underneath. No PC-12 cells were found in the areas coated with Pluronic F108. Scale bars, 100 µm.

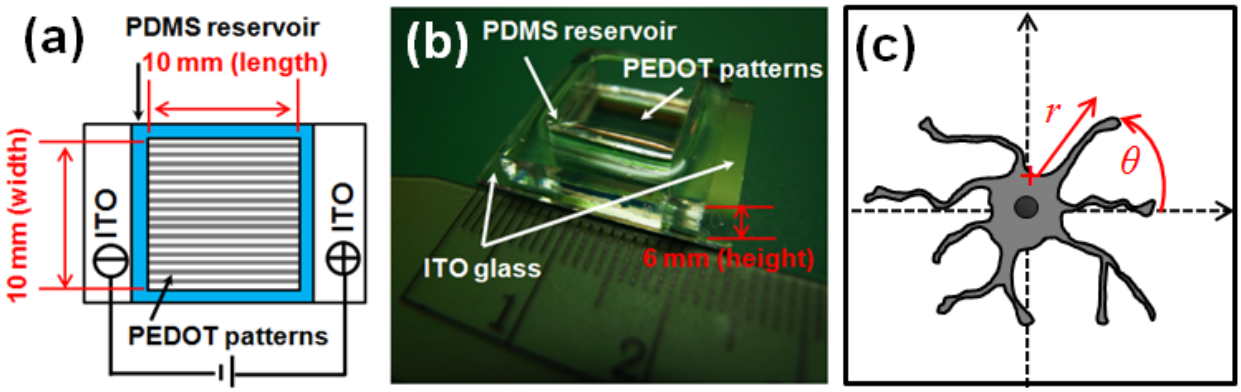

Figure S3. (a–b) Architecture and photograph of the **PEDOT-X** devices (Pluronic F108–modified PEDOT/ITO glass with PDMS reservoir). The dimension of PDMS reservoirs was 10 mm × 10 mm × 6 mm (length × width × height). (c) The neurite length is defined as the straight-line distance from the cell body to the end of the neurite, and orientation of each neurite is defined in terms of the angle between the neurite and the electrode.

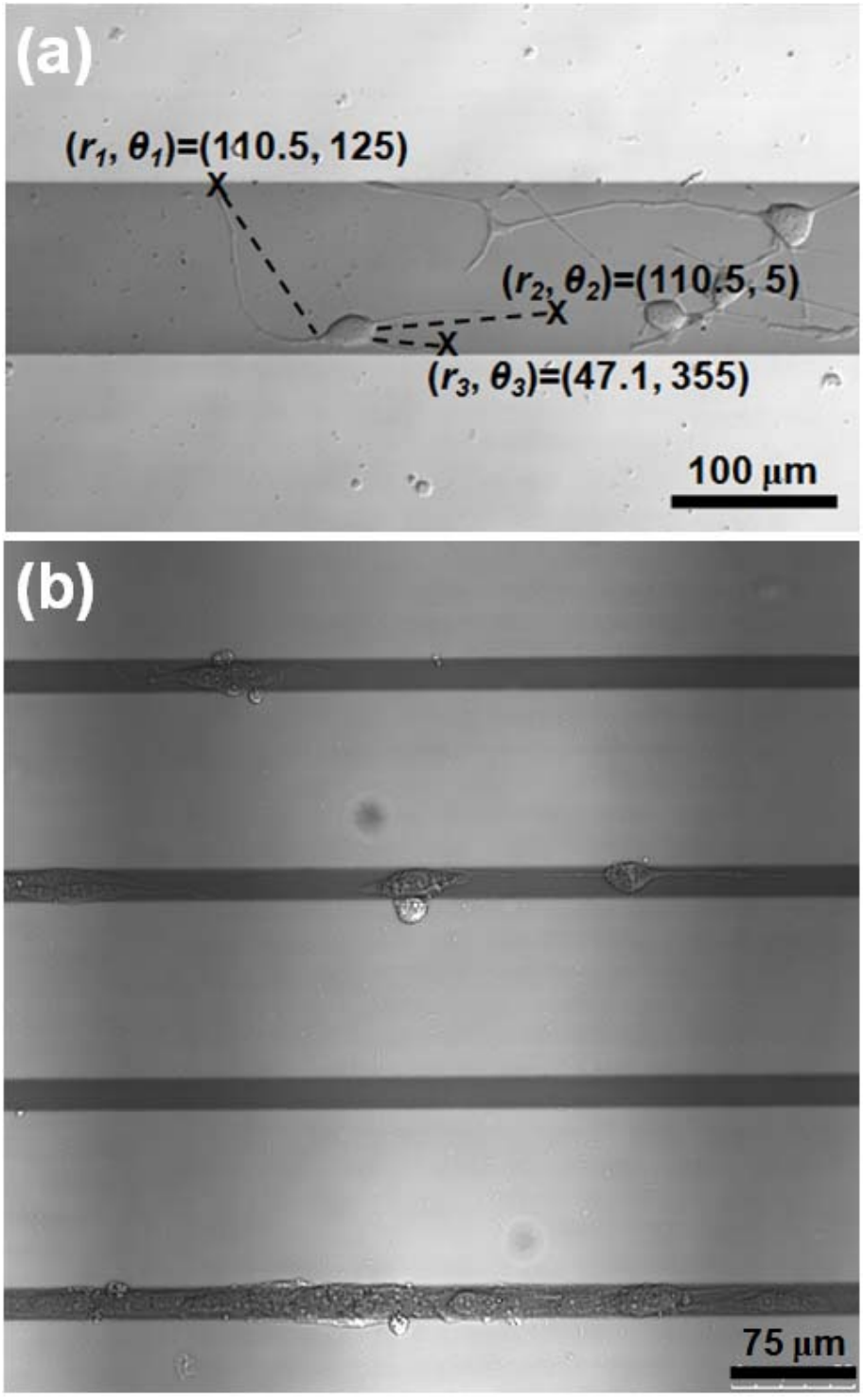

Figure S4. (a) An example of quantitative analysis of the neurite outgrowth and spreading morphologies of the differentiated PC-12 cells on PEDOT-100 patterns from the DIC image. (b) DIC image of PC-12 cells on the PEDOT pattern with 20-µm-wide and 100-µm-spacing (filled with pluronics).

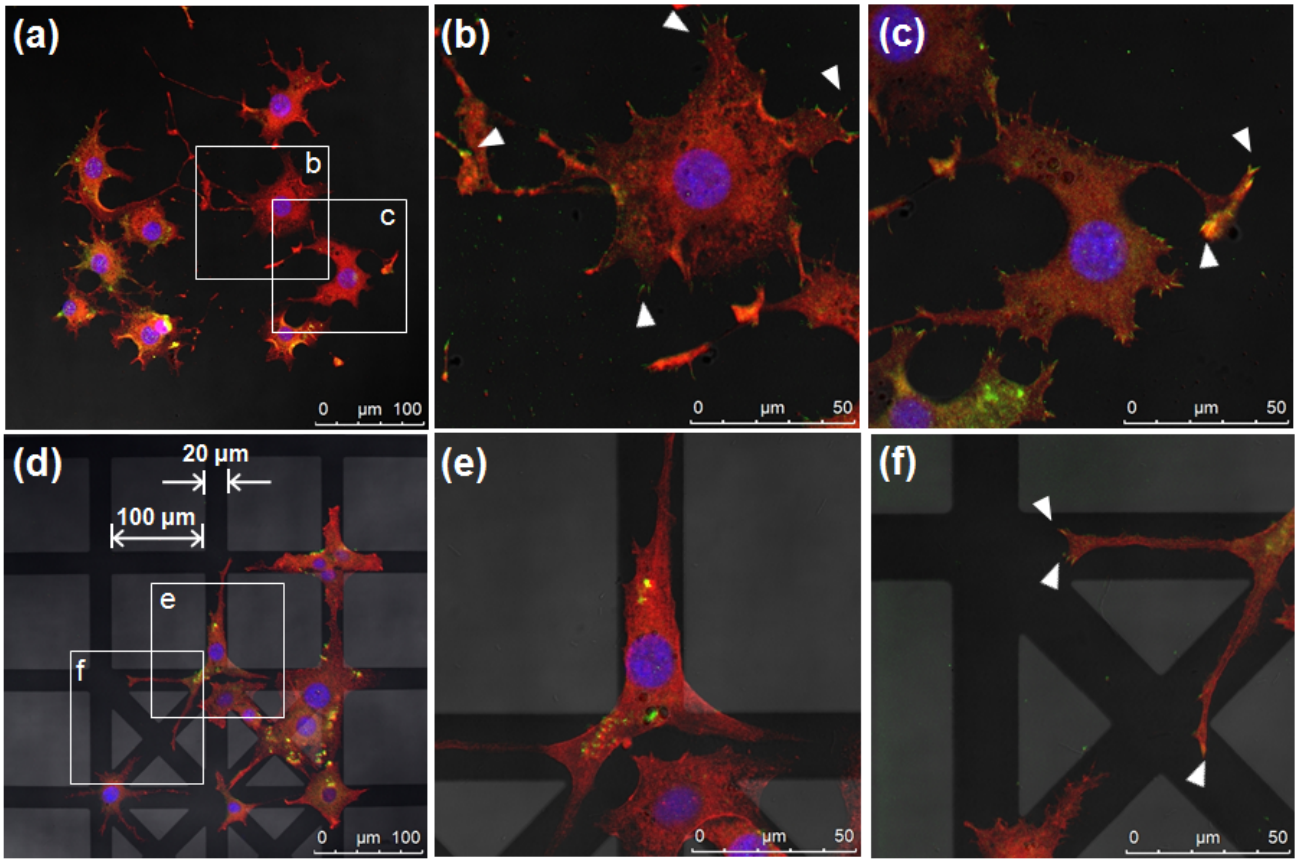

Figure S5. Localization of actin filaments and vinculin of PC-12 cells spreading on the (a-c) PEDOT-Flat, and (d-f) PEDOT network patterns. PC-12 cells were stained for F-actin (red) for cytoskeleton, vinculin (green) as marker for focal adhesions (arrows), and DAPI (blue).

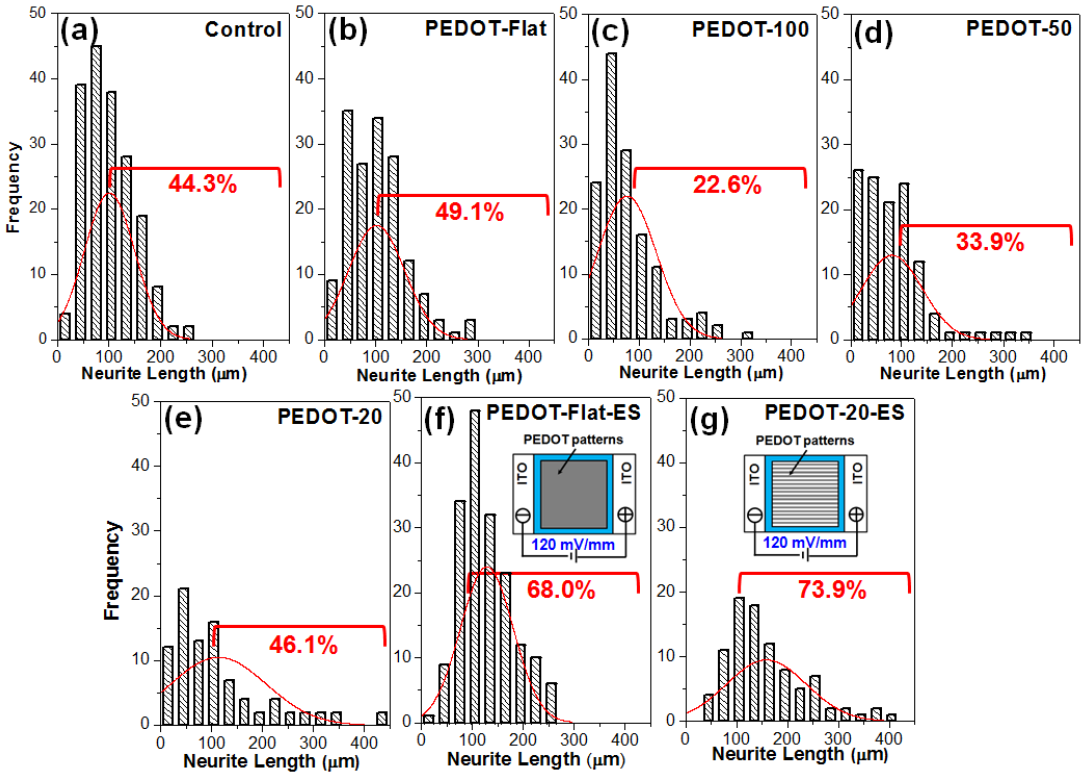

Figure S6. Histograms of neurite lengths on the (a) **Control**, (b) **PEDOT-Flat**, (c) **PEDOT-100**, (d) **PEDOT-50**, (e) **PEDOT-20**, (f) **PEDOT-Flat-ES**, and (g) **PEDOT-20-ES** devices. The percentage of neurites longer than 100 μm is marked in each histogram. Insets to (f) and (g): Device configurations for electrical stimulation experiments.

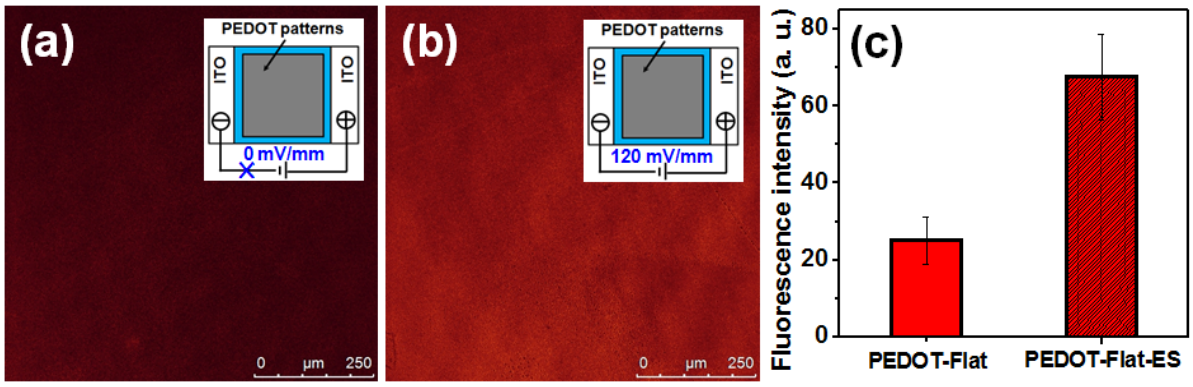

Figure S7. Fluorescence images of PEDOT-Flat devices absorbed with Fn-TMR to the (a) **PEDOT-Flat** (without ES), and (b) **PEDOT-Flat-ES** electrode systems. (c) Quantification of protein adsorption to the devices using Fn-TMR and confocal microscopy.