

Supporting information

Blends of Polymer Semiconductor and Polymer Electrolyte for Mixed Ionic Electronic Conductivity

Hadar Frankenstein¹, Eyal Stein¹, Mikhail Stolov², Maria Koifman¹, Viatcheslav Freger² and Gitti L. Frey^{1,*}

¹Department of Materials Science and Engineering, Technion – Israel Institute of Technology, Haifa 32000, Israel

²The Wolfson Department of Chemical Engineering, Technion – Israel Institute of Technology, Haifa 32000, Israel

*Corresponding author E-mail: gitti@technion.ac.il

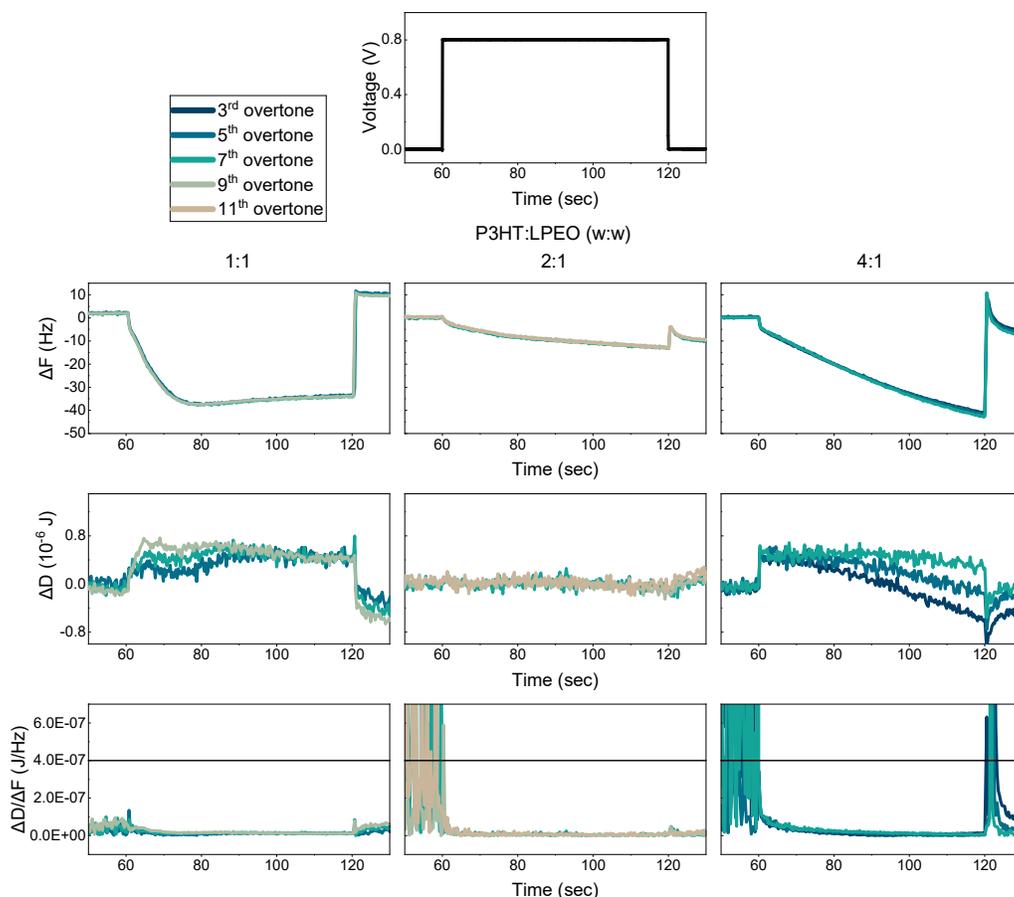


Figure S1: EQCM-D response of P3HT:LPEO (w:w) blends under chronoamperometry (CA) conditions. The applied voltage vs. Ag/AgCl reference electrode as a function of time is shown in the upper part of the figure. The frequency change (Δf) of all overtones overlap (top row). The dissipation change (ΔD) for all overtones does not exceed $1 \cdot 10^{-6} [J]$ (middle row). The dissipation (ΔD) to frequency (Δf) ratio is lower than 4×10^{-7} (bottom row). These values confirm that the films are rigid enough so that the Sauerbrey equation can be applied to convert the change in frequency to the change in mass. For each blend, the three overtones that were used for the calculations are presented.

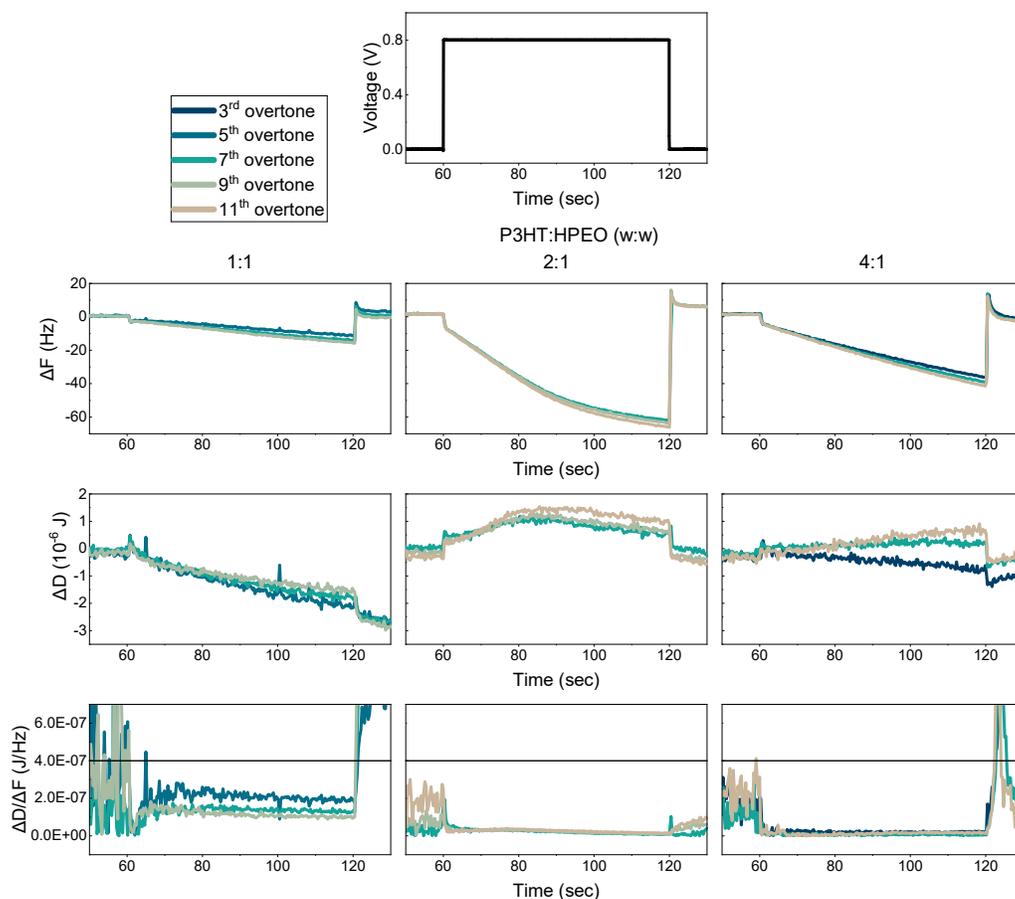


Figure S2: EQCM-D response of P3HT:HPEO (w:w) blends under chronoamperometry (CA) conditions. The applied voltage vs. Ag/AgCl reference electrode as a function of time is shown in the upper part of the figure. The frequency change (Δf) of all overtones overlap (top row). The dissipation change (ΔD) for all overtones does not exceed $3 \cdot 10^{-6}$ [J] (middle row). The dissipation (ΔD) to frequency (Δf) ratio is lower than 4×10^{-7} (bottom row). These values confirm that the films are rigid enough so that the Sauerbrey equation can be applied to convert the change in frequency to change in mass. For each blend, the three overtones that were used for the calculation are presented.

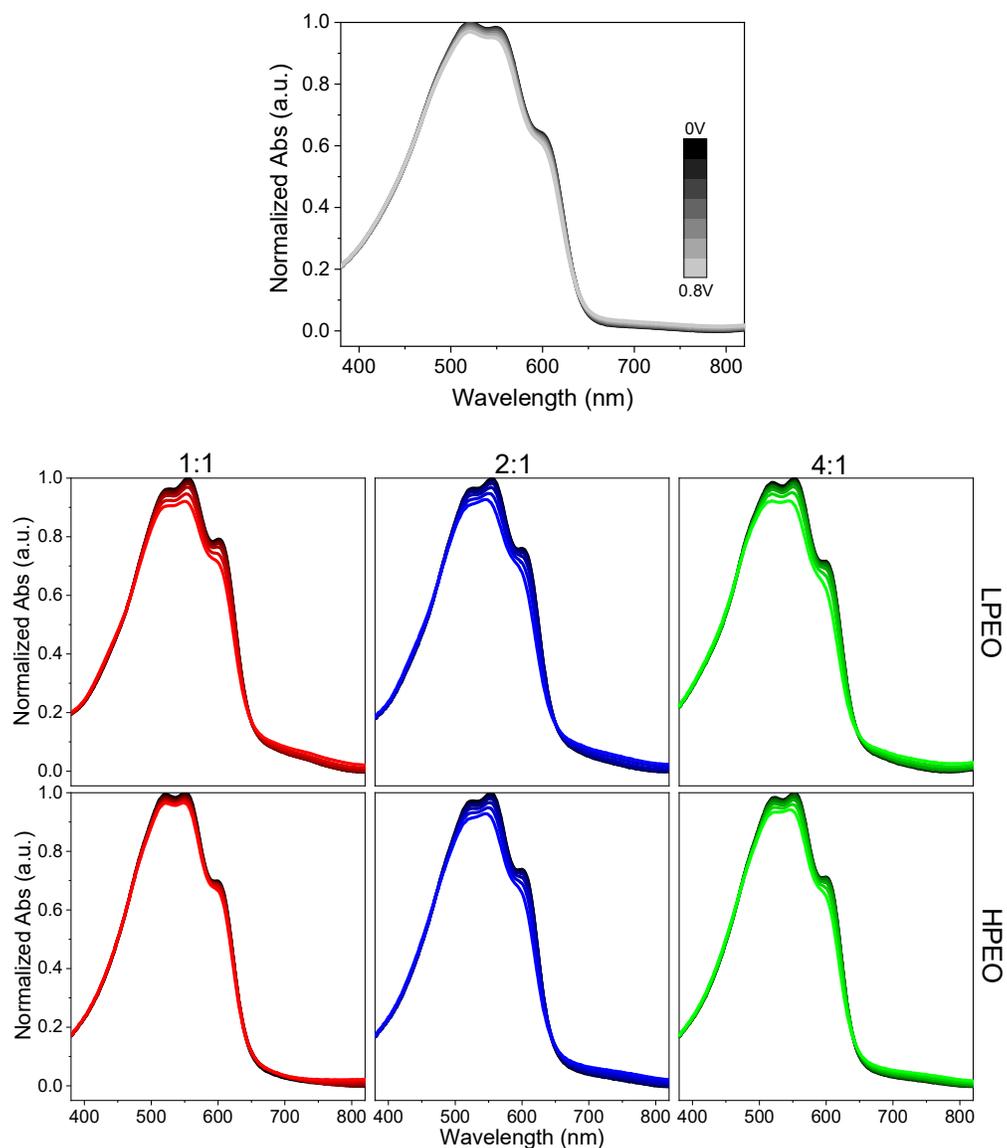


Figure S3: Spectroelectrochemical response of P3HT (top) and blends with LPEO (middle) and HPEO (bottom) and at blend weight ratios of 1:1 (1st column), 2:1 (2nd column), and 4:1 (3rd column). The applied voltages are 0 to 0.8 V vs. Ag/AgCl with 0.1V step. The brighter lines are for higher applied voltages. When applying an increasing positive bias, the main absorption peak of neutral P3HT at ~550nm, assigned to the π - π^* transition, is reduced and a new peak appears and increases at ~750nm, assigned to the P3HT positive polaron.

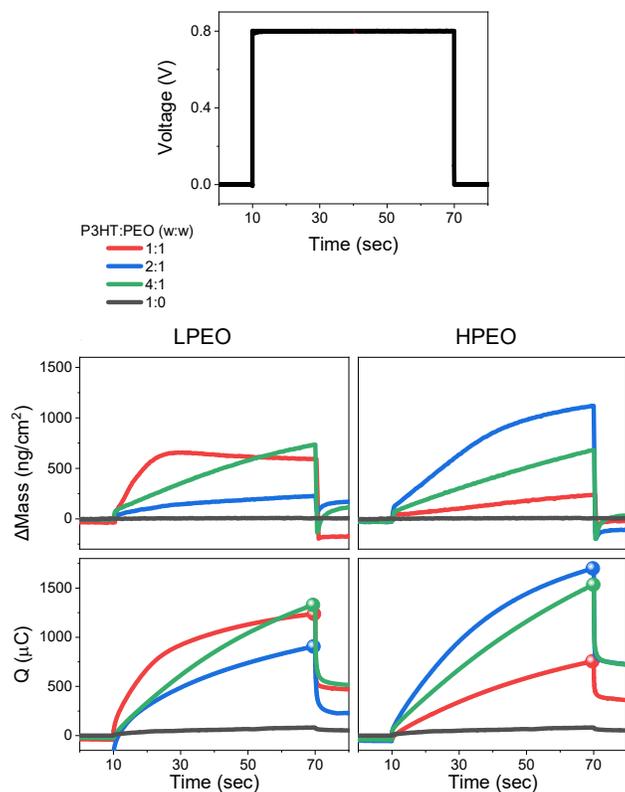


Figure S4: Chronoamperometry (CA) EQCM-D measurements of P3HT:PEO blends under the same conditions used for the SEC measurements, i.e. 0.8V for 1 min. Top row shows the mass uptake and the bottom row shows the accumulated charge. The circles represent the values used to calculate the accumulated charge density presented in Figure 4b in the paper.

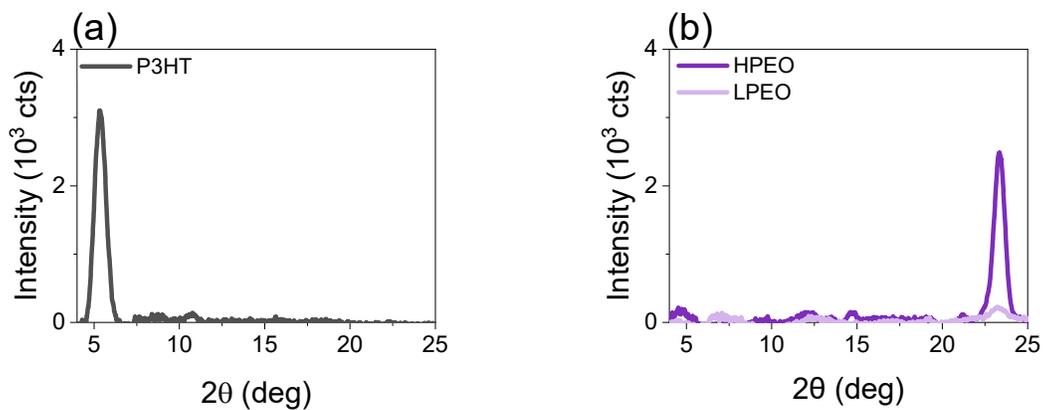


Figure S5: Out-of-plane GIXRD patterns of (a) P3HT and (b) LPEO (light purple) and HPEO (dark purple).

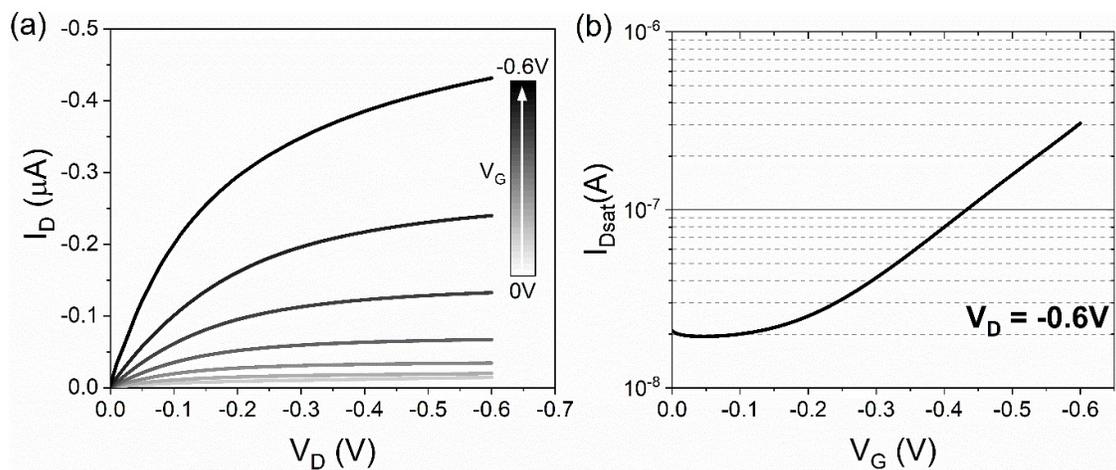


Figure S6: (a) Output and (b) transfer curves of EGOFET based on P3HT.

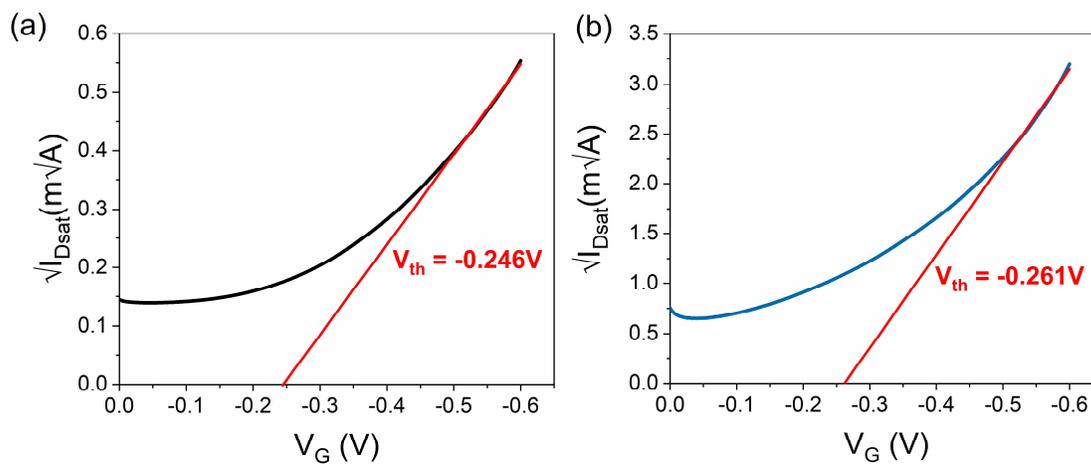


Figure S7: Calculation of the threshold voltage for (a) P3HT and (b) 2:1 P3HT:HPEO devices.