SUPPORTING INFORMATION

Tailoring the microstructure and charge transport in conjugated polymers by alkyl side-chain engineering

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SPACE CHARGE LIMITED DEVICES

Figure S1: Current-Voltage curves of space-charge-limited hole-only devices [structure: ITO/PEDOT:PSS/Polymer/PEDOT:PSS/Al] using different polymer layers and thicknesses (L). We plotted $I \times L$ as a function of $V/L$ to compare the results obtained at constant electric fields. In this way, differences in current due to a field-dependent mobility can be minimized.

Figure S2: Current-Voltage curves (in linear and logarithmic scale), obtained on several $P_a$ based SCLC devices with a constant film thickness. The results illustrate the significant scattering in SCLC data for this particular polymer.
ORGANIC FIELD EFFECT TRANSISTORS

Figure S3: OFET output characteristics measured at room temperature, with a 20µm channel length and 10 mm channel width.
Figure S4: OFET transfer characteristics measured at different temperatures. For each polymer, the threshold voltage was assumed to be independent on temperature, and equal to -6 V for $T_a$, and zero for $T_b$, P_a and P_b, respectively. The solid lines are obtained by adjusting the experimental curves to $I_D = c \cdot (V_g - V_T)^k$, with $V_T$ being the threshold voltage and $c$ a constant. According to Vissenberg’s transistor model, the fitting parameter $k$ is expected to vary with temperature as $k = \frac{E_o}{kT} - 1$.

Figure S5: The fitting parameter $k$, extracted from the solid lines in Figure S4, are plotted as a function of inverse temperature. The solid lines are obtained by fitting the experimental data to

$$k = 2E_o \frac{1}{kT}$$

The corresponding $E_o$ values are given in Table 1 of the main article and are used together with Equation 4 to plot the field-effect mobility as a function of charge carrier density in Figure 4.

GIWAXS

Figure S6: GIWAXS pattern on $P_b$ OFET (a) and SCLC (b) devices