Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Photo-gain optimization in multilayer organic phototransistors by study of space-charge limited current

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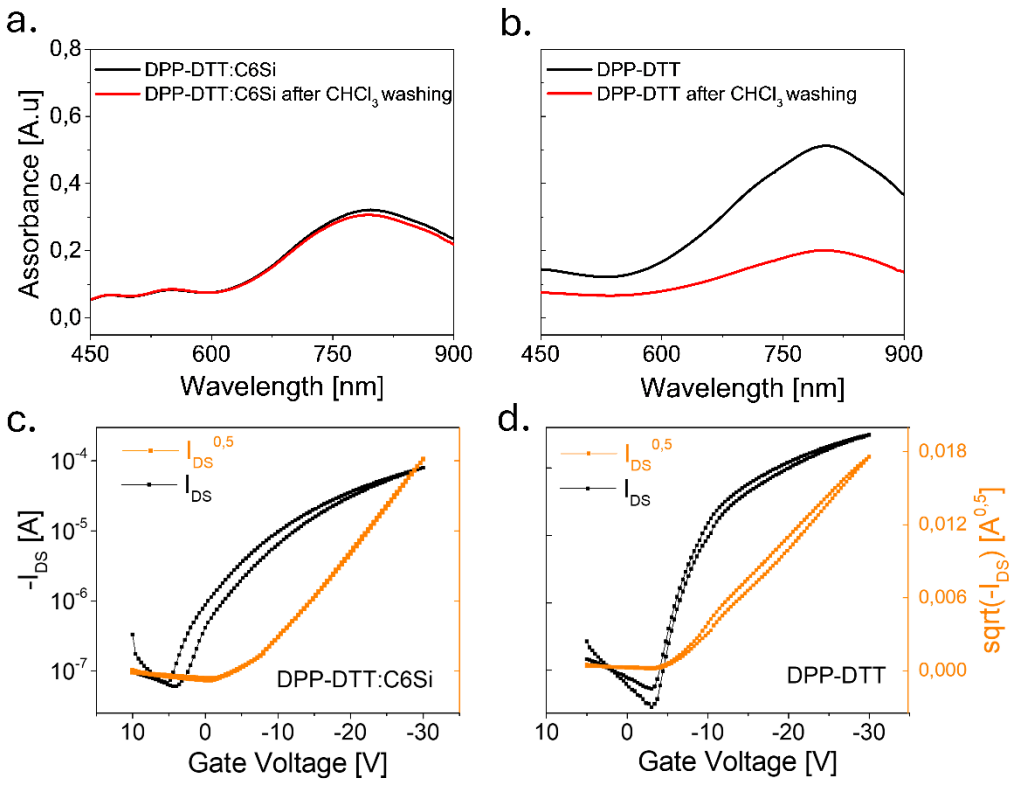

Figure S1. *Cross-linked DPP-DTT:C6Si characterization: (a-b) The absorption spectra of the two different HTL after $CHCl_3$ washing (c-d) Transfer characteristics of transistors with different HTL (V_{DS} = −30 V), including, (c) cross-linked DPP-DTT:C6Si film, (d) pristine DPP-DTT film.*

	μ_p^{FET} [$cm^2/(V\,s)$]	Vth [V]	Id/Ig @Vg=-30V	Ion/Ioff
DPP-DTT	10^{-1}	-4	10^3	10^3
DPP-DTT:C6Si	10^{-2}	-7	10^3	10^3

Table S1: *Performance parameters of the OFETs fabricated with pristine DPP-DTT and DPP-DTT crosslinked by C6Si. Each value has been extrapolated from transfer curve measured in dark conditions.*

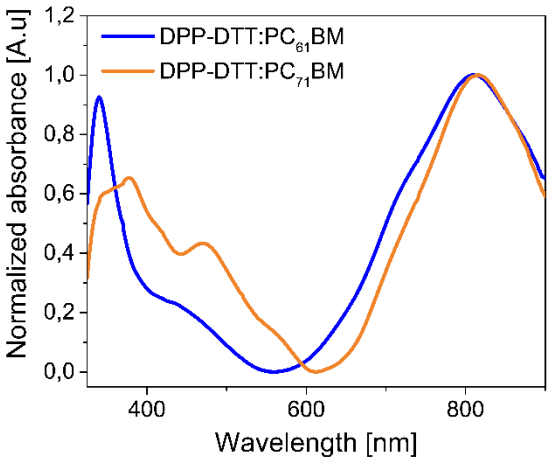

Figure S2. *Normalized absorption spectra of the BHJs.*

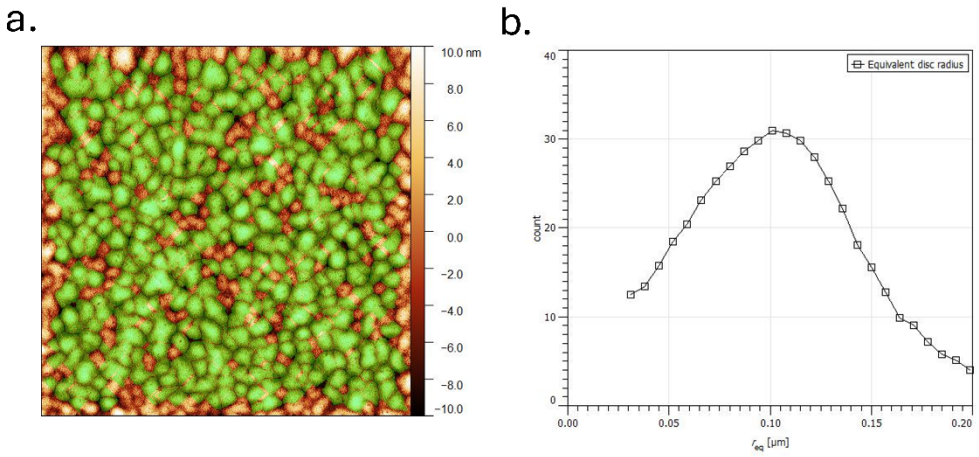

Figure S3. *(Left): Example of granular domain measurement from AFM micrographs for a a DPP-DTT:PC71BM-$CHCl_3$ film. Lateral size is 5x5µm Individual domains were automatically outlined via the Gwyddion segmentation algorithm after a 7px Gaussian Smoothing. (Right): Equivalent disc radius from*

several individual grains is plotted as equivalent disc radius values. The resulting size distribution is monomodal with a mode of ~100nm, corresponding to a mean grain diameter of ~200nm.

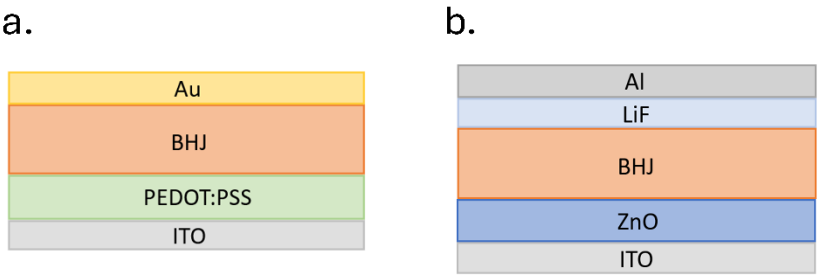

Figure S4: *Schematic device structure of (a) HOD and (b) EOD device structures.*

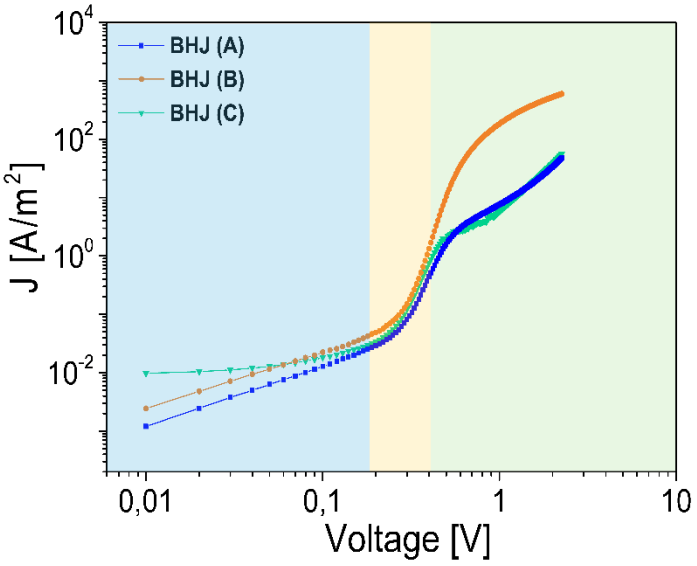

Figure S5: *J-V curves of the hole-only devices with structure ITO/PEDOT:PSS/BHJ/Au in which the three typical charge-transport regions are clearly visible: (i) ohmic region (J α V) highlighted in blue, (ii) trap-SCLC region (J αV^n) region in yellow and (iii) SCLC region (J α V^2) in green.*

BHJ	Annealing	μ^{SCLC}_p [cm²/Vs] @10V	μ^{SCLC}_n [cm²/Vs] @10V
(C)	135°C for 10'	$3,4 \cdot 10^{-5}$	$1,1 \cdot 10^{-6}$
(C)	-	$1,2 \cdot 10^{-5}$	$7,3 \cdot 10^{-5}$

Table S2 *Performance parameters of the HODs and EODs fabricated with the BHJ based on DPP-DTT:$PC_{61}BM$ processed from the $CHCl_3$:ODCB solvent mixtures, with and without annealing post-process on the BHJ. Each value has been extrapolated from measurements on 2 different devices.*

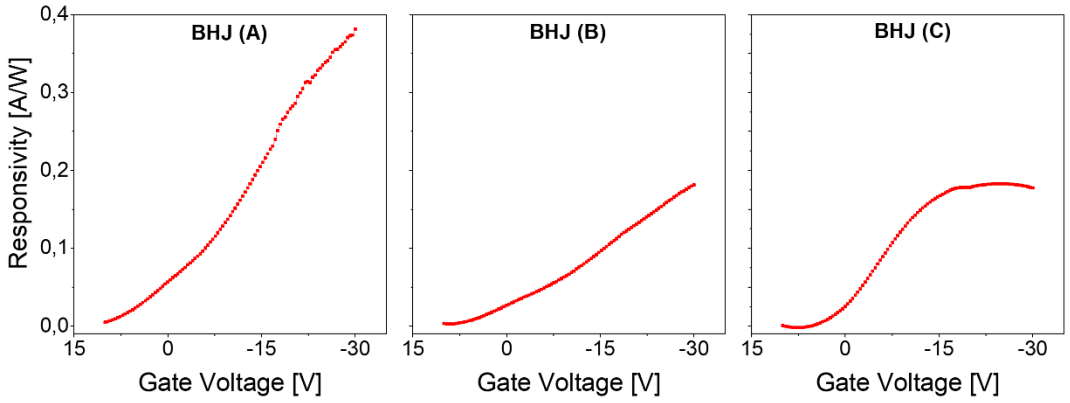

Figure S6. *Light responsivity R as function of the applied gate voltage V_g of multilayer OPTs with BHJ photoactive layer (a)* ***(A)****, (b)* ***(B)*** *and (c)* ***(C)****.*

The data supporting this article have been included as part of the Supplementary Information.

Multiple Output Curve of OPT fabricated with the BHJ based on DPP-DTT:$PC_{61}BM$ processed from the $CHCl_3$

PC60-CF-moc p vd-20.csv

Multiple Output Curve of OPT fabricated with the BHJ based on DPP-DTT:$PC_{71}BM$ processed from the $CHCl_3$

PC70-CF-moc p vd-20.csv