Electronic Supplementary Information:

Photo-induced fluorescence quenching in conjugated polymers dispersed in solid matrices at low concentration

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1. Fluorescence emission spectra of the polymers:

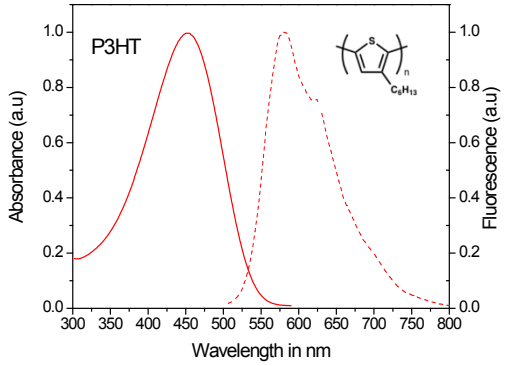

Figure S1: *Normalized absorbance (solid line) and fluorescence (dashed line) spectra P3HT in toluene solution at low concentration.*

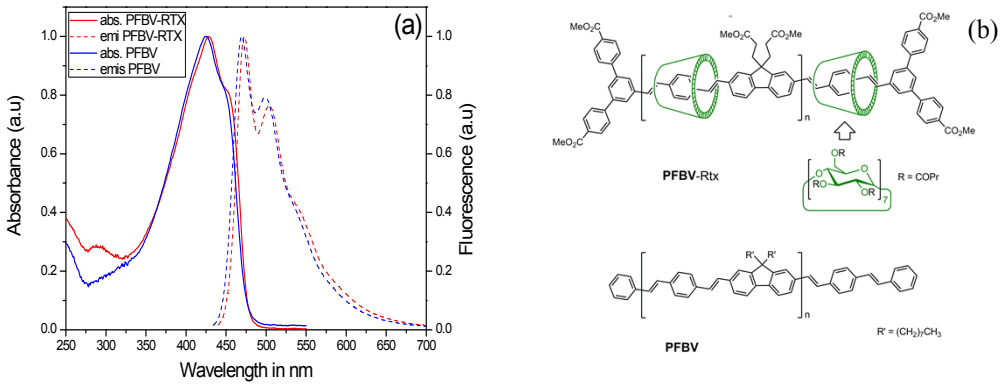

Figure S2: *(a) Normalized absorbance (solid line) and fluorescence (dashed line) spectra and (b) structure of PFBV-RTX and PFBV in toluene solution*

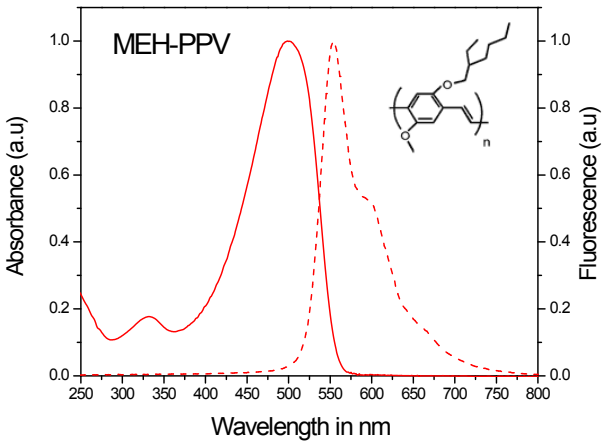

Figure S3: *Normalized absorbance (solid line) and fluorescence (dashed line) spectra of MEH-PPV in toluene solution*

2. Check of the photobleaching during the excitation power scan.

The photobleaching was very small is all experiments. The fluorescence quantum yield recovered almost completely when the excitation power was decreased from high to low power limit (reverse scan, see the figure).

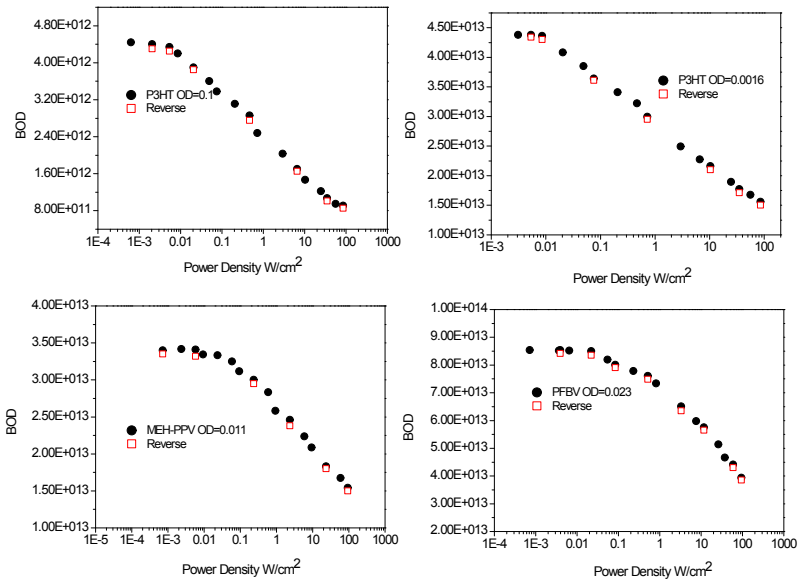

Figure S4: *BOD of different polymers dispersed in PMMA matrix as function of excitation power density (λ_{ex}=458). Black indicates the value of BOD at the time of power increasing and red indicate at the time of decreasing power at the same spot. OD is measured in 1 cm cell. All experiment was done in N_2 environment.*

3. Singlet-Triplet annihilation in continuous media – simple rate model

If we treat S-TA as a simple extra rate of exciton de-activation in infinitely large space (domain size is very large) then we can write the total exciton de-activation rate:[1,2]

$$k = k_1 + \gamma_{ST} n_T \qquad \text{(SI-1)}$$

Where k_1 – exciton decay rate without triplets, n_T – triplet exciton concentration, γ_{ST} – S-T annihilation constant.

For the built up of the triplet concentration with excitation power I we have a simple equation of saturation:

$$n_T = \frac{AI}{1 + BI} \qquad \text{(SI-2)}$$

Then for the fluorescence quantum yield we will get

$$\phi = \frac{k_{radiative}}{k} = \frac{k_{radiative}}{k_1 + \dfrac{AI}{1 + BI}} = \frac{E + BI}{C + DI} \qquad \text{(SI-3)}$$

Where A, B, C, D, E are parameters independent on excitation power.

An example of such curve (E=10, B=1, C=10, D=10) in comparison with experimental data is given in Fig.SI5. One can see that the steepness of the decay given by eq.SI-3 is much larger than that shown by the experimental data. The simple rate model gives steepness in between those given by the domain model[3] in the large and small domain limit.

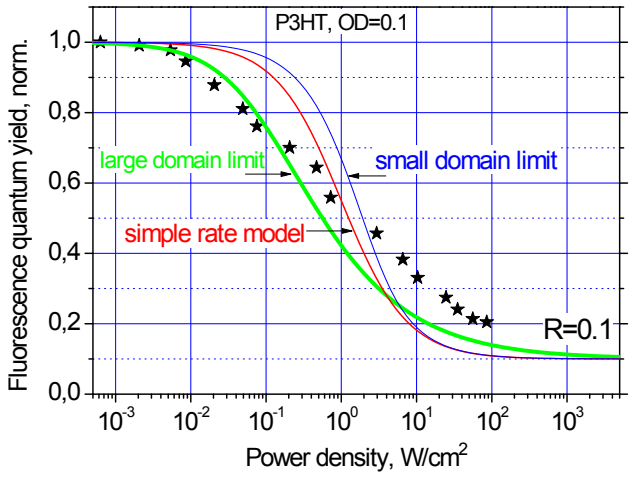

Figure S5: *Comparison of the steepness predicated by different models with the experimental data for aggregated P3HT.*

Reference List

[1] L. Valkunas, V. Liuolia, and A. Freiberg, *Photosynth Res*, 1991, **27**, 83-95.

[2] Y. Zaushitsyn, K.G. Jespersen, L. Valkunas, V. Sundstrom, and A. Yartsev, *Phys. Rev. B*, 2007, **75**, 195201.

[3] G. Paillotin, N.E. Geacintov, and J. Breton, *Biophysical Journal*, 1983, **44**, 65-77.