Supporting Information for

Physical insights into protection effect of conjugated polymers by natural antioxidants†

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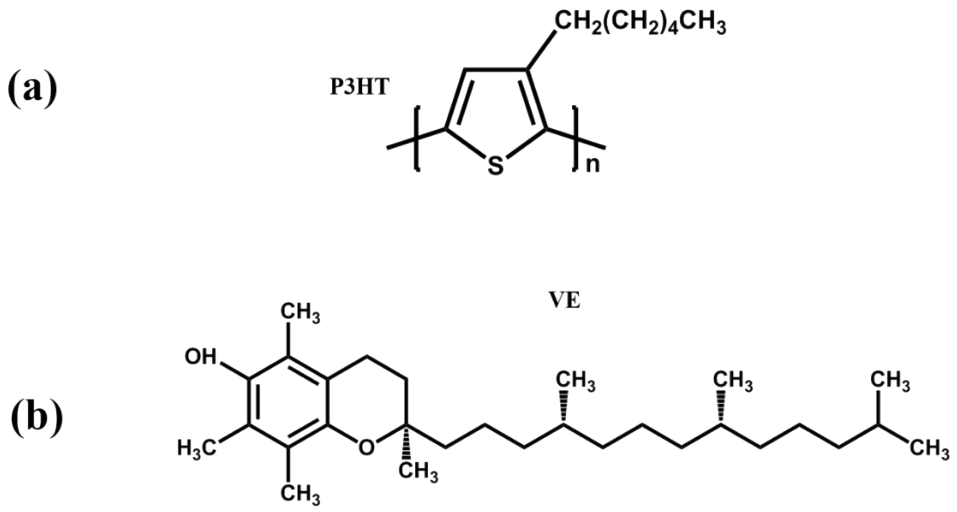

Fig. S1. Chemical structure of (a) P3HT and (b) VE.

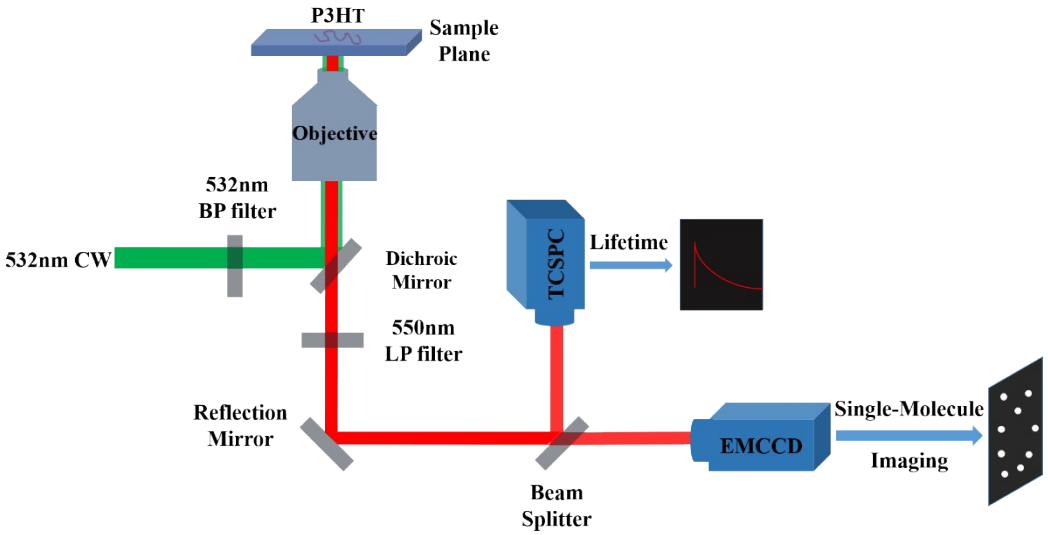

Fig. S2. Experimental setup of a home-built wide-field fluorescence microscope.

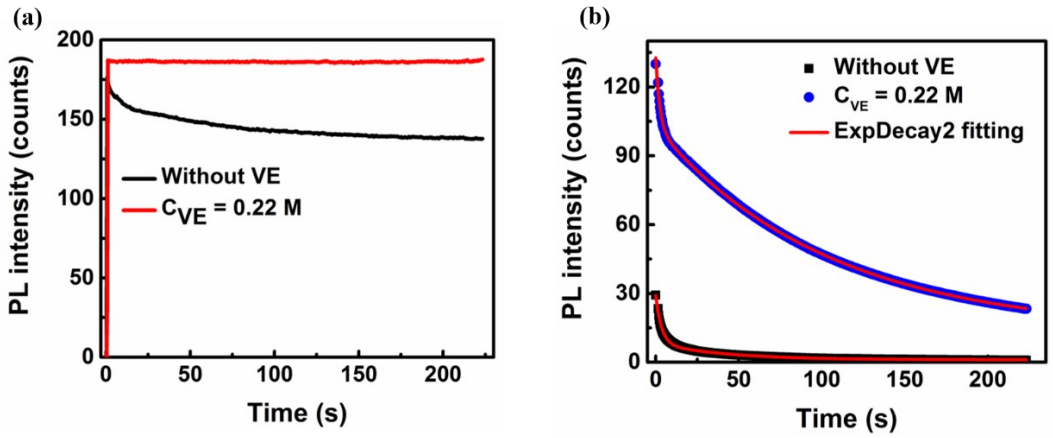

Fig. S3. (a) The raw fluorescence intensity traces of P3HT in solution with and without addition of VE. (b) The raw fluorescence intensity traces of P3HT in solid films with (blue solid circles) and without (black solid square) addition of VE. The red solid lines are the fitting curves of the fluorescence decay using a bi-exponential function. The power density of the excitation light of the 532 nm laser was 3.11 and 4.30 W/cm^2 for P3HT in solutions and in films, respectively. The exposure time was 0.3 s.

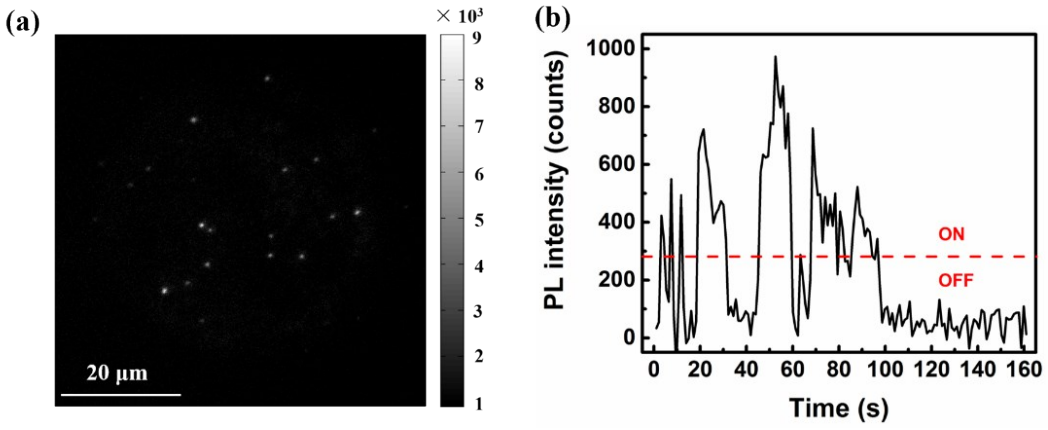

Fig. S4. (a) The typical single-molecule fluorescence image and (b) intensity trace of P3HT with addition of C_{VE} = 0.22 M under continuous light irradiation for 160 s. The 532 nm laser with power density of 7.23 W/cm^2 was used as excitation source and the exposure time was 1 s.

As shown in Fig. S5, we detailedly provided the calculation methods of the on-time duration, off-time duration, total on-time duration and total off-time duration. Fig. S5a was the schematic diagram of single-molecule fluorescence intensity traces with significant blinking of two-state

level. The number labelled on the blinking stages represented on-state or off-state time duration. We can easily count the present frequency of different on/off-time duration in the blinking stages. For example, we obtained 11 times for the on-time duration of 3s by simple counting. Similarly, we calculated different on-time and off-time duration histograms as shown in Fig. S5b and S5c, respectively. In addition, we calculate the staying time of a molecule in the fluorescent state and dark state to investigate the photobleaching property for a molecule under continuous light excitation. As indicated in Fig. S5d, we use the total on-time and total off-time duration to characterize the staying time of a molecule in the fluorescent state and dark state by summing up on-time and off-time duration from single-molecule fluorescence intensity traces in Fig. S5a, respectively.

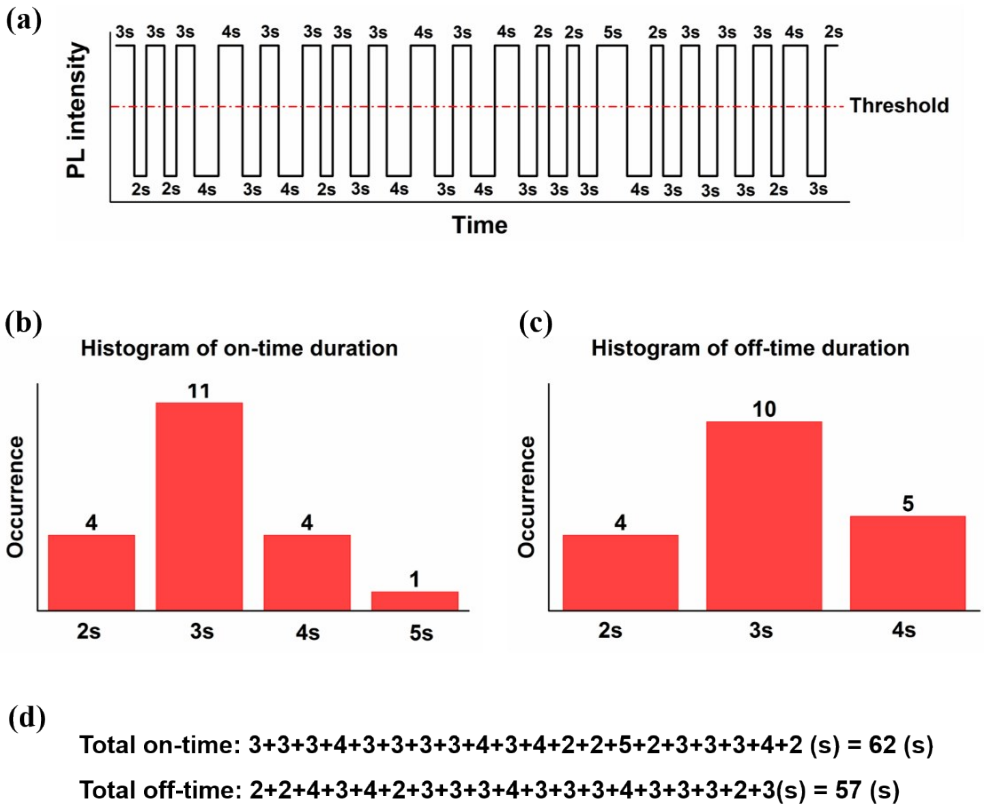

Fig. S5. The schematic illustration for statistic and calculation. (a) The fluorescence intensity traces in individual molecules. (b) On-time duration calculation. (c) Off-time duration calculation. (d) Total on-time and off-time duration calculation.