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Journal of Materials Chemistry A

ARTICLE

Correlating photovoltaic properties of PTB7-Th:$PC_{71}BM$ blend to photophysics and microstructure as a function of thermal annealing

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Supporting Information

Correlating photovoltaic properties of PTB7-Th:$PC_{71}BM$ blend to its photophysics and microstructure as a function of thermal annealing

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Electronic Supplementary Information (ESI) available: [details of any supplementary information available should be included here]. See DOI: 10.1039/x0xx00000x

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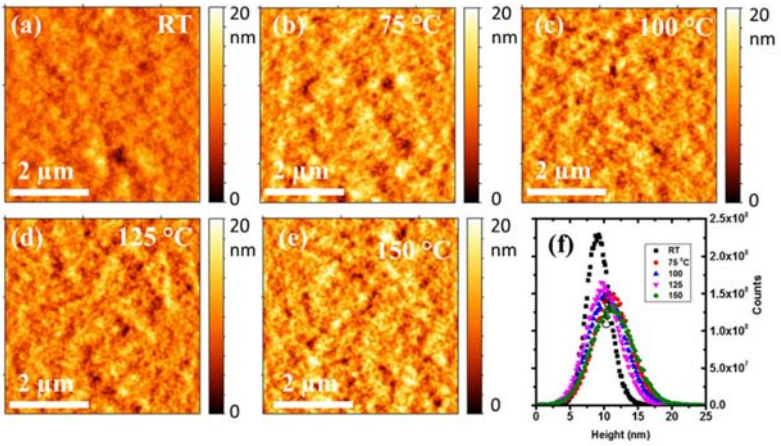

Figure S1. Atomic force microscopy height images of PTB7-Th:$PC_{71}BM$ blends as a function of thermal annealing. Thermal annealing temperatures are given in inset.

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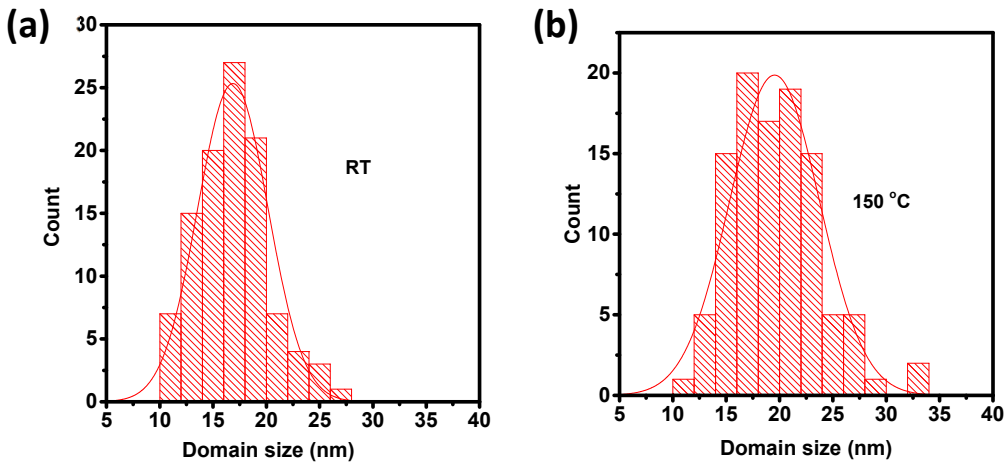

Figure S2: Histogram of domain size distribution of PTB7-Th:$CP_{71}BM$ blend films estimated from AFM height images corresponding to two processing temperatures of (a) RT and (b) 150 °C

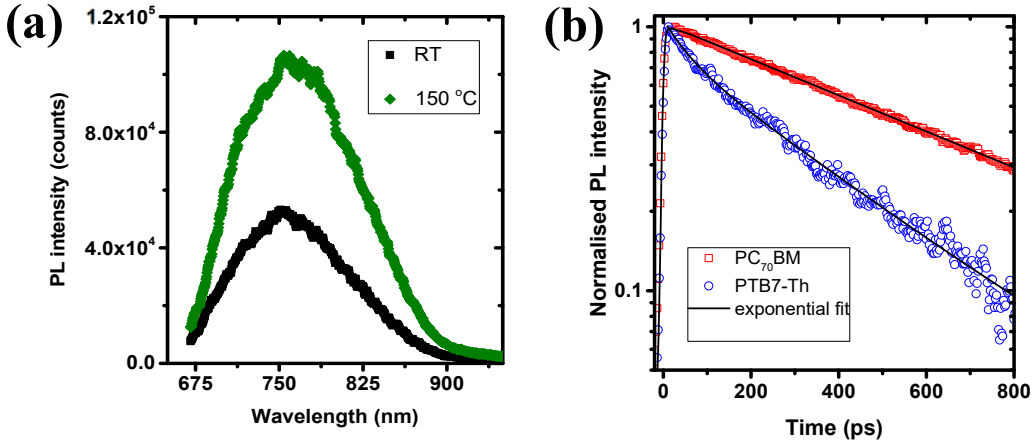

Figure S3. (a) PL intensity comparison of the RT and 150 ˚C thermally annealed PTB7-Th:$PC_{71}BM$ blend films (b) Time-resolved PL decays of neat PTB7-Th (Blue dots) and PC_{71} BM measured using excitation wavelength of 515 nm.

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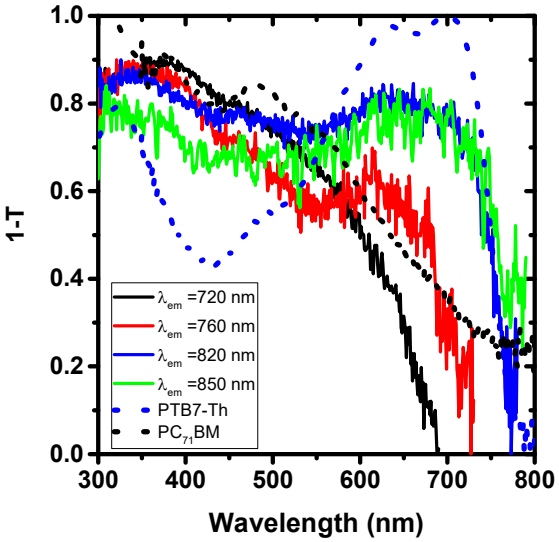

Figure S4: Absorption spectra of PTB7-Th:$PC_{71}BM$ blends measured at different emission wavelengths. The dotted lines shows the absorption spectra of the neat donor and acceptor films.

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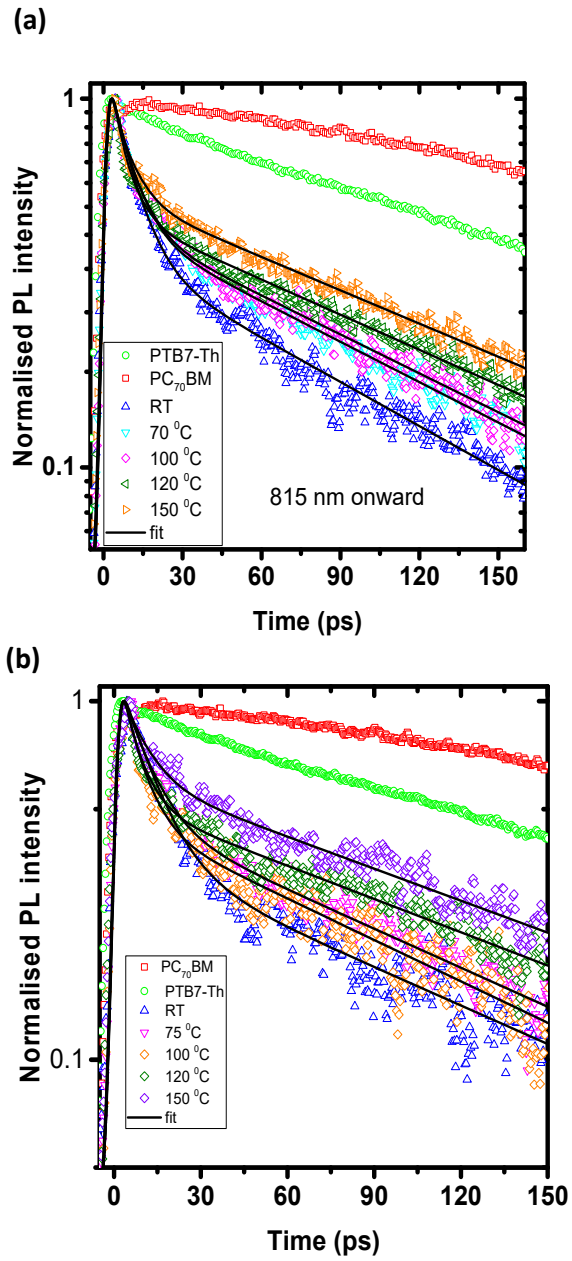

Figure S5. Fitted PL decay curves for the PTB7:$PC_{71}BM$ blends as a function of thermal annealing temperature (a) from 815 nm onwards and (b) 850 nm onwards.

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Table S1: PL quenching efficiency of the PTB7-Th:$PC_{71}BM$ blend films annealed at different temperatures.

Thermal annealing temperature (°C)	$Ø_q$ (720nm) (%)	$Ø_q$ (820nm) (%)
RT	71.7±0.7	62.2±0.8
70	69.9±0.5	54.0±0.5
100	68.4±0.6	52.6±0.6
120	65.7±0.8	49.0±1.0
150	61.4±1.1	41.6±1.3

Table S2: Domain size of $PC_{71}BM$ and the exciton decay life times of PTB7-Th:$PC_{71}BM$ blend films at different emission wavelengths as a function of thermal annealing.

T (°C)	1/e τ (ps) λ_{em} (670-720 nm)	1/e τ (ps) λ_{em} (815-900nm)	1/e τ (ps) λ_{em} (850-900 nm)	Domain size of PC_{71} BM (nm)
RT	15.9±1.0	21.3±2.8	28.6±1.9	9.1 ± 0.4
70	19.9±1.6	30.1±1.5	29.1±2.1	10.2 ± 0.7
100	22±2	31.6±1.5	33.6±2.2	10.8 ± 0.8
120	23±1.5	37.3±1.9	43.0±2.0	12.3 ± 1.1
150	38±2	57.4±2.4	64.3±2.8	13.4 ± 0.6

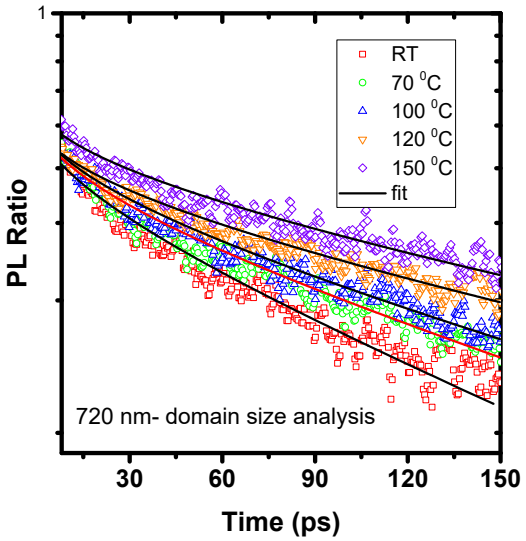

Figure S6: PL ratio of $PC_{71}BM$ in blend to pristine $PC_{71}BM$. Black lines are best fit achieved using model described in the main paper with diffusion coefficient of $1.6\times10^{-4}cm^2/s$.

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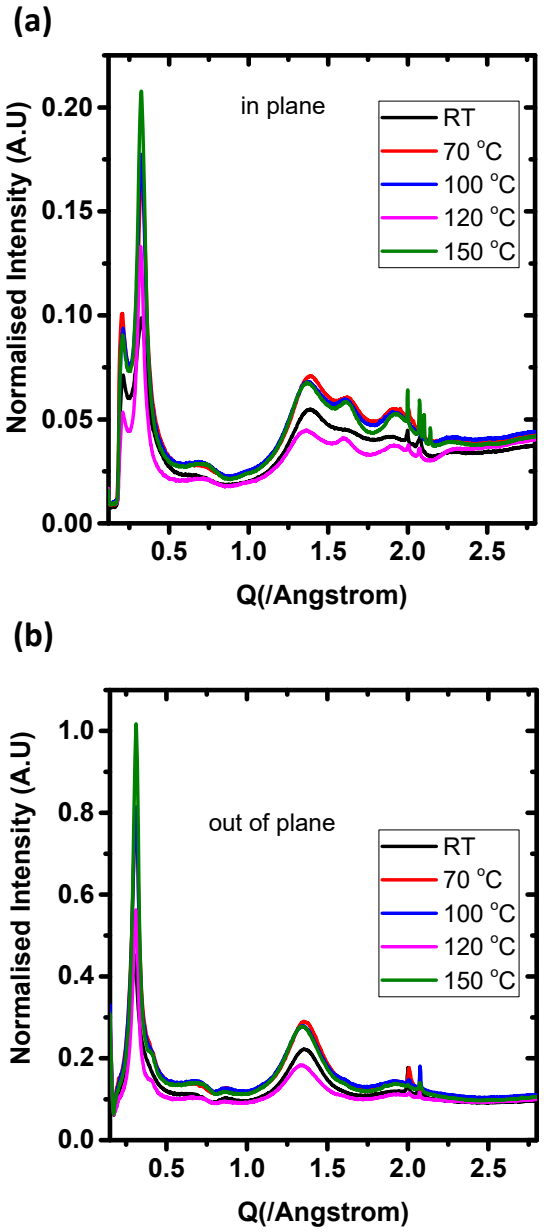

Figure S7. Normalised 1D diffraction data of PTB7-Th:$PC_{71}BM$ blends as a function of different thermal annealing temperatures for (a) in plane (b) out of plane directions.

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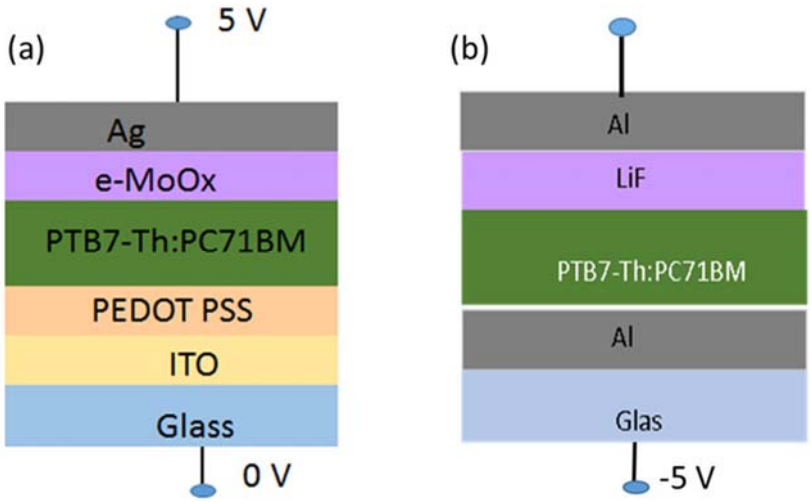

Figure S8: Device architectures used for (a) hole mobility and (b) electron mobility measurements