

Supporting Information

Ternary organic solar cells with a phase-modulated surface distribution
via the addition of a small molecular luminescent dye to obtain a high
efficiency over 10.5%

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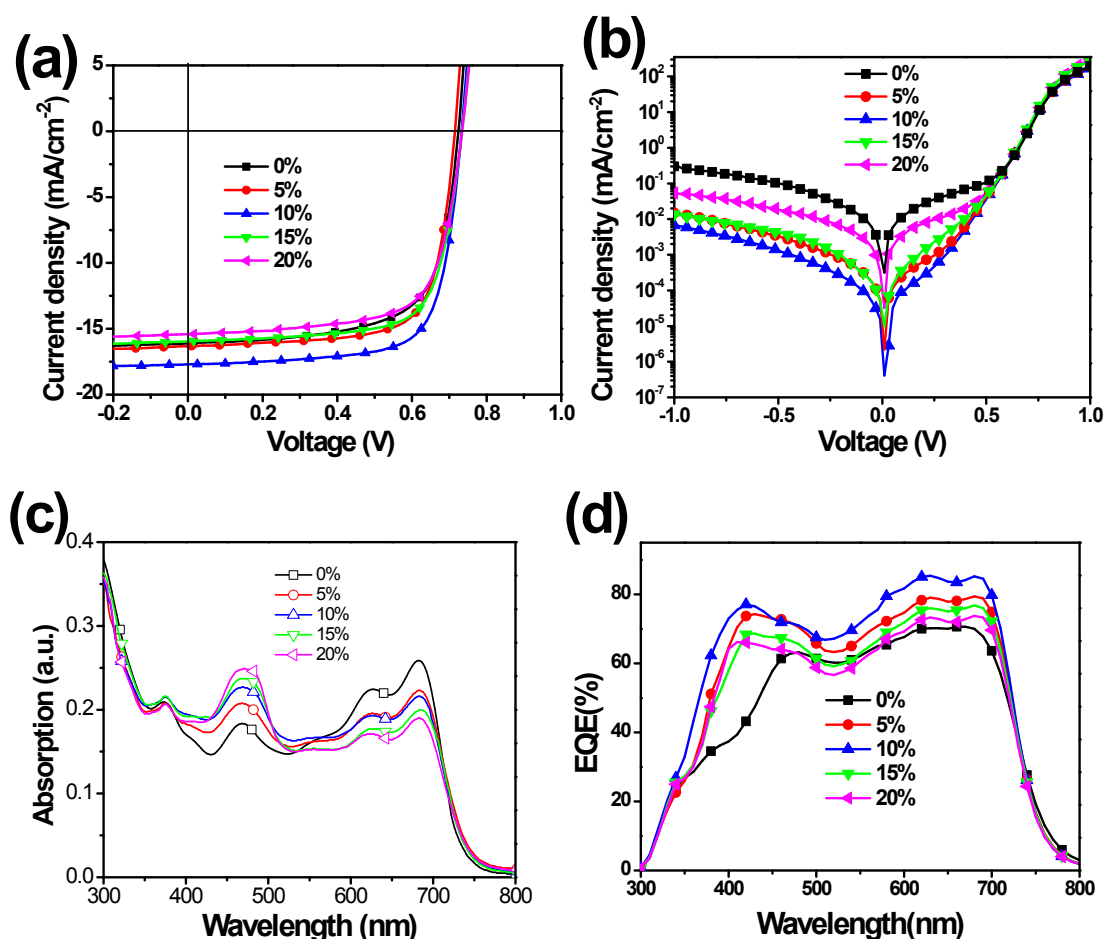


Figure S1. (a) Current-voltage (J-V) characteristics; (b) Dark J-V curves; (c) Absorption spectra and (d) EQE spectra of PTB7/C5/PC₇₁BM blends with different doping amounts of C5.

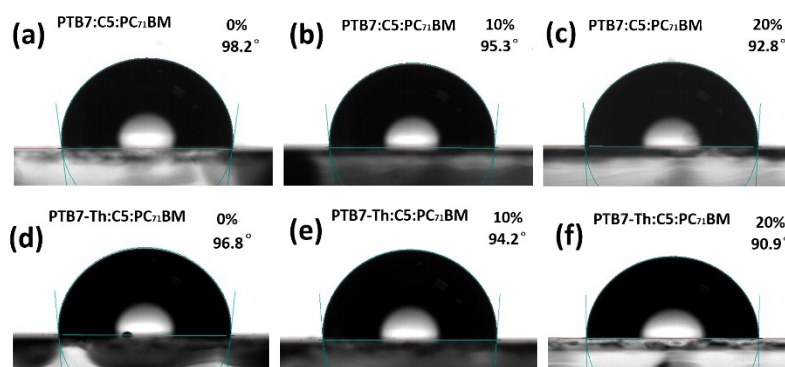


Figure S2. Photographs of water contact angle (WCA) on the ITO substrate surfaces coated with “binary” and “ternary” active layer blend films. (a) PTB7/ PC₇₁BM = 1:1.5; (b) PTB7/C5/ PC₇₁BM = 0.9:0.1:1.5; (c) PTB7/C5/ PC₇₁BM = 0.8:0.2:1.5; (d) PTB7-Th/C5/ PC₇₁BM = 0.9:0.1:1.5; (e) PTB7-Th/C5/ PC₇₁BM = 0.8:0.2:1.5; (f) PTB7-Th/C5/ PC₇₁BM = 0.8:0.2:1.5.

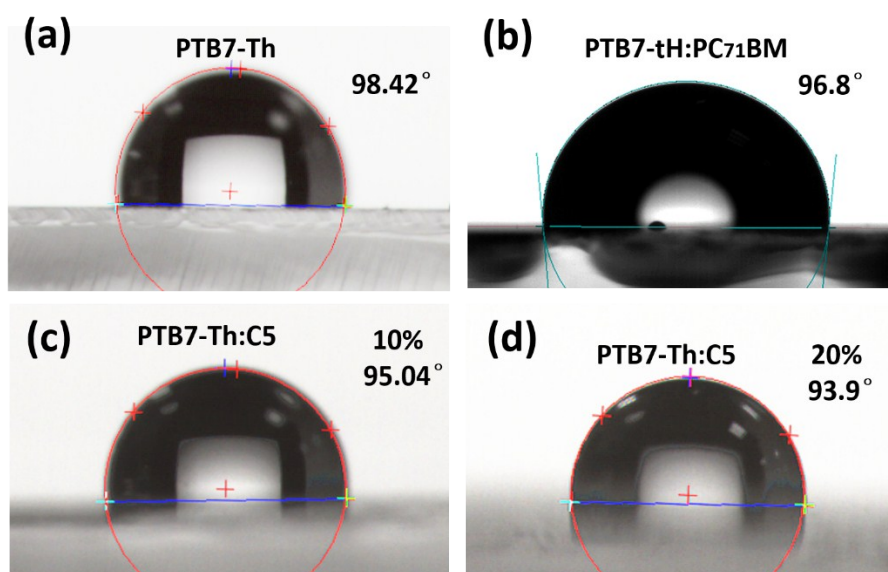


Figure S3. WCA images of (a) pure PTB7-Th film; (b) PTB7-Th:PC₇₁BM blend film; The binary blend films of (c) PTB7/C5 = 0.9:0.1 and (d) PTB7/C5 = 0.8:0.2.

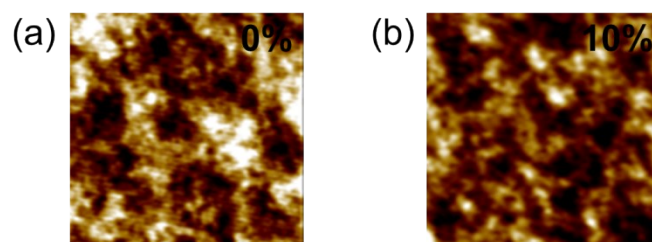


Figure S4. The enlarged parts of the AFM images, (a) is the control film without any additive; (b) is 10% C545T doped ternary film.

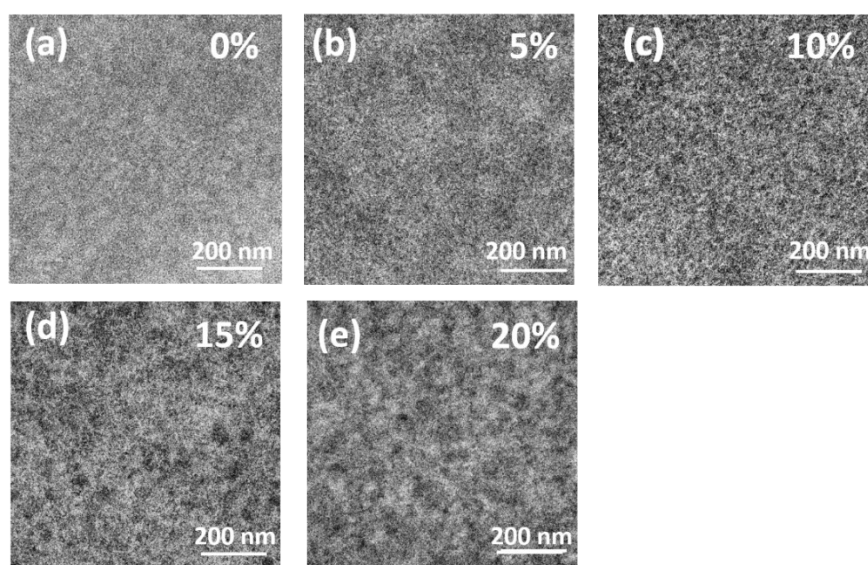


Figure S5. Transmission electron microscopy (TEM) images for the active-layer films with different amounts of C5. (a) PTB7/ PC₇₁BM = 1:1.5; (b) PTB7/C5/ PC₇₁BM = 0.95:0.05:1.5; (c) PTB7/C5/ PC₇₁BM = 0.9:0.1:1.5; (d) PTB7/C5/ PC₇₁BM = 0.85:0.15:1.5; (e) PTB7/C5/ PC₇₁BM = 0.8:0.2:1.5.

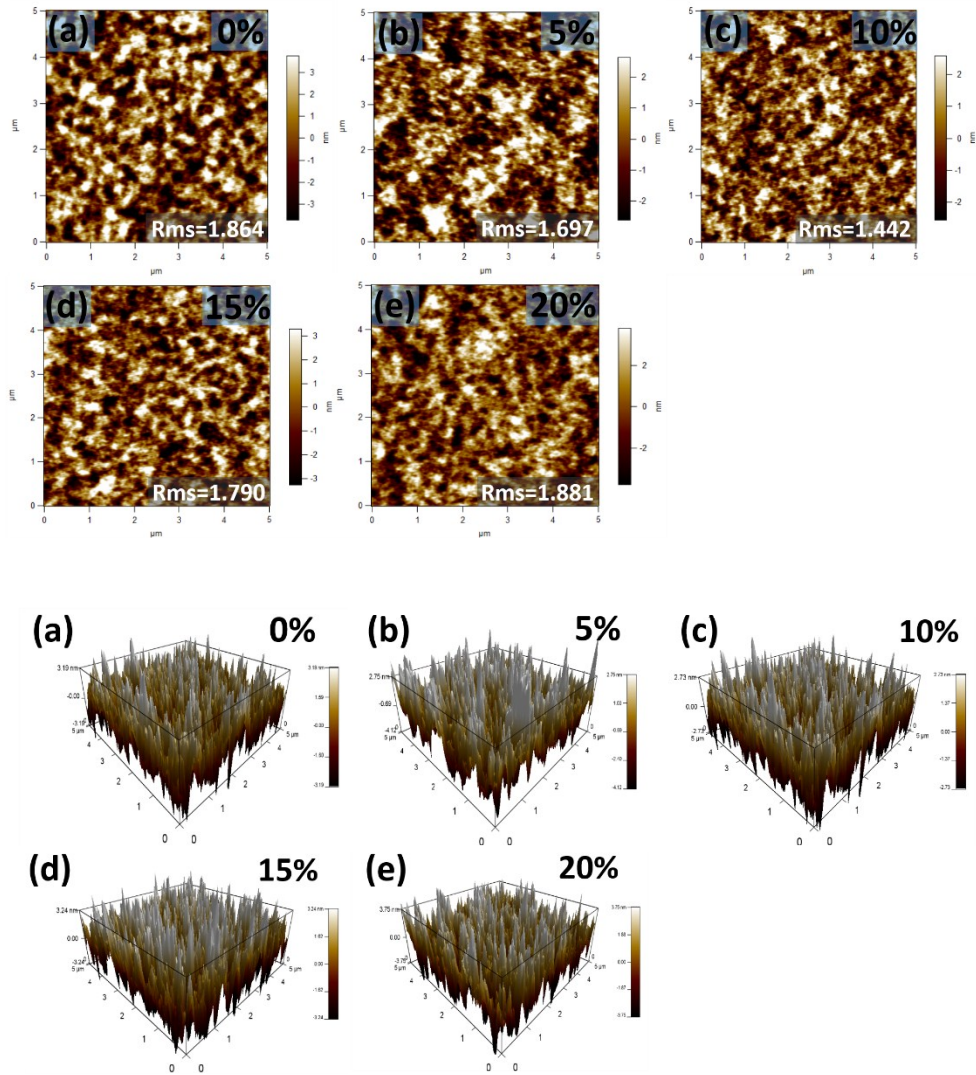


Figure S6. 2D and 3D atomic force microscope (AFM) images for the binary and ternary-blended films (5×5 μm). (a) PTB7: PC₇₁BM = 1:1.5; (b) PTB7/C5/PC₇₁BM = 0.95:0.05:1.5; (c) PTB7/C5/ PC₇₁BM = 0.9:0.1:1.5; (d) PTB7/C5/ PC₇₁BM = 0.85:0.15:1.5; (e) PTB7/C5/ PC₇₁BM = 0.8:0.2:1.5.

Table S1. Summary for the contact angle of two liquids and surface energy for different active layer materials.

Materials	Contact angle		Surfaces energy
	Water	Ethanol	
C5	72.15°	48.50°	34.96 mN/m
PC ₇₁ BM	84.45°	56.98°	32.78 mN/m
PTB7	100.47°	80.78°	17.5 mN/m
PTB7-Th	98.42°	82.43°	15.57 mN/m