Supporting Information

2D/1A Strategy to Regulate Film Morphology for Efficient and Stable Nonfullerene Organic Solar Cells

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Figure S1. Optical absorption of binary and ternary blend films. Symbols: $D_1 = PTB7-Th$, $D_2 = PffBT4T-2OD$ and A = ITIC.



Figure S2. Optical absorption spectra of PTB7–Th, PffBT4T–2OD and ITIC neat films.



Figure S3. Photoluminescence spectra of binary and ternary blend films in comparison to neat films. Symbols: $D_1 = PTB7-Th$, $D_2 = PffBT4T-2OD$ and A = ITIC.



Figure S4. GIWAXS patterns of binary and ternary blend films. Symbols: $D_1 = PTB7-Th$, $D_2 = PffBT4T-2OD$ and A = ITIC.



Figure S5. GIWAXS line-cut profiles of binary and ternary blend films. Note that $D_1 = PTB7-Th$, $D_2 = PffBT4T-2OD$ and A = ITIC.



Figure S6. GIWAXS patterns of PTB7–Th, PffBT4T–2OD and ITIC neat films.



Figure S7. TEM images of binary and ternary blend thin films. Symbols: $D_1 = PTB7-Th$, $D_2 = PffBT4T-2OD$ and A = ITIC.



Figure S8. *J*–*V* characteristics of binary and ternary blend OSCs. Symbols: $D_1 = PTB7-Th$, $D_2 = PffBT4T-2OD$ and A = ITIC.



Figure S9. EQE curves of binary and ternary blend OSCs. Symbols: $D_1 = PTB7-Th$, $D_2 = PffBT4T-2OD$ and A = ITIC.



Figure S10. J-V curves of ternary PTB7–Th:PffBT4T–2OD (80:20, w/w):ITIC blend based OSCs in N₂ and air atmosphere, respectively.



Figure S11. Dark CELIV *j*-*t* profiles of binary and ternary blend OSCs. Symbols: $D_1 = PTB7-Th$, $D_2 = PffBT4T-2OD$ and A = ITIC.



Figure S12. Light intensity dependence on J_{SC} of binary and ternary blend OSCs. Symbols: **D**₁ = PTB7–Th, **D**₂ = PffBT4T–2OD and **A** = ITIC.

Table S1. Summary of photovoltaic parameters of PTB7–Th:PffBT4T–2OD:ITIC ternary devices under simulated light irradiation of 100 mW $\rm cm^{-2}$

D ₁ : D ₂ : A ^{a)}	$J_{\rm SC}$	V _{oc}	FF	PCE	Best PCE
(w/w/w)	(mA/cm^2)	(V)	(%)	(%)	(%)
1:0:1.5	15.06 ± 0.13	0.82 ± 0.01	51.21 ± 0.78	6.35 ± 0.13	6.48
0.9:0.1:1.5	15.62 ± 0.21	0.83 ± 0.01	56.90 ± 0.67	7.37 ± 0.19	7.56
0.8:0.2:1.5	15.36 ± 0.16	0.84 ± 0.01	62.62 ± 0.60	8.05 ± 0.17	8.22
0.7:0.3:1.5	11.77 ± 0.15	0.85 ± 0.01	56.48 ± 0.63	5.66 ± 0.16	5.82
0.6:0.4:1.5	10.76 ± 0.09	0.86 ± 0.01	55.59 ± 0.83	5.12 ± 0.13	5.25
0:1:1.5	8.91 ± 0.10	0.88 ± 0.01	56.25 ± 0.53	4.42 ± 0.09	4.51