

**Increase the nucleation and growth barrier of non-fullerene acceptor to achieve
bicontinuous pathways in semitransparent ternary polymer solar cells**

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Average visible light transmittance calculation

The average visible light transmittance (AVT) is calculated according to the equation:

$$AVT = \frac{\int T(\lambda) \times V(\lambda) \times AM1.5G(\lambda) d(\lambda)}{\int V(\lambda) \times AM1.5G(\lambda) d(\lambda)}$$

Where $T(\lambda)$ is the transmission spectrum, $V(\lambda)$ is the photopic response of human eye, $AM1.5G(\lambda)$ is the photon flux.

Additional experimental results

Table S1 The hole and electron mobility of the binary and optimized ternary polymer solar cells. The data were obtained from 10 devices.

NCBDT-4Cl content (wt%)	μ_h ($10^{-4} \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$)	μ_e ($10^{-4} \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$)	μ_h/μ_e
0	4.66	2.41	1.93
20	5.11	4.19	1.22
100	1.16	0.91	1.27

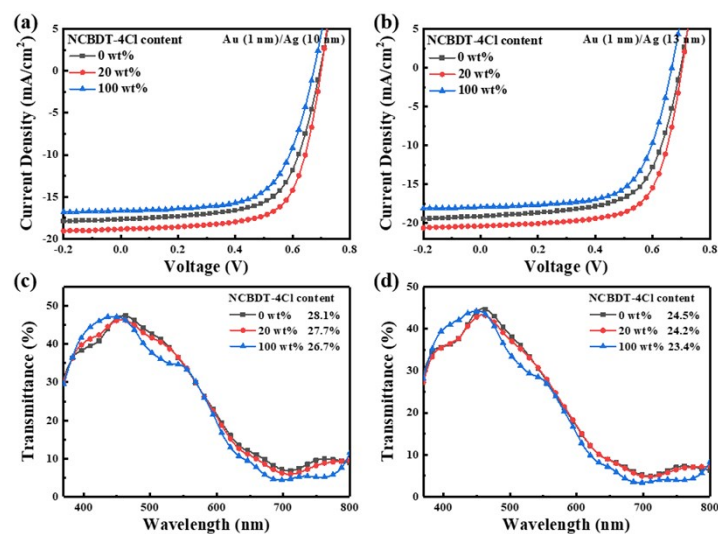


Fig. S1 The J - V curves and AVT of the binary and optimized ternary ST-PSCs with different Ag thickness. (a, c) 10 nm; (b, d) 13 nm.

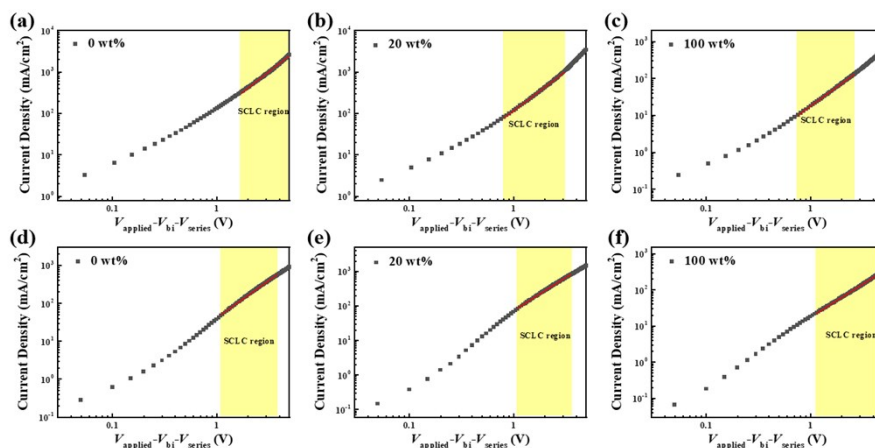


Fig. S2 SCLC J - V characteristics in dark for (a-c) hole-only devices and (d-f) electron-only devices with varied NCBDT-4Cl content.

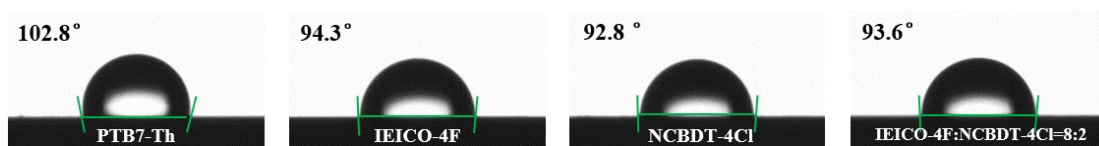


Fig. S3 WCAs of pristine PTB7-Th, IEICO-4F, NCBDT-4Cl films, and the IEICO-4F:NCBDT-4Cl blend film.

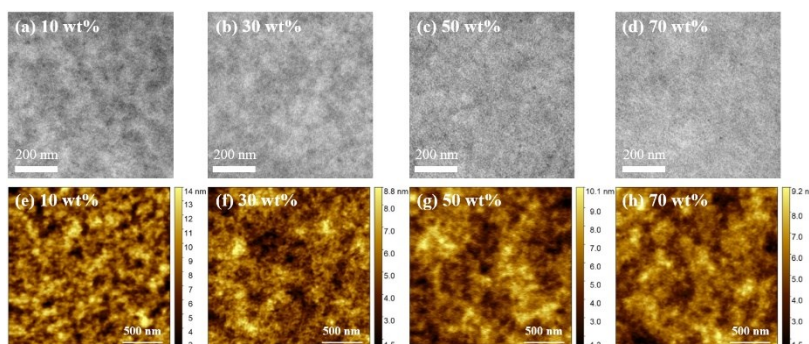


Fig. S4 TEM images and AFM surface morphology images of the blend films with varied NCBDT-4Cl content.

(a, e) 10 wt%; (b, f) 30 wt%; (c, g) 50 wt%; (d, h) 70 wt%.

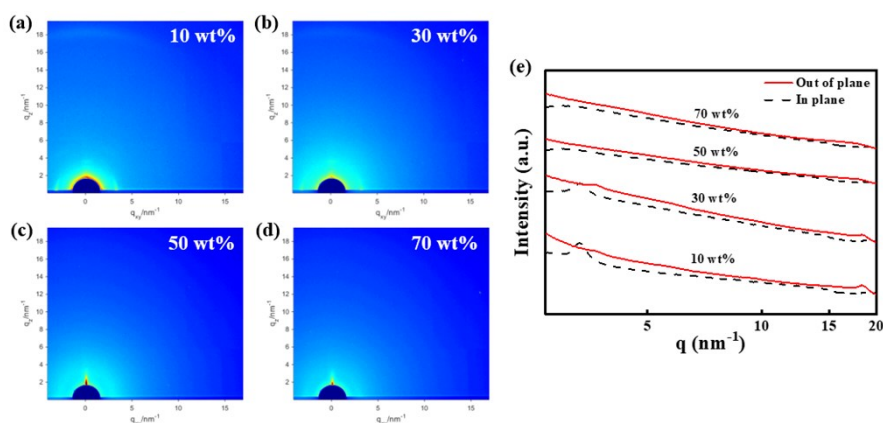


Fig. S5 (a-d) 2D GIXD patterns and (e) OOP and IP line-cut profiles of ternary blend films with varied NCBDT-

4Cl content.

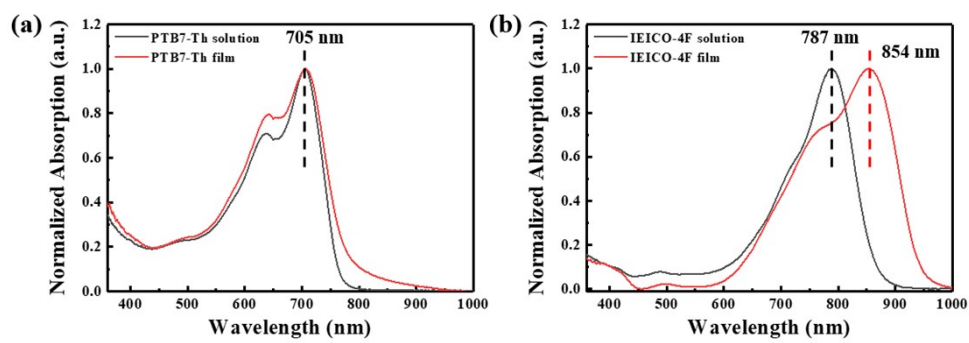


Fig. S6 The UV-vis absorption spectra of (a) PTB7-Th and (b) IEICO-4F solution and film.