Synthesis and Characterization of Amide-bridged Colorless Polyimide Films with Low CTE and High Optical Performance for Flexible OLED Displays

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Figure S2. ¹H NMR spectrum of AMDA.



Figure S3. ¹³C NMR spectrum of AMDA.



Figure S4. Mass spectrum of IAMDA.



Figure S5. ¹H NMR spectrum of IAMDA.

165.5 165.6 165.6 165.6 163.2 163.2 133.9 133.9 133.9 133.9 133.9 133.9 133.9 133.9 133.9 133.9 133.9 133.9 133.9 133.9 132.7 132.3 133.9 126.5 126.5 126.5 126.1 126.5 126.5 133.9 126.5



Figure S6. ¹³C NMR spectrum of IAMDA.



Figure S7. Mass spectrum of p-DAMDA.



Figure S8. ¹H NMR spectrum of p-DAMDA.



Figure S9. ¹³C NMR spectrum of p-DAMDA.

2. The inherent viscosity and molecular weight of cPIs.

Table S1 The inherent viscosity and molecular weight of cPI films.

Polyimide	$\eta_{\rm inh} ({ m dL} \ { m g}^{-1})^{a}$	$M_{\rm n}(10^4~{ m g~mol^{-1}})^{b}$	$M_{\rm w}(10^4{ m g\ mol^{-1}})$	PDI
AMDA/TFDB	1.93	25.5	36.0	1.40
IAMDA/TFDB	1.80	22.1	32.9	1.48

^{*a*} Measured at a concentration of 0.5 g dL⁻¹ in DMAc at 30 °C.

^{*b*} Measured in DMF by GPC.

Table S2 The inherent viscosity of poly (amic acid)s for insoluble cPI films.

Poly (amic acid)	AMDA/t-CHDA	p-DAMDA/TFDB	IAMDA/ t-CHDA
$\eta_{\rm inh} ({\rm dL} \ {\rm g}^{-1})^{a}$	1.20	0.56	0.94

 $^{\it a}$ Measured at a concentration of 0.5 g dL-1 in DMAc at 30 °C.

3. Structure characterization of cPI films.



Figure S10. (a) dimension change of PAHP/TFDB as a function of temperature; (b) XRD pattern of PAHP/TFDB.

Polymer	Molar ratio of AMDA/6FDA/TFDB	λ _{cut-off} (nm)	T _{550 nm} (%)	YI	Haze	T _{d5%} (°C)	T _g (°C)	CTE (ppm K ⁻¹)
6FDA/TFDB	0:100:100	346	90	2.46	0.54	540	342	56
Co-PI-1	25:75:100	383	89	3.44	0.67	523	353	47
Co-PI-2	50:50:100	388	88	3.20	0.39	515	358	36
Co-PI-3	75:25:100	391	87	3.37	0.52	508	348	19
Co-PI-4	85:15:100	393	87	4.11	0.56	506	340	15
AMDA/TFDB	100:0:100	386	87	4.29	0.71	502	333	5.2

Table S3 Optical and thermal properties of Co-PIs.



Figure S11. UV-Vis spectra of co-PI films.



Figure S12. Tand value of cPI films as a function of temperature.



Figure S13. TGA curves of cPI films.



Figure S14. WAXD patterns of cPI films.



Figure S15. The stress-strain curves of cPI films.



Figure S16. FTIR spectra of dianhydride monomers: (a) AMDA; (b) IAMDA; (c) p-DAMDA.