Supporting Information

Indolo[3,2,1-*jk*]carbazole Fused Multiple Resonance Induced Thermally Activated Delayed Fluorescence Emitter for Efficient Green Narrowband OLEDs

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1. Instrumentation and materials.

All of the reagent and solvent were obtained from commercial sources and directly used without any further purification. ¹H and ¹³C NMR spectra were measured on a Bruker ARX 400 NMR spectrometer, Bruker ARX 500 NMR spectrometer and reported as parts per million (ppm) from the internal standard TMS. High-resolution mass spectra were recorded on a MICROTOF-Q III instrument. Absorption and photoluminescence spectra were measured on a Shimadzu UV-3100 and a Hitachi F-4600 photoluminescence spectrophotometer, respectively. Cyclic voltammetry measurements were conducted on a MPI-A multifunctional electrochemical luminescent system (Xi'an Remex Analytical Instrument Ltd. Co., China) at room temperature with a polished Pt plate as the working electrode, platinum thread as the counter electrode and Ag-AgNO₃ (0.1 M) in CH₃CN as the reference electrode, *tetra-n*-butylammonium hexafluorophosphate (0.1 M) was used as the supporting electrolyte, respectively, using Fc^+/Fc as the internal standard, the scan rate was 0.1 V/s. The absolute photoluminescence quantum yields via an integrating sphere and the decay lifetimes of the compounds were measured with HORIBA Fluorolog-3 fluorescence spectrometer. The thermogravimetric analysis (TGA) curves were performed on a Pyris 1 DSC under nitrogen at a heating rate of 10 °C min⁻¹. The ground state calculations are based on optimized structure using Gaussian 09 by density functional theory (DFT) using the B3LYP functional with the 6-31G(d,p) basis set; excited state calculations were conducted by time-dependent density functional theory (TD-DFT) with B3LYP functional with the 6-31G(d,p) basis set.

Indium-tin-oxide (ITO) coated glass with a sheet resistance of 10 Ω sq⁻¹ was used as the anode substrate. Prior to film deposition, patterned ITO substrates were cleaned with detergent, washed by de-ionized water, dried and treated with oxygen plasma for 10 minutes at a pressure of 10 Pa to enhance the surface work function of ITO anode (from 4.7 to 5.1 eV). All the organic layers were

deposited with the rate of 0.1 nm/s under high vacuum ($\leq 8 \times 10^{-5}$ Pa). The doped layers were prepared by co-evaporating dopant and host material from two individual sources, and the doping concentrations were modulated by controlling the evaporation rate of dopant. LiF and A1 were deposited in another vacuum chamber ($\leq 1.0 \times 10^{-4}$ Pa) with the rates of 0.01 and 1 nm/s, respectively, without being exposed to the atmosphere. The thicknesses of these deposited layers and the evaporation rate of individual materials were monitored in vacuum with quartz crystal monitors. A shadow mask was used to define the cathode and to make ten emitting dots (with the active area of 10 mm²) on each substrate. Device performances were measured via using a programmable Keithley source measurement unit (Keithley 2400 and Keithley 2000) with a silicon photodiode. The EL spectra were measured with a Hitachi F-4600 spectrophotometer. Based on the uncorrected EL fluorescence spectra, the Commission International e de l'Eclairage (CIE) coordinates were calculated using the test program of Spectra scan PR650 spectrophotometer. The EQE of EL devices were calculated based on the photo energy measured by the photodiode, the EL spectrum, and the current pass through the OLED.

2. Experimental section

All other of the reagents and solvents were obtained from commercial sources and directly used



without any further purification. The synthesis details of Scheme S1 are described in the following: **Scheme S1.** The synthetic routes for LTCz-NL precursor and LTCz-BN compound.

2.1 Preparation procedure for TtBuCzBr

3,6-Di-*tert*-butylcarbazole (2.0 g, 7.2 mmol) and Cs₂CO₃ (10.5 g, 32.2 mmol) were dissolved in DMF (50 mL) at room temperature. After stirring for 30 min, 2-bromo-1,3,5-trifluorobenzene (0.4 g, 2.0 mmol) was added to the solution, and the mixture was stirred at 150 °C for 24 h. After cooling to room temperature, the reaction mixture was poured into a large amount of water. The product was extracted with dichloromethane, and the combined organic layer was dried over anhydrous MgSO₄. After filtration and evaporation, crude product was purified by column chromatography on silica gel (PE/DCM= 10/1, v/v) to get the TtBuCzBr as white solid (yield = 1.78 g, 90%). ¹H NMR (400 MHz, CDCl₃) δ 8.17 (d, *J* = 1.6 Hz, 4H), 8.09 (d, *J* = 1.5 Hz, 2H), 7.91 (s, 2H), 7.56 (dd, *J* = 8.6, 1.9 Hz, 4H), 7.51 (d, *J* = 8.7 Hz, 2H), 7.46 (dd, *J* = 8.7, 1.8 Hz, 2H), 7.27 (d, *J* = 8.6 Hz, 4H), 1.48 (s, 36H), 1.43 (s, 18H). ¹³C NMR (101 MHz, CDCl₃) δ 144.0, 143.4, 140.8, 139.5, 139.1,

138.2, 127.7, 124.2, 124.0, 123.6, 122.5, 116.6, 116.5, 109.4, 109.1, 34.8, 34.8, 32.1, 31.9. MS (MALDI-TOF, m/z): [M]+ calcd for C₆₆H₇₄BrN₃, 987.507; found, 988.240.

2.2 Preparation procedure for LTCz-NL

Under the nitrogen atmosphere, Pd(OAc)₂ (44.9 mg, 0.2 mmol) was added to the mixture of TtBuCzBr (2.0 g, 2.0 mmol) and K₂CO₃ (0.4 g, 3.0 mmol) in solvent of DMAC (15 mL), then the mixture was refluxed at 170 °C for 6 h. After cooling to room temperature, the reaction mixture was poured into a large amount of water. The product was extracted with dichloromethane, and the combined organic layer was dried over anhydrous MgSO₄. After filtration and evaporation, crude product was purified by column chromatography on silica gel (PE/DCM= 10/1, v/v) to get the LTCz-BNL as white solid (yield = 1.6 g, 88%). ¹H NMR (400 MHz, CDCl₃) δ 8.27 (d, *J* = 1.7 Hz, 2H), 8.21 (d, *J* = 1.7 Hz, 2H), 8.18 (dd, *J* = 3.0, 1.8 Hz, 2H), 8.07 (d, *J* = 1.0 Hz, 1H), 7.83 (d, *J* = 1.7 Hz, 1H), 7.81 (d, *J* = 8.5 Hz, 1H), 7.63 (d, *J* = 8.6 Hz, 2H), 7.58 (dd, *J* = 8.5, 1.9 Hz, 1H), 7.53 (dd, *J* = 8.7, 1.9 Hz, 2H), 7.43 (dd, *J* = 8.7, 1.9 Hz, 2H), 7.32 (d, *J* = 8.6 Hz, 2H), 6.63 (d, *J* = 1.0 Hz, 1H), 1.50 - 1.47 (m, 45H), 1.15 (s, 9H).¹³C NMR (101 MHz, CDCl₃) δ 146.8, 145.5, 143.6, 143.3, 143.1, 140.7, 139.4, 138.6, 137.2, 136.9, 134.2, 130.4, 125.5, 124.1, 123.9, 123.7, 123.6, 123.6, 120.8, 119.8, 118.5, 117.8, 116.9, 116.4, 116.4, 115.4, 111.7, 110.6, 109.4, 109.2, 35.6, 34.9, 34.8, 32.3, 32.0, 31.9 MS (MALDI-TOF, m/z): [M]+ calcd for C₆₆H₇₃N₃, 907.580; found, 907.959. Anal. Calcd for C₆₆H₇₃N₃: C, 87.27; H, 8.10; N, 4.63. Found: C, 87.22; H, 8.13; N, 4.64.

2.3 Preparation procedure for LTCz-BN

LTCz-NL (3.0 g, 3.3 mmol) was dissolved in acetic acid (50 mL) at room temperature, and then liquid bromine (0.6 g, 3.7 mmol) was added dropwise to the solution. The mixture was stirred at 90 °C for 3 h. After cooling to room temperature, a large amount of water was poured into the reaction mixture. The formed precipitate was filtered off and then washed with water. After drying at 80 °C under vacuum, the crude brominated LTCz-NL (2.9 g) was obtained, which was subjected to the next step without further purification.

To a solution of brominated LTCz-NL (2.9 g) in *tert*-butylbenzene was slowly added *t*-BuLi (1.3 M in hexane, 10.2 mL, 13.2 mmol) at 0 °C. After reacting for 1 h at 70 °C, BBr₃ (1.4 mL, 14.0 mmol) was slowly added at -30 °C, and then the mixture was stirred at room temperature for 0.5 h. After addition of NEt(i-Pr)₂ (1.8 mL) at 0 °C, the reaction mixture was further stirred at 130 °C for 24 h. After cooling to room temperature, the reaction mixture was carefully quenched by addition of saturated brine. The product was extracted with dichloromethane, and the combined organic layer was dried over anhydrous MgSO₄. After filtration and evaporation, the crude product was purified by column chromatography on silica gel (eluent: hexane/chloroform = 25:1, v/v) and recrystallization from chloroform/methanol to afford LTCz-BN as a yellow solid (yield = 100 mg,

10%). ¹H NMR (400 MHz, CD₂Cl₂) δ 9.02 (d, *J* = 7.7 Hz, 2H), 8.71 (s, 1H), 8.48 (d, *J* = 15.2 Hz, 2H), 8.40 (s, 1H), 8.25 (d, *J* = 14.4 Hz, 2H), 8.12 (s, 1H), 7.93 (d, *J* = 8.3 Hz, 2H), 7.72 (d, *J* = 8.0 Hz, 1H), 7.61 (d, *J* = 8.3 Hz, 1H), 7.48 (d, *J* = 8.2 Hz, 1H), 7.34 (d, *J* = 8.3 Hz, 1H), 6.85 (s, 1H), 1.61 (d, *J* = 14.2 Hz, 18H), 1.49 (s, 9H), 1.44 (d, *J* = 1.0 Hz, 18H), 1.19 (s, 9H). ¹³C NMR (126 MHz, CDCl₃) δ 146.5, 145.8, 145.5, 145.4, 145.2, 145.0, 144.7, 143.8, 143.5, 142.5, 141.7, 139.2, 138.4, 137.5, 137.2, 131.2, 130.1, 129.2, 127.4, 126.7, 124.6, 124.5, 124.0, 123.6, 123.4, 122.8, 120.6, 120.4, 119.7, 119.4, 118.0, 117.6, 117.1, 116.8, 114.8, 113.6, 112.6, 112.0, 93.9, 35.8, 35.3, 35.2, 35.0, 35.0, 35.0, 32.5, 32.3, 32.3, 32.0, 31.9, 31.9. MS (MALDI-TOF, m/z): [M]+ calcd for C₆₆H₇₀BN₃, 915.566; found, 914.895. Anal. Calcd for C₆₆H₇₀BN₃: C, 86.53; H, 7.70; N, 4.59. Found: C, 86.44; H, 7.74; N, 4.61.





Fig. S1 ¹H NMR spectrum of TtBuCzBr in CDCl₃.









Fig. S6 ¹³C NMR spectrum of LTCz-BN in CDCl₃.

4. Mass spectra



Fig. S7 Mass spectrum of LTCz-NL.



Fig. S8 Mass spectrum of LTCz-BN.

5. Thermal gravimetric analyzer



6. Absorption and emission performance

6.1 Photophysical data of the two compounds.

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Compound	$\lambda_{abs}{}^{a}$	$\lambda_{PL}{}^{b}$	FWHM ^c	\mathbf{S}_{1}^{d}	T_1^e	$\Delta E_{\rm ST}^{\rm f}$	$arPsi_{ ext{PL}}{}^{ ext{g}}$	$ au_{ m p}{}^{ m h}$	$ au_{ m d}{}^{ m h}$	$k_{\rm r}^{\rm i}$	$k_{\rm ISC}{}^{\rm i}$	$k_{\rm RISC}{}^{ m i}$
	[nm]	[nm]	[nm]	[eV]	[eV]	[eV]	[%]	[ns]	[µs]	$[10^7 \text{ s}^{-1}]$	$[10^8 \text{ s}^{-1}]$	$[10^5 \text{ s}^{-1}]$
LTCz-NL	376	394	29	3.15	2.63	0.52	88	16.1	-	-	-	-
LTCz-BN	473	497	27	2.49	2.39	0.10	93	4.9	4.7	4.7	1.6	8.3

Table S1. Photophysical data of the two compounds.

^aAbsorption peak at room temperature measured in toluene solution $(5.0 \times 10^{-5} \text{ M})$. ^bEmission peak at room temperature measured in toluene solution $(5.0 \times 10^{-5} \text{ M})$. ^cFull width at half maximum of emission spectrum for PL spectrum. ^dCalculated by the fluorescence spectrum at room temperature. ^cCalculated by the phosphorescence spectrum at 77 K. ^fEstimated by S₁ and T₁. ^gAbsolute photoluminescence quantum yield measured in doped film. ^bprompt decay and delayed fluorescence lifetime in doped film. ⁱRate constant of fluorescence radiative decay (S₁ \rightarrow S₀): $k_r = \Phi_P / \tau_p$; Rate constant of ISC (S₁ \rightarrow T₁); $k_{ISC} = (1 - \Phi_P) / \tau_p$; Rate constant of RISC (T₁ \rightarrow S₁); $k_{RISC} = \Phi_d / (k_{ISC} \cdot \tau_p \cdot \tau_d \cdot \Phi_P)$.

6.2 Absorption spectra of two compounds in various solvents



Fig. S10 Absorption spectra of LTCz-NL (a) and LTCz-BN (b) in various solvents.

6.3 Photoluminescence spectra of two compounds in various solvents



Fig. S11 Photoluminescence spectra of LTCz-NL (a) and LTCz-BN (b) in various solvents.

7. The temperature-dependent transient PL curve



Fig. S12 The temperature-dependent transient PL curves of LTCz-BN doped film in mCBP at a doping concentration of 5 wt%.





Fig. S13 Φ_{PL} of LTCz-NL in co-doped mCBP film (5 wt%).



Fig. S14 Φ_{PL} of LTCz-BN in co-doped mCBP film (5 wt%).

9. Cyclic voltammogram curve



Fig. S15 Cyclic voltammogram curves of LTCz-BN and LTCz-NL measured in CH₃CN containing 0.1 M *tetra-n*-butylammonium hexafluorophosphate.

Table 52. Electroenemical properties of ETC2 TCE and ETC2 BTV.								
$E_{\rm ox,onset}^{a}$ (V)	$E_{\rm g,opt}^{\rm b} ({\rm eV})$	$E_{\rm HOMO}^{\rm c}~({\rm eV})$	$E_{\rm LUMO}^{\rm d} ({\rm eV})$					
0.50	2.47	-5.12	-2.65					
1.22	3.10	-5.83	-2.73					
	$\frac{E_{\text{ox,onset}}^{a}(\text{V})}{0.50}$ 1.22		Enemietar properties of Erce Are and Erce Brt. $E_{ox,onset}^{a}$ (V) $E_{g,opt}^{b}$ (eV) E_{HOMO}^{c} (eV) 0.50 2.47 -5.12 1.22 3.10 -5.83					

 Table S2. Electrochemical properties of LTCz-NL and LTCz-BN.

^aThe onset of oxidation curve; ^bOptical gap (1240/ λ_{onset}); ^c E_{HOMO} = -[$Eox - E_{(Fc/Fc^+)} + 4.8$] eV; ^d E_{LUMO} =($E_{HOMO} + E_{g,opt}$).

10. TD-DFT calculations 10.1 NTO analysis



Fig. S16 The natural transition orbitals of the excited states of LTCz-BN.

10.2 UV-vis absorption spectrum simulations



Fig. S17 The calculated absorption spectra (dotted line), the experimentally measured absorption spectra (red line) and calculated oscillator strengths (black line) of two compounds.



Fig. S18 Reorganization energies (λ) of LTCz-NL and LTCz-BN.

Table S3. TD-DFT calculation results for LTCz-NL and LTCz-BN in the optimized S_0 geometries at the B3LYP/6-31G(d,p) level.

compound	State	E [eV]	λ [nm]	f	Main cont [9	figuration
	S ₁	3.21	386	0.1579	H→L	86
	S_2	3.35	370	0.1906	H-1→L	85
					H→L	12
	S_3	3.60	344	0.0614	H-3→L	79
	S_4	3.75	331	0.0002	H-2→L	92
LTCz-NL	S_5	3.76	330	0.0005	H-4→L	92
	S_6	3.88	320	0.0202	$H \rightarrow L+1$	65
	\mathbf{S}_7	3.92	316	0.0648	$H \rightarrow L+2$	62
	\mathbf{S}_8	3.94	315	0.0614	$H \rightarrow L+3$	62
	S_9	3.96	313	0.0913	H-5→L	71
	\mathbf{S}_{10}	4.03	308	0.0090	$H-1 \rightarrow L+1$	38
					H-1 \rightarrow L+2	13
					$H-1 \rightarrow L+3$	34
	\mathbf{S}_1	2.75	451	0.2941	H→L	98
	S_2	3.24	383	0.0401	H-1→L	36
					$H \rightarrow L+1$	59
	S_3	3.38	367	0.4408	H-1→L	51
					$H \rightarrow L+1$	33
	S_4	3.44	360	0.0458	H-2→L	84
	S_5	3.51	353	0.0122	H-3→L	92

	S_6	3.59	345	0.0836	H-5→L	62
					H-4→L	27
LTCz-BN	S_7	3.67	338	0.0222	H-4→L	61
					H-5→L	19
	S_8	3.71	334	0.0115	$H \rightarrow L+2$	88
	S_9	3.75	331	0.0574	H-1→L+1	69
	\mathbf{S}_{10}	3.89	319	0.0506	$H \rightarrow L+3$	74
	S_{11}	3.97	312	0.1242	H-2→L+1	61
	\mathbf{S}_{12}	4.00	310	0.2308	H-6→L	78
	S ₁₃	4.09	303	0.0106	H-3→L+1	70

11. Device characterization



Fig. S19 EL spectra of D-LTCz-BN taken at various voltages from 5 to 10 V.



Fig. S20 (a) Energy-level diagrams and (b) CIE coordinates and device photo of D-LTCz-BN.

Table S4. Dev Device	λ_{EL}^{a} [nm]	FWHM ^b [nm]	of D-I $V_{\rm on}^{\rm c}$ [V]	$\frac{LTCz-BN}{L_{max}^{d}}$ [cd m ⁻²]	CE ^e [cd A ⁻¹]	PE ^f [lm W ⁻¹]	EQE ^g [%]	CIE^{h} (<i>x</i> , <i>y</i>)
D-LTCz-BN	500	33	3.6	38099	71.0/66.2/61.3	33.3/26.7/22.1	27.2/25.4/23.5	0.13,0.60

^aThe electroluminescence peak. ^bFull width at half maximum of electroluminescence spectrum. ^cTurn-on voltage at 1 cd m⁻². ^dMaximum luminance. ^eMaximum current efficiency and current efficiency at 3000 and 5000 cd m⁻². ^fMaximum power efficiency at 3000 and 5000 cd m⁻². ^gMaximum external quantum efficiency and external quantum efficiency at 3000 and 5000 cd m⁻². ^hCommission Internationale de l'Éclairage color coordinates measured at 10 mA cm⁻².

Table S5. The devices performances of reported NB-based MR-TADF-OLEDs vs this work.

MR-TADF material	$\Delta E_{ m ST}^{ m a}$ [eV]	$k_{\mathrm{RISC}}{}^{\mathrm{b}}$ [10 ⁵ s ⁻¹]	FWHM ^c [nm]	EQE _{max/3000 cd m} ^{-2c} ^{2/5000 cd m^{-2c} [%]}	Reference
DABNA-1	0.15	0.10	28	13.5/-/-	Adv. Mater. 2016, 28, 2777.
Ph C NPh ₂ Ph C N C N DABNA-2	0.15	0.15	28	20.2/-/-	

t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.14	_	27	32.1/7.0/5.0	Angew. Chem. Int. Ed. 2018 , 57, 11316-11320
Me Me Me B2	0.19	_	37	18.3/-/-	J. Am. Chem. Soc. 2018, 140, 1195- 1198
	0.02	2.00	18	34.4/-/-	Nat. Photonics 2019, 13, 678- 682
Me Mes B Mes B Mes B Mes Mes Mes	0.18	0.08	32	24.5/-/-	Org. Lett. 2019 , 21, 9311-9314
Me Tip ^B ADBNA-Me-Tip	0.18	0.09	33	34.7/-/-	
t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.16	0.22	40	22.0/11.7/9.6	Angew. Chem. Int. Ed. 2019 , 58, 16912-16917
	0.08	0.39	39	22.7/18.6/15.9	

3F-BN

t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.11	0.44	32	20.9/13.0/11.1	
r-Bu r-Bu r-Bu r-Bu r-Bu r-Bu r-Bu r-Bu	0.15	0.22	27	29.3/-/-	J. Am. Chem. Soc. 2020, 142, 19468-19472
	0.15	0.20	26	27.8/-/-	
BBCz-SB t-Bu	0.14	1.90	54	31.8/19.0/15.7	
t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.14	1.10	48	29.3/15.7/13.5	
rBu rBu rBu rBu rBu rBu RBC 7-R	0.19	0.12	26	22.0/-/-	
	0.09	-	33	25.5/14.2/12.6	<i>Adv. Opt. Mater.</i> 2020 , <i>8</i> , 1902142

t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.18	0.08	30	26.5/14.1/12.1	Angew. Chem. Int. Ed. 2020 , 59, 17499-17503
OAB-ABP-1	0.12	0.40	33	21.8/-/-	Adv. Mater. 2020 , 32, 2004072
t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.08	10.0	45	31.4/9.1/6.4	Angew. Chem. Int. Ed. 2020 , 59, 17442-17446
	0.17	0.14	33	26.7/-/-	Angew. Chem. Int. Ed. 2021 , 60, 2882-2886
t-Bu Me	0.14	0.73	27	21.8/-/-	
Me Ph N N N N N N N N N N N N N N N N N N	0.06	0.51	29	19.5/-/-	
	0.03	1.60	23	29.5/-/-	Angew. Chem. Int. Ed. 2021 , 60, 17910-17914

	0.13	19.00	25	21.0/6.5/-	Angew. Chem. Int. Ed. 2021 , 60, 1-7
	0.19	0.56	60	17.7/5.6/3.8	<i>Chem. Eng. J.</i> 2021 , <i>426</i> , 131169
	0.15	1.17	58	25.5/10.2/9.6	
r-Bu r-Bu r-Bu r-Bu r-Bu r-Bu r-Bu r-Bu	0.12	-	30	29.4/5.5/4.1	<i>Adv. Mater.</i> 2021 , <i>33</i> , 2100652
(R)-OBN-2CN-BN r-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.13	-	33	24.5/0.3/-	
	0.11	1.90	36	24.3/8.2/5.9	Adv. Funct. Mater. 2021 , 31, 2102017
	0.13	1.50	46	24.5/4.1/3.5	
BN2	0.09	1.40	43	24.7/3.9/3.2	

t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.18	4.20	49	33.7/11.2/10.0	Chem. Sci. 2021 , 12, 9408-9412
R-BN	0.18	0.67	48	25.6/-/-	Angew. Chem. Int. Ed. 2021 , 60, 2-8
t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu t-Bu	0.16	0.25	49	24.7/-/-	
	0.14	0.20	30	22.6/-/-	<i>Angew. Chem.</i> <i>Int. Ed.</i> 2021 , DOI:10.1002/anie .202109335
N_N KIN γ-Cb-B	0.12	0.58	28	19.0/-/-	
	0.09	0.13	30	29.2/-/-	
	0.14	0.10	44	19.6/-/-	
	0.09	3.00	33	28.0/22.4/18.8	
NBNP					Adv. Opt. Mater. 2022, 10,

r-Bu r-Bu r-Bu r-Bu NBO	0.12	9.30	29	26.1/15.7/9.7	
	0.16	0.50	28	13.7/4.3/-	
SBON	0.10	1.5	31	17.6/9.0/-	Adv Ont Mater
	0.13	0.8	29	26.7/7.15/-	2022 , 2200504
	0.13	1.9	43	21.8/12.5/-	
Y ↓ Y ⊕ N ↓ U N ↓ S-Cz-BN	0.16	0.2	26	30.5/22.4/19.8	Angew. Chem. Int. Ed. 2021 , DOI:
D-Cz-BN	0.14	0.2	24	37.2/28.8/25.0	10.1002/anie.202 113206
t-Bu t-Bu t-Bu t-Bu	0.10	8.30	33	27.2/25.4/23.5	This work

^aRecorded in solution; ^bRecorded in doped film; ^cRecorded in device.