Supporting information

Simple and Efficient Non-doped Deep-Blue and White Organic Light-Emitting Diode Based on Hybridized Local and Charge Transfer (HLCT) Materials

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Section 1

All OLEDs were fabricated on pre-patterned indium tin oxide (ITO) glass substrates with a sheet resistance of 15 Ω sq^{-1}. ITO-coated glass substrates were cleaned by ultrasonic cleaning in deionized water, acetone and isopropyl alcohol for 20 min in order, then treated with ultraviolet-ozone for 15 min. After this, the ITO substrates were leaded into a deposition chamber, and the OLEDs were fabricated through a vacuum evaporation deposition process under a pressure below 5×10^{-4} Pa. The deposition rates and film thicknesses were monitored by calibrated crystal quartz sensors. The deposition rates for the organic materials, LiF, MoO_3 and Al were 1~2, 0.3, 0.5, and 3~6 Å s^{-1}, respectively, in particular, the evaporation rate of Ph-UEMLs is about 0.1 Å s^{-1}. All the devices had an active emissive area of 3 mm×3 mm, which are defined by the overlap between the ITO anode and Al cathode. The current density-voltage-luminance (J-V-L) characteristics were performed simultaneously by using a computer-controlled source meter (Keithley 2400) integrated with a BM-7A luminance meter test system. The EL spectra were recorded by a PR655 spectrometer. The EQE was calculated from the current density-voltage-luminance curves and EL spectral data.

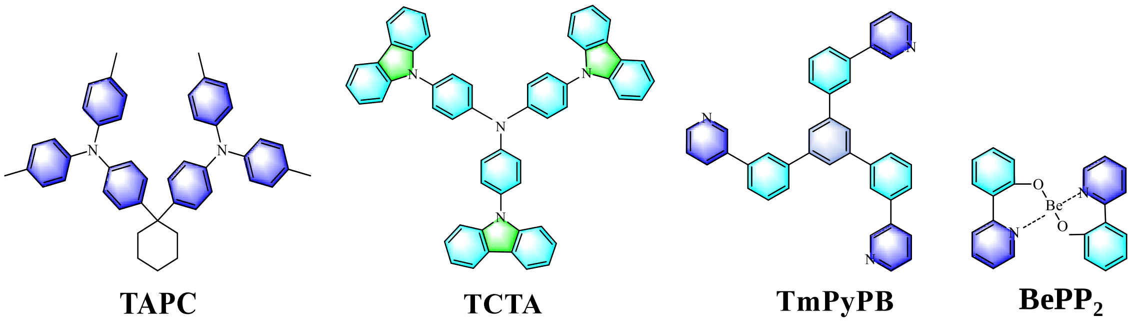

Figure S1. Molecular structures for all organic functional materials used in this work.

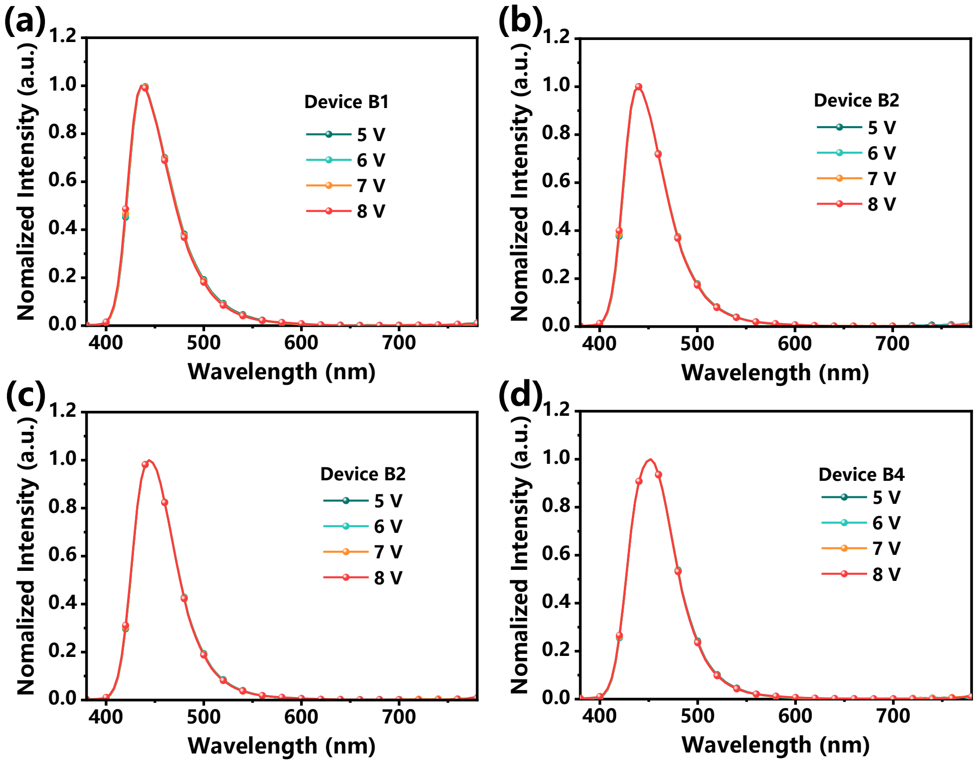

Figure S2. Normalized EL spectra for non-doped blue devices B1-B4 at different driving voltages from 5 V to 8 V.

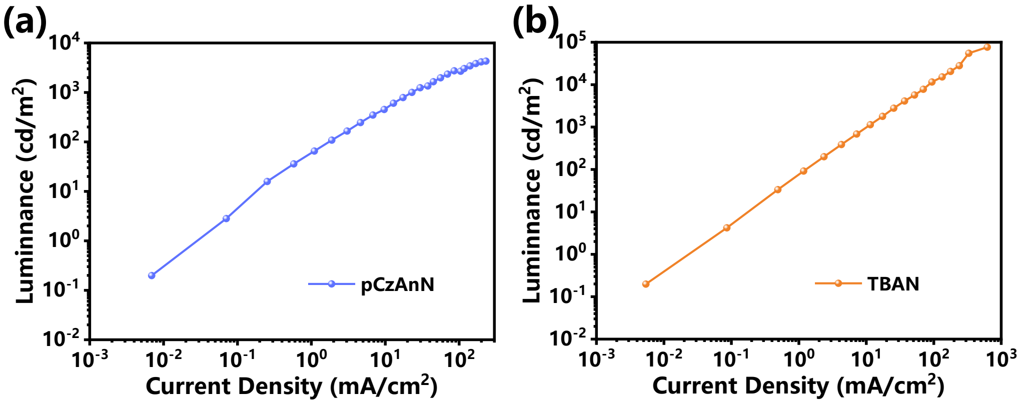

Figure S3. Linear curves of current density-luminance for pCzAnN and TBAN.

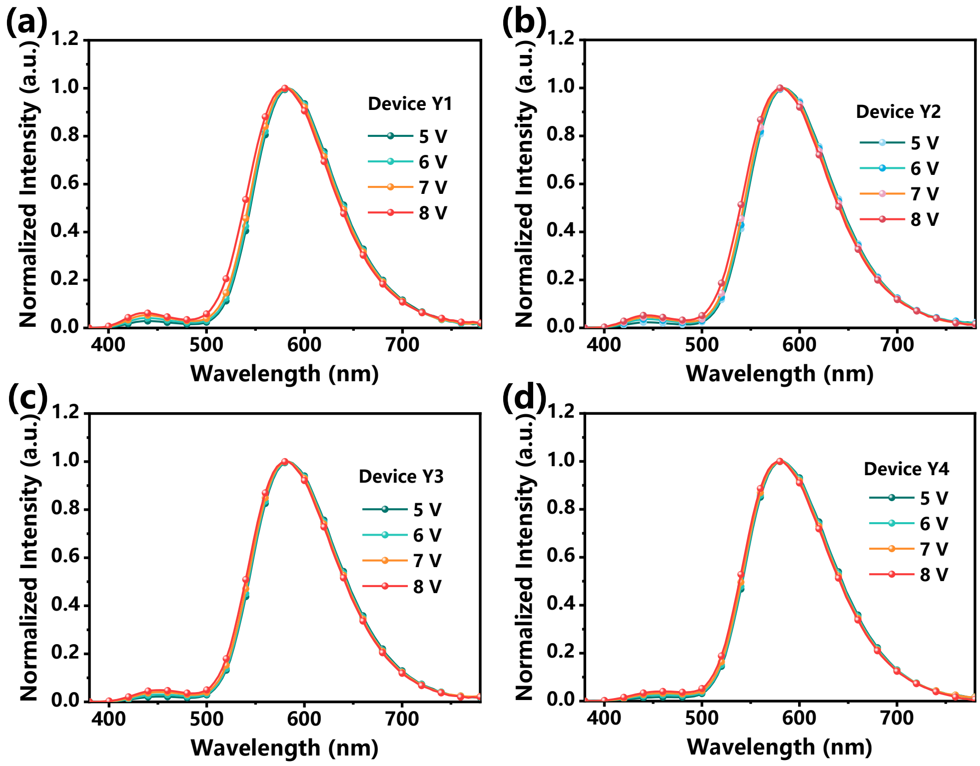

Figure S4. Normalized EL spectra for yellow devices Y1-Y4 at different driving voltages from 5 V to 8 V.

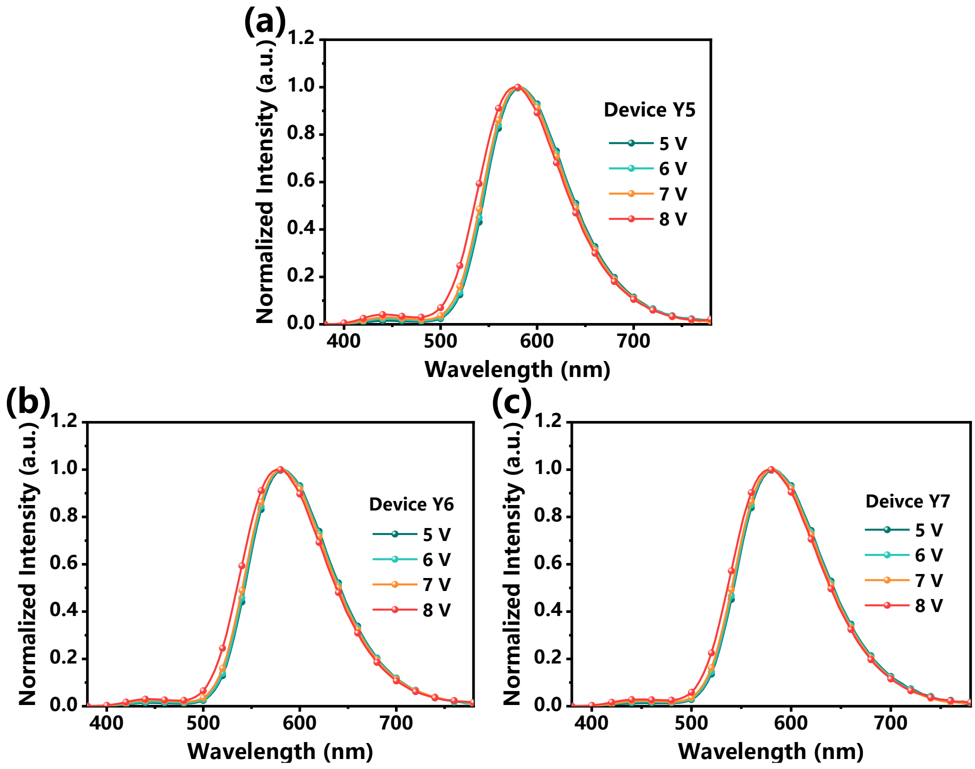

Figure S5. Normalized EL spectra for yellow devices Y5-Y7 at different driving voltages from 5 V to 8 V.

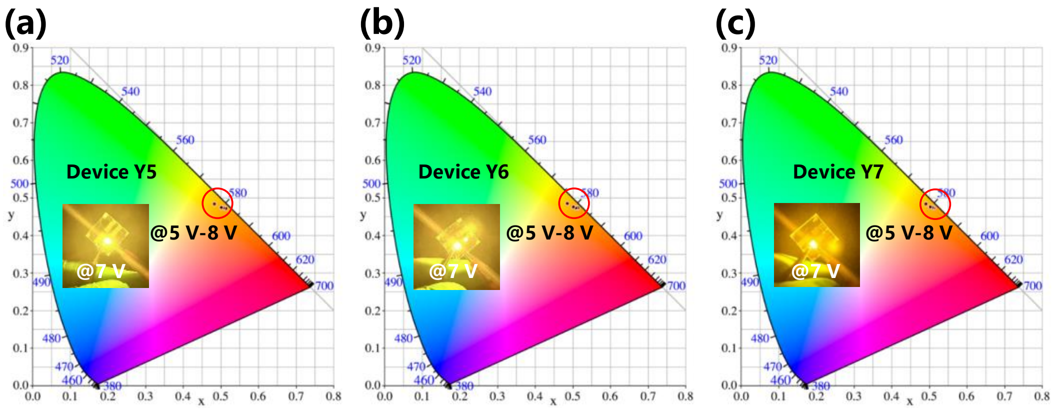

Figure S6. (a)-(c) CIE coordinates diagram of non-doped yellow devices Y5-7 at versus voltage and EL photo at 5 V.

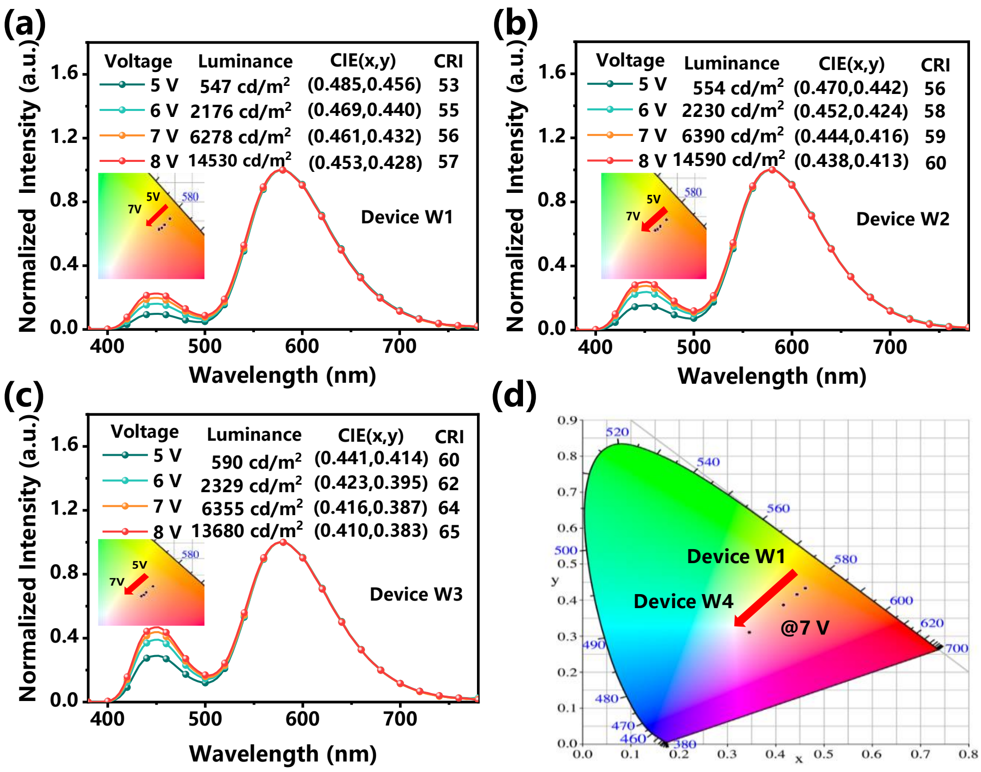

Figure S7. (a-c) Normalized EL spectra for white devices W1-W3 at different driving voltages from 5 V to 8 V; (d) The CIE coordinate graph for white devices W1-W4 at a voltage of 7 V.

Table S1 Key performance parameters of the reported non-doped non-doped blue based-HLCT OLEDs exhibiting hot excitons process with CIE ≦ 0.08.

Devices	CE(cd/A)	EQE (%)	λ_{EL} (cd/m^2)	CIE(x,y)	Ref.
pCzAnN	6.27	9.36	444	(0.151,0.068)	**This work**
TPATPA-CNPPI	19.58	8.96	457	(0.16,0.07)	[24]
SP	6.9	11.3	436	(0.158, 0.068)	[25]
SFCz	3.80	5.86	419	(0.16, 0.08)	[26]
SAFpCN	6.54	4.63	432	(0.153, 0.054)	[27]
SAF-PI	2.90	4.57	428	(0.156, 0.053)	[28]
IDCz-BPSP	5.81	4.61	432	(0.154,0.059)	[29]
PPITPh	7.21	11.83	436	(0.15, 0.07)	[30]
PCZPBO	2.8	5.1	414	(0.15,0.08)	[40]

Reference

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Table S2. The summary of the key EL performance for white devices W5-W8.

Devices	V_{on} [a] (V)	CE[b] (cd/A)	PE[b] (lm/W)	L_{max} (cd/m^2)	CIE[d] (x,y)	CRI[e]
W1	3.5	0.05	0.03	733.5	(0.440,0.426)	58/59
W2	3.9	0.09	0.04	1113	(0.426,0.392)	60/62
W3	4.2	0.12	0.05	1369	(0.415,0.361)	63/66
W4	4.8	0.13	0.05	1379	(0.413,0.346)	65/68

[a] Turn-on voltage corresponds to the voltage at a luminance of >1 cd m^{-2};

[b]maximum CE/PE;

[c]CIE coordinates are measured at the voltage of 7 V;

[d]CRI is measured at a voltage of 7 V and 8 V.