Supporting Information

Very bright and efficient ITO-free narrow-spectrum micro-cavity top-emitting organic light-emitting diodes with low operation voltage

Xiaokang Li [a,b], Wenxing Liu [b], Kai Chen [b], Chunyu Yu [b], Xiaoyang Xia [b], Guojun Liu [a,c,*], and Liang Zhou [b,*]

[a] *School of OPTO-Electronic Engineering, Changchun University of Science and Technology, Changchun 130022, P. R. China*

[b] *State Key Laboratory of Rare Earth Resource Utilization, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, P. R. China*

[c] *School of Physics and Electronic Engineering, Hainan Normal University, Haikou 571100, P. R. China*

[a] Correspondence to: School of OPTO-Electronic Engineering, Changchun University of Science and Technology, Changchun 130022, People's Republic of China. Tel.: +8643185583390. *E-mail address*: gjliu626@126.com.

[b] Correspondence to: State Key Laboratory of Rare Earth Resource Utilization, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, People's Republic of China. Tel.: +8643185262855. *E-mail address*: zhoul@ciac.ac.cn.

[c] Correspondence to: School of Physics and Electronic Engineering, Hainan Normal University, Haikou 571100, P. R. China.

Table S1 The key properties of devices with EML at different thicknesses.

Device	$V_{turn-on}$ (V)	B[a] (cd m^{-2})	η_c[b] (EQE[c]) (cd A^{-1})	η_p[d] (lm W^{-1})	η_c[e] (cd A^{-1}) (EQE[f]) (1000 cd m^{-2})	η_c[g] (cd A^{-1}) (EQE[h]) (5000 cd m^{-2})	$CIE_{x,y}$[i]
6 nm	2.2	327609	100.94 (30.5%)	110.61	100.94 (30.5% 2.9 V)	95.74 (29.0% 3.4 V)	(0.16, 0.69)
8 nm	2.2	316355	119.11 (32.1%)	129.91	118.49 (31.9% 2.9 V)	117.26 (31.6% 3.3 V)	(0.20, 0.71)
10 nm	2.2	343809	147.19 (35.6%)	163.32	147.19 (35.6% 2.9 V)	142.04 (34.3% 3.5 V)	(0.28, 0.68)
12 nm	2.2	379485	135.53 (34.3%)	143.66	127.72 (32.3% 2.8 V)	134.83 (34.1% 3.3V)	(0.23, 0.70)
14 nm	2.4	422901	161.35 (39.5%)	170.20	160.43 (39.1% 3.3 V)	155.56 (37.9% 3.7 V)	(0.27, 0.68)

[a] The data for maximum brightness (B), [b] maximum current efficiency (η_c), [c] maximum external quantum efficiency (EQE), [d] maximum power efficiency (η_p), [e] current efficiency (η_c) at the practical brightness of 1000 cd m^{-2}, [f] external quantum efficiency (EQE) at the practical brightness of 1000 cd m^{-2}, [g] current efficiency (η_c) at the practical brightness of 5000 cd m^{-2}, [h] EQE at the practical brightness of 5000 cd m^{-2}, [i] Commission Internationale de l'Eclairage coordinates ($CIE_{x,y}$) at 10 mA cm^{-2}.

Table S2 The key properties of devices A and B.

Device	$V_{turn-on}$ (V)	B[a] (cd m^{-2})	η_c[b] (EQE[c]) (cd A^{-1})	η_p[d] (lm W^{-1})	η_c[e] (cd A^{-1}) (EQE[f]) (1000 cd m^{-2})	$CIE_{x,y}$[g]
A	2.3	288001	94.34 (34.7%)	104.40	94.33 (34.5%)	(0.12, 0.62)
B	2.3	234423	85.37 (27.6%)	103.00	80.61 (26.0%)	(0.20, 0.62)

[a] The data for maximum brightness (B), [b] maximum current efficiency (η_c), [c] maximum external quantum efficiency (EQE), [d] maximum power efficiency (η_p), [e] current efficiency (η_c) at the practical brightness of 1000 cd m^{-2}, [f] external quantum efficiency (EQE) at the practical brightness of 1000 cd m^{-2}, [g] Commission Internationale de l'Eclairage coordinates ($CIE_{x,y}$) at 10 mA cm^{-2}.

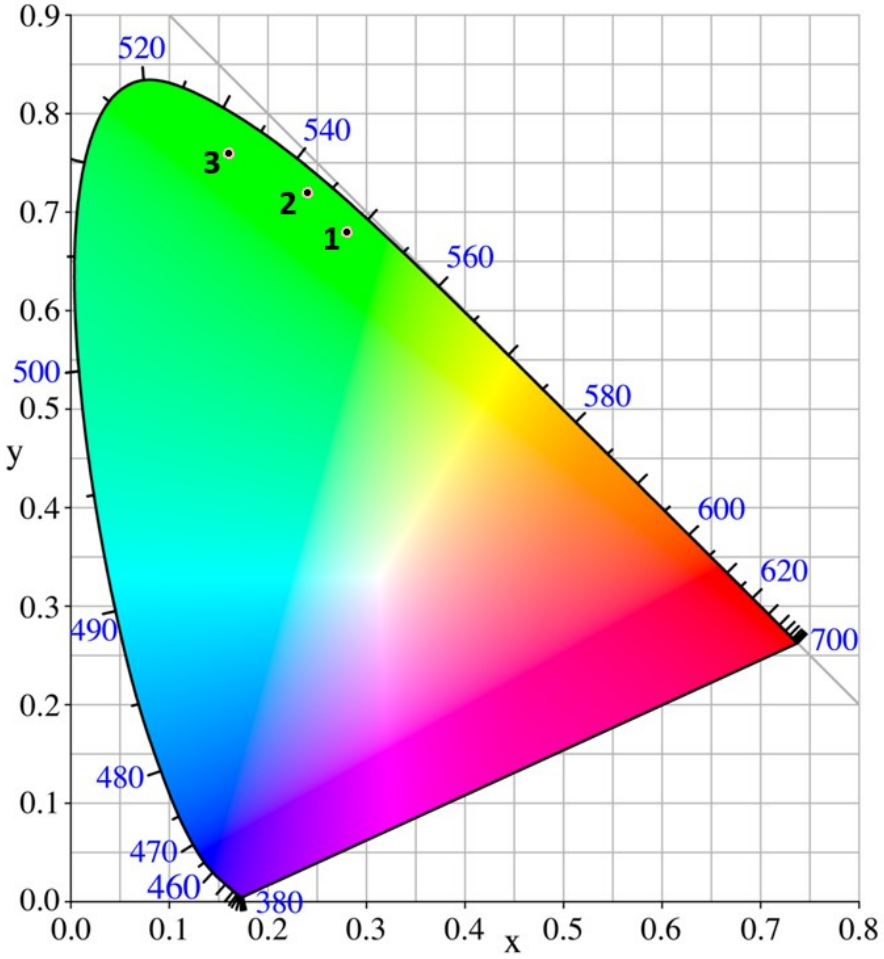

Figure S1 The change of CIE chromaticity diagram of devices with Ag electrode at different thicknesses.

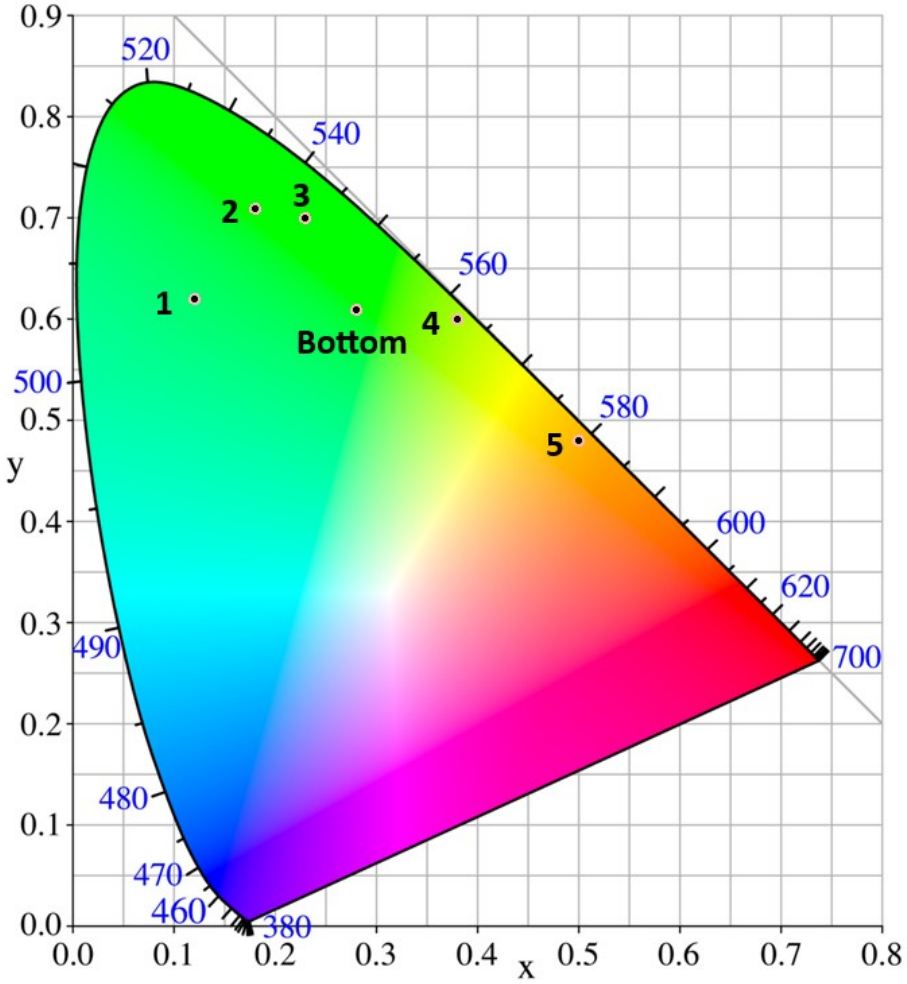

Figure S2 The change of CIE chromaticity diagram of devices with HTL at different thicknesses.

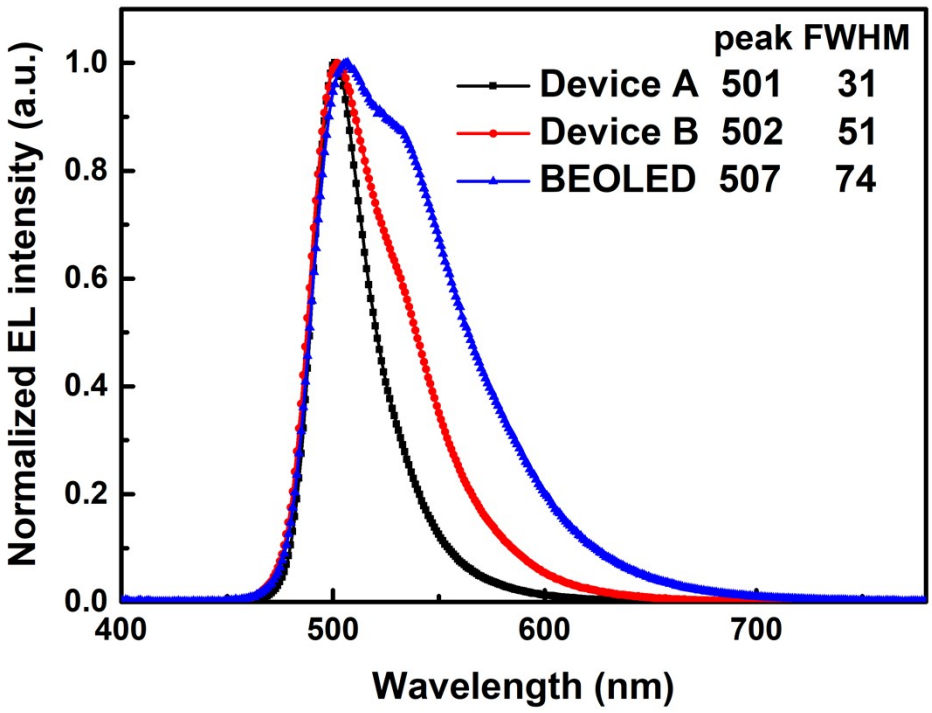

Figure S3 Normalized EL spectra of device A, device B and BEOLED.

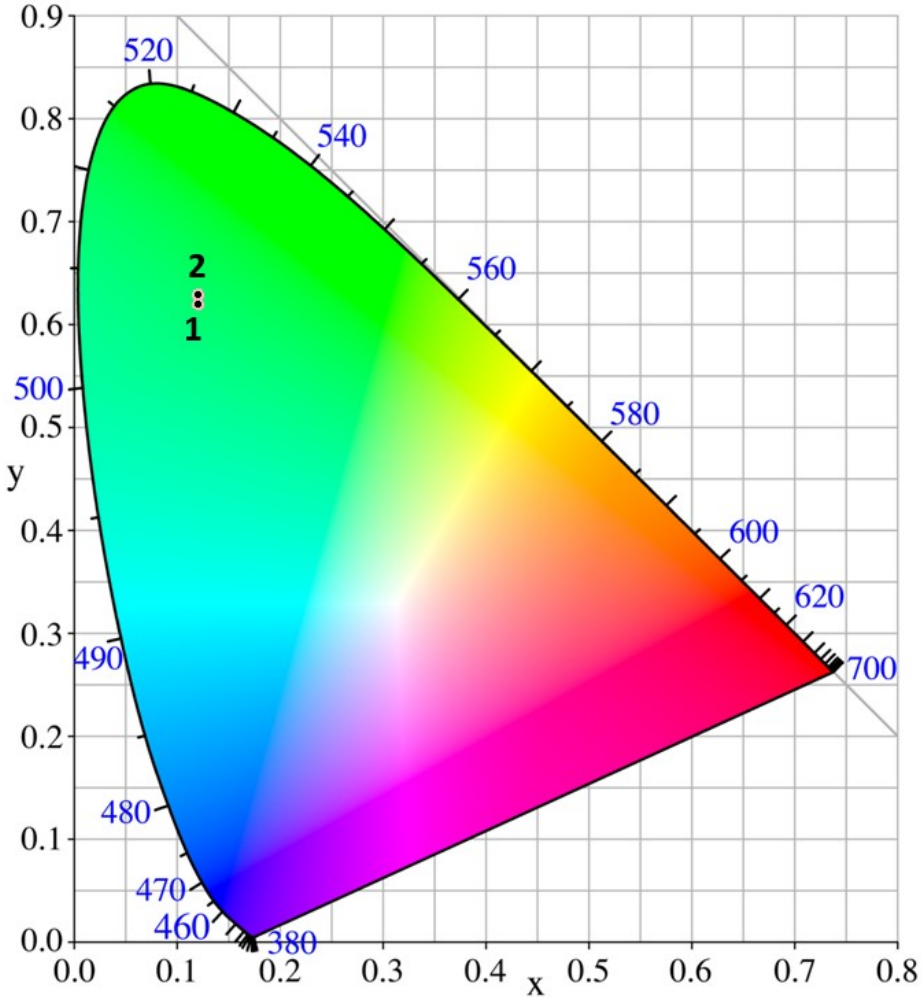

Figure S4 The change of CIE chromaticity diagram of devices A and C.