

Electronic Supplementary Information for

**Single-component electroluminescent white light-emitting diodes
based on zinc oxide quantum dots with high color rendition and
tunable correlated color temperature**

*Yongshuang Zhao,^a Yue Yang,^b Lixiang Chen,^{*a} Haohong Jiang,^a Yuanhong Hu,^a Zhaojue Lan,^c Yanqin Miao,^d Yude Wang,^{*b} Yanlian Lei,^{*a} and Furong Zhu^{*c}*

^a School of Physical Science and Technology, Chongqing Key Lab of Micro&Nano Structure Optoelectronics, Southwest University, Chongqing 400715, China

*Corresponding author. E-mail address: lxchen18@swu.edu.cn; yllei@swu.edu.cn

^b School of Materials and Energy, Yunnan University, Kunming 650091, China.

*Corresponding author. E-mail address: ydwang@ynu.edu.cn

^c Department of Physics and Institute of Advance Materials, Hong Kong Baptist University, Kowloon Tong, Hong Kong, China

*Corresponding author. E-mail address: frzhu@hkbu.edu.hk

^d MOE Key Laboratory of Interface Science and Engineering in Advanced Materials, Taiyuan University of Technology, Taiyuan, 030024, China

1. Supplementary Figures

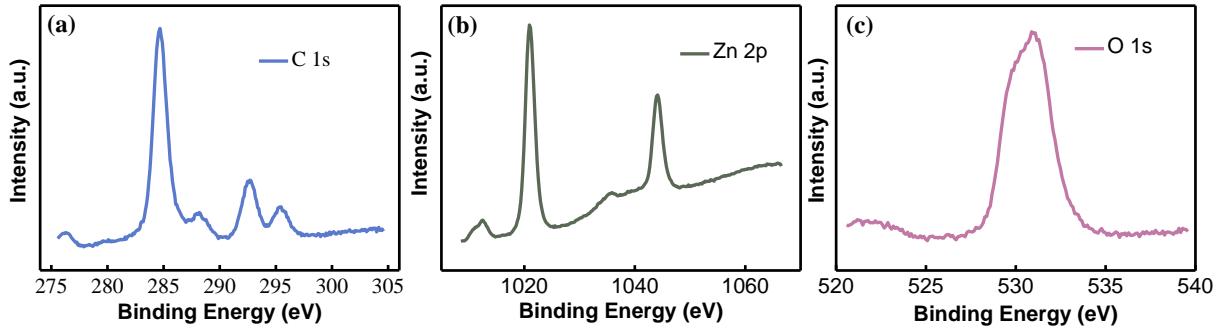


Figure S1. The high-resolution XPS spectra of (a) C 1s spectrum, (b) Zn 2p spectrum and (c) O 1s spectrum.

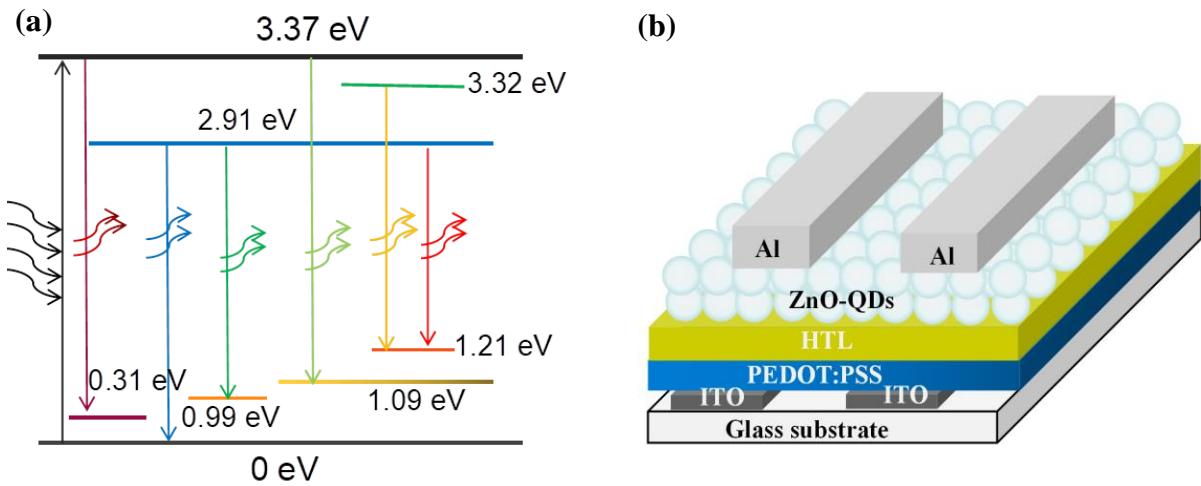


Figure S2. (a) The mechanism diagram of the corresponding relationship between the visible emission and sub-bandgap states. (b) Device architecture of the ZnO-WLEDs.

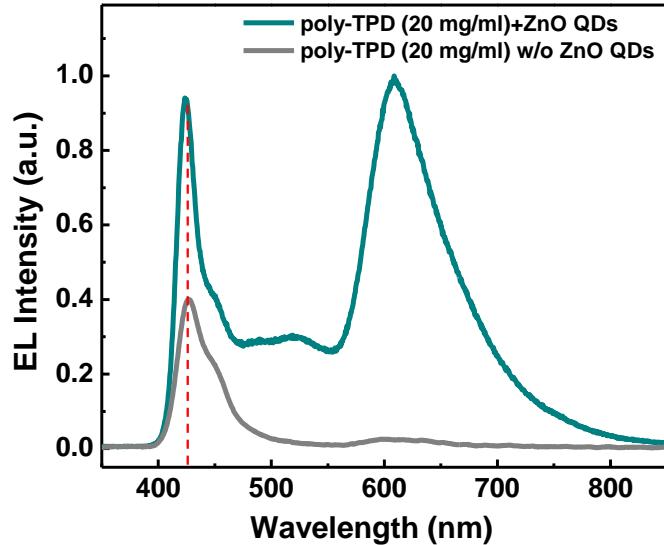


Figure S3. The normalized EL spectra for the devices with the structure of (a) ITO/PEDOT:PSS /poly-TPD/ZnO-QDs/Al, where the concentration of poly-TPD is up to 20 mg/ml and (b) ITO/PEDOT:PSS/poly-TPD (20 mg/ml)/Al without ZnO QDs.

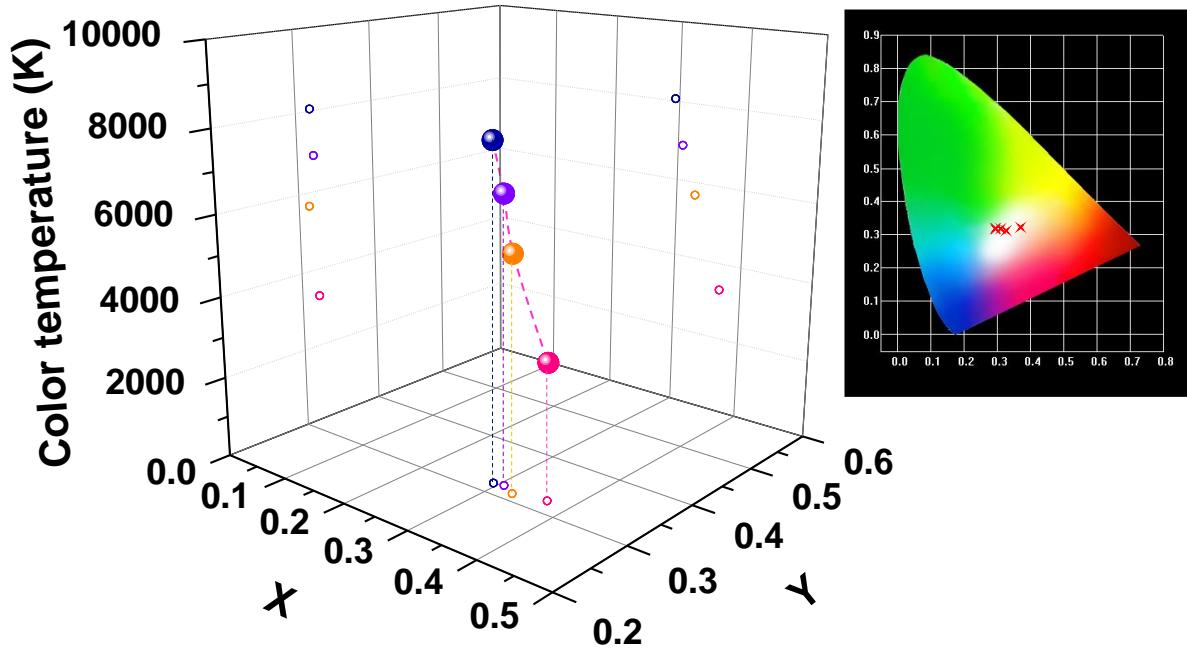


Figure S4. The CIE coordinates of the single-component electroluminescent ZnO-WLED with tunable CCT form 3303 to 8055 K. The inset shows that the CIE coordinates are distributed in white emission area.

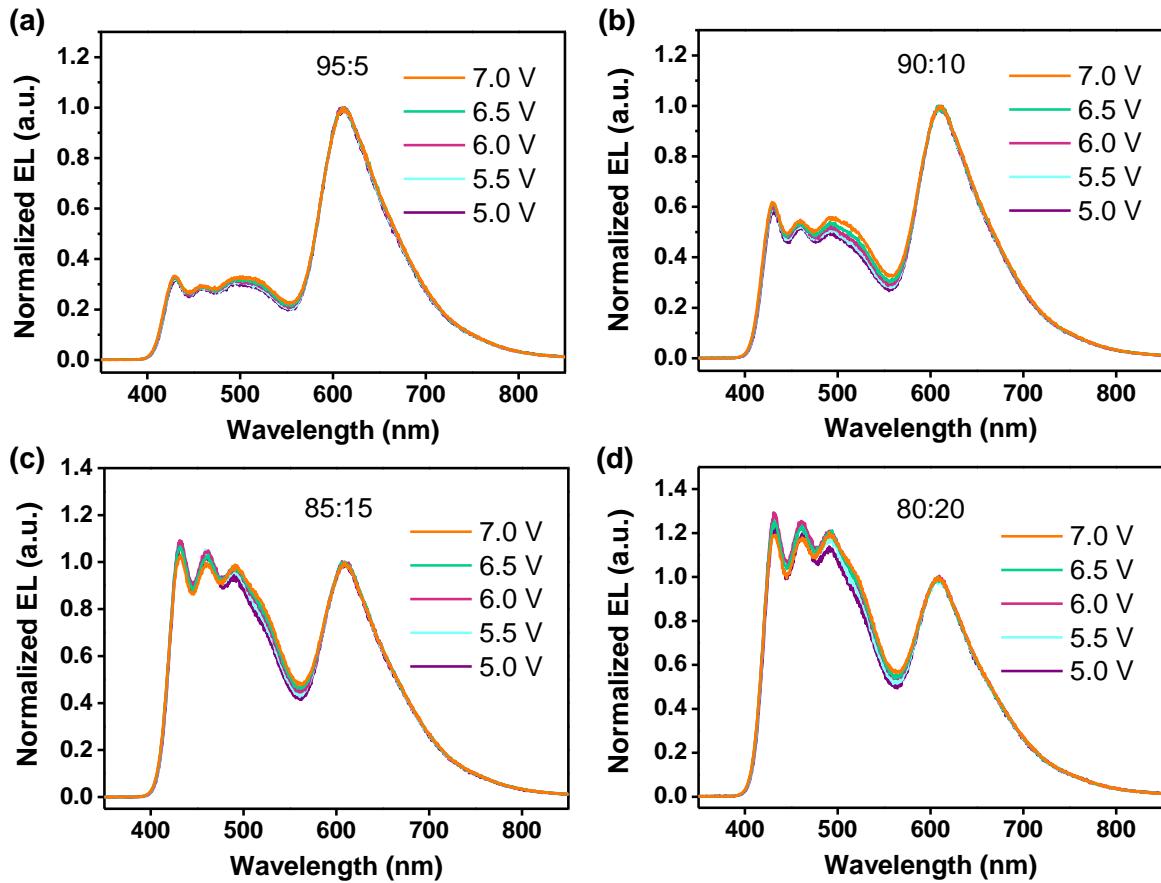


Figure S5. The normalized EL spectra of ZnO-WLEDs based on poly-TPD:TFB HTLs with different ratios under voltage bias from 5 to 7 V. (a) 95:5, (b) 90:10, (c) 85:15, and (d) 80:20.

2. Supplementary Tables

Table S1. A summary of the performance parameters obtained for the ZnO-WLEDs based on poly-TPD with various concentration.

Poly-TPD	V_{on}	L_{max}	Current efficiency	(x, y)
	(V)	(cd/m ²)	(cd/A)	
5 mg/ml	2.0	343	0.06	(0.347, 0.299)
8 mg/ml	2.0	494	0.08	(0.358, 0.296)
11 mg/ml	2.0	594	0.09	(0.367, 0.310)
14 mg/ml	2.0	677	0.11	(0.392, 0.326)

Table S2. A summary of the performance parameters obtained for the ZnO-WLEDs based on poly-TPD:TFB HTLs with different ratios.

Poly-TPD:TFB (14 mg/ml)	V_{on}	L_{max}	Current efficiency	(x, y)
	(V)	(cd/m ²)	(cd/A)	
95:5	2.0	586	0.07	(0.372, 0.321)
90:10	2.0	719	0.09	(0.327, 0.310)
85:15	2.0	1214	0.10	(0.301, 0.317)
80:20	2.0	934	0.10	(0.294, 0.315)