

Electronic Supplementary Information (ESI)

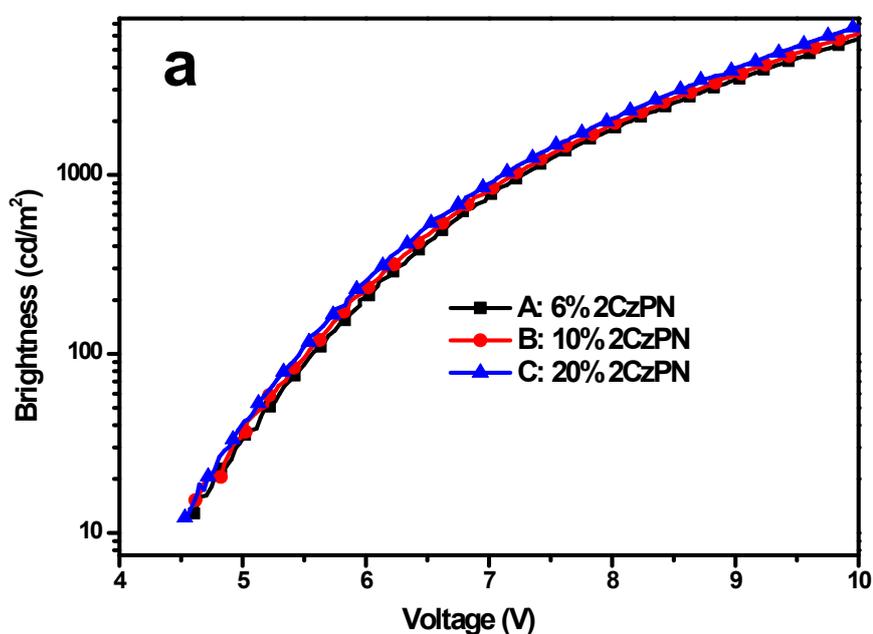
Highly efficient and color stable hybrid warm white organic light-emitting diodes using a blue material with thermally activated delayed fluorescence

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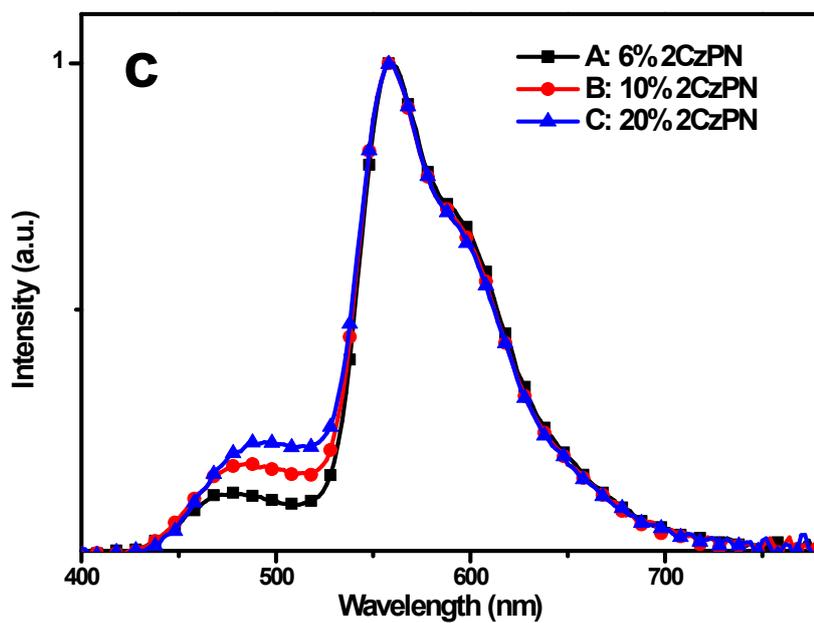
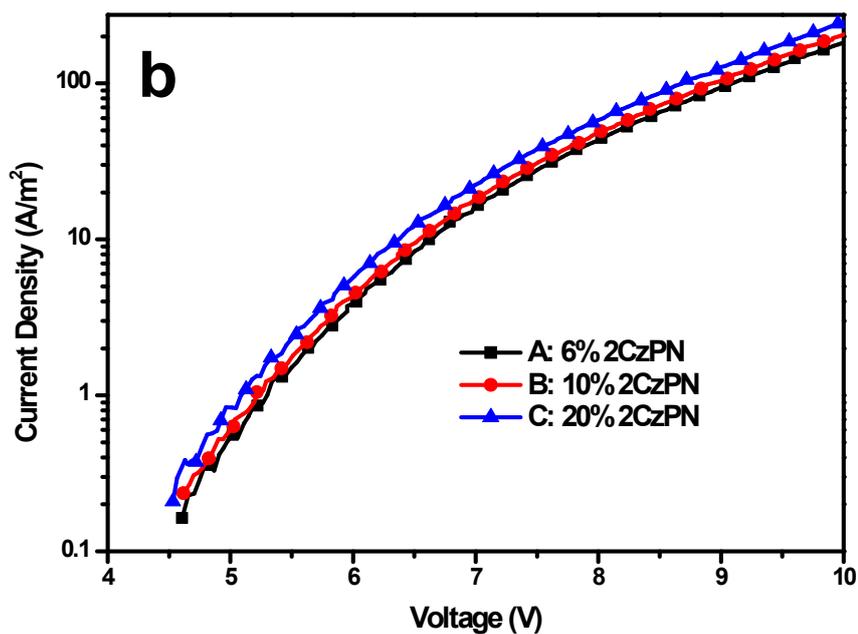
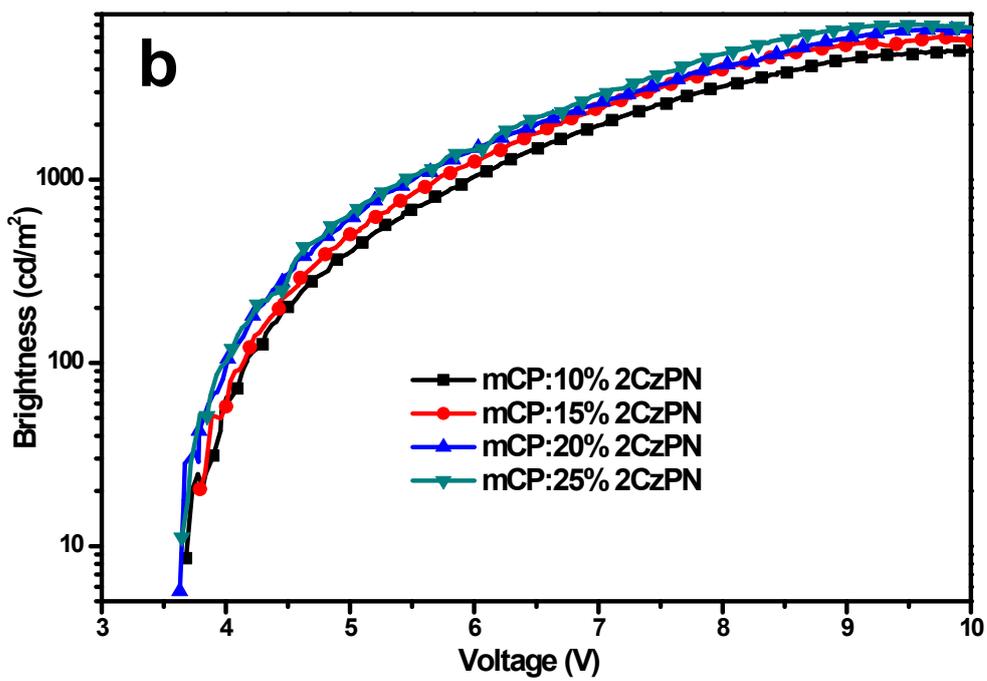
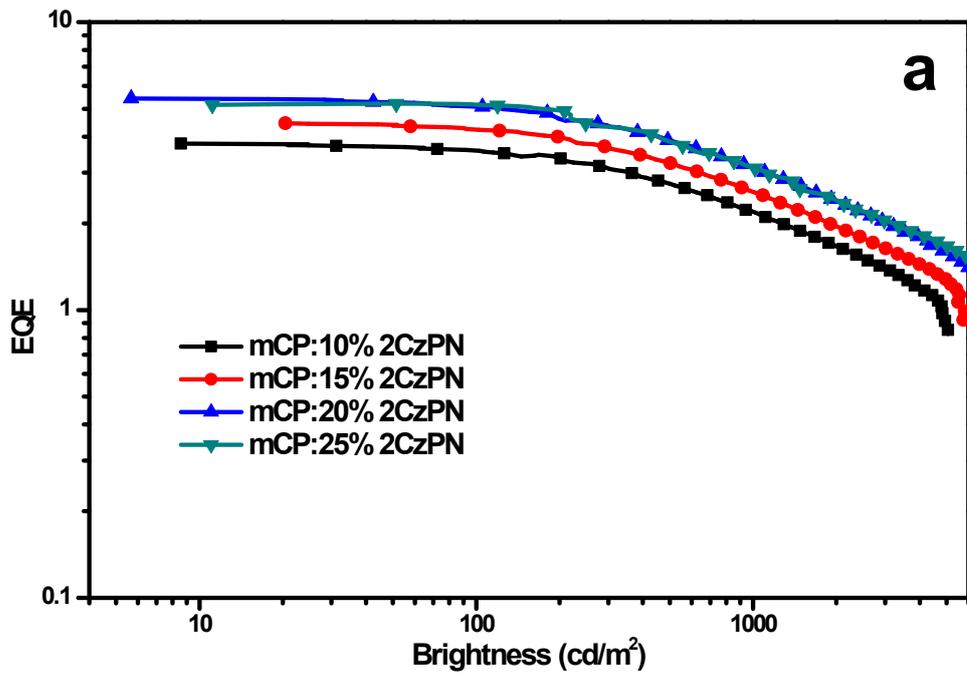


Figure S1: (a) Current density-voltage characteristics of device A-C. (b) Current efficiency-brightness characteristics of device A-C. (c) Electroluminescence spectra of device A-C.



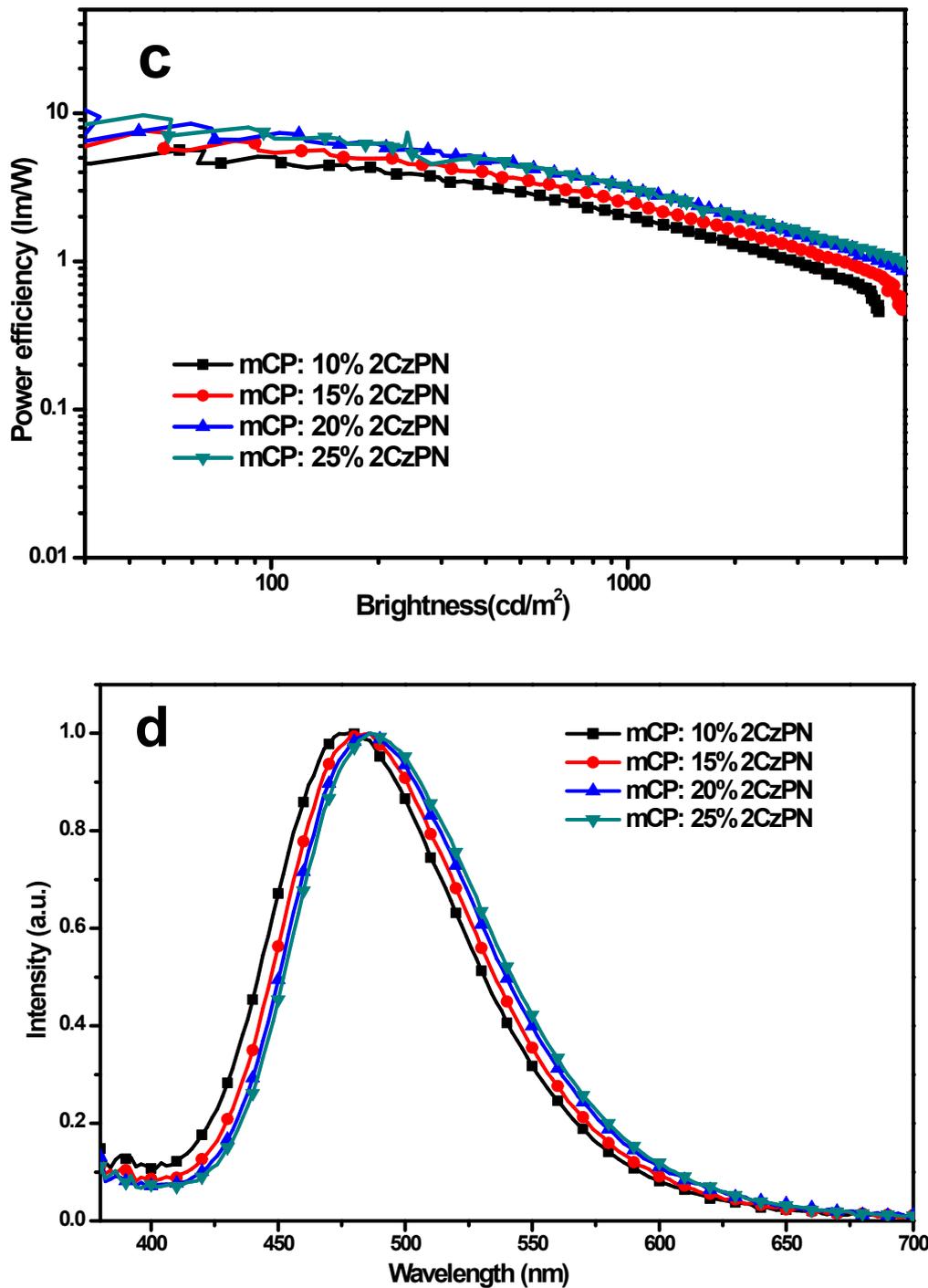
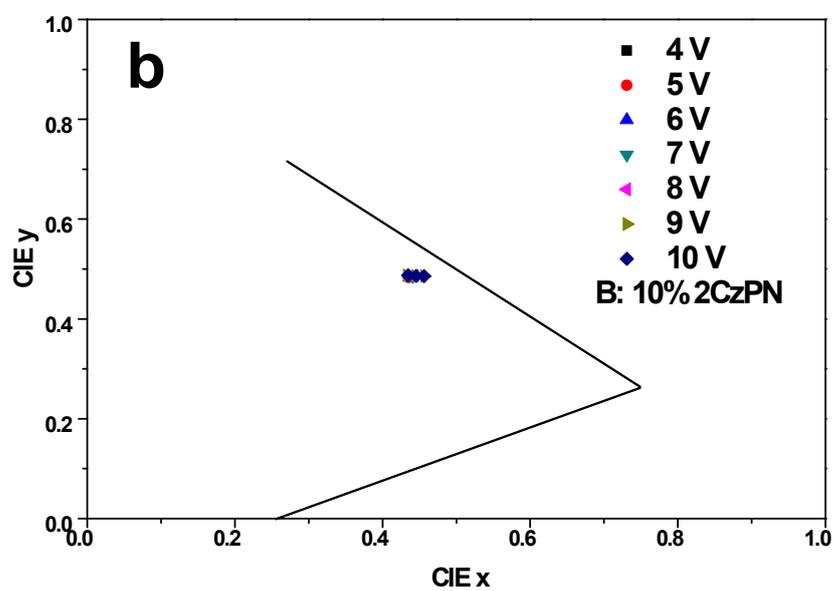
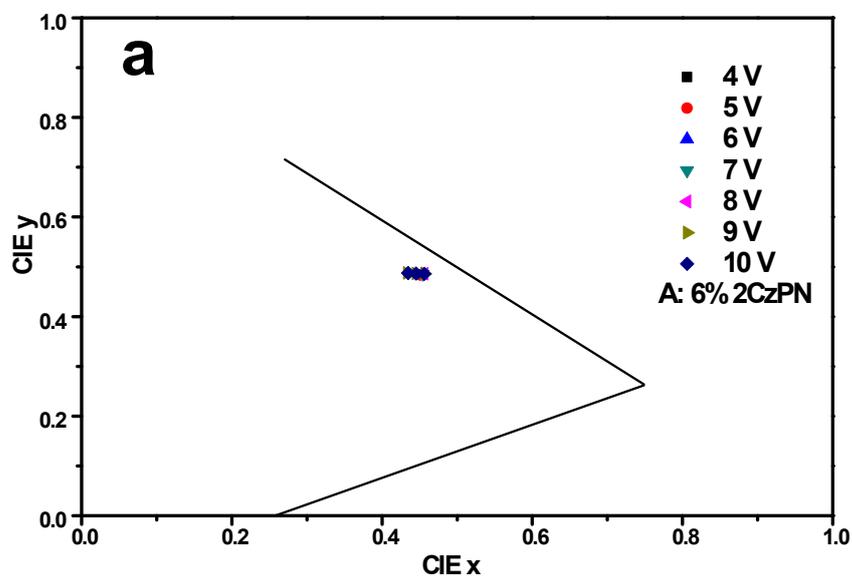


Figure S2: (a) EQE-brightness characteristics of devices. (b) Voltage-brightness characteristics of devices. (c) Power efficiency-brightness characteristics of devices. (d) Electroluminescence spectra of blue devices. The device structures are ITO/HATCN (50 nm)/NPB (40 nm)/TCTA (10 nm)/EMLs (30 nm)/TAZ (40 nm)/LiF

(0.5 nm)/ Al (150 nm). Where the EMLs are mCP: 10% 2CzPN, mCP: 15% 2CzPN, mCP: 20% 2CzPN and mCP: 25% 2CzPN, respectively.



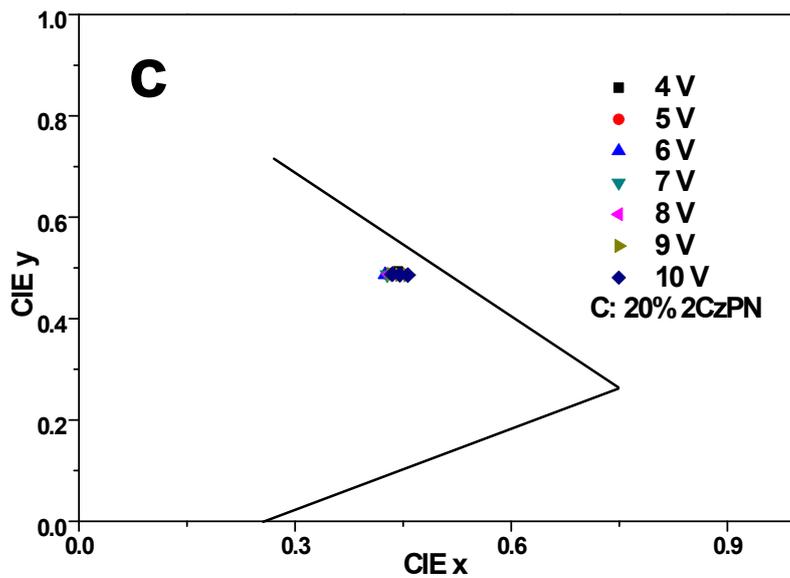
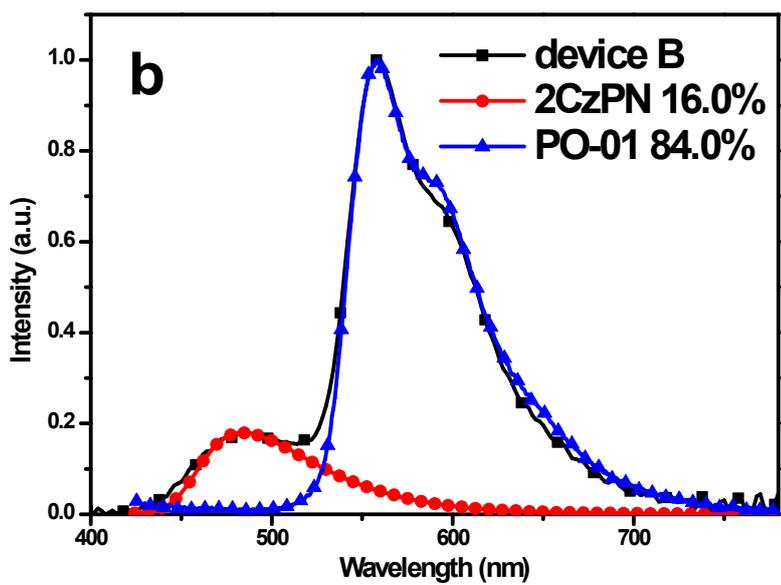
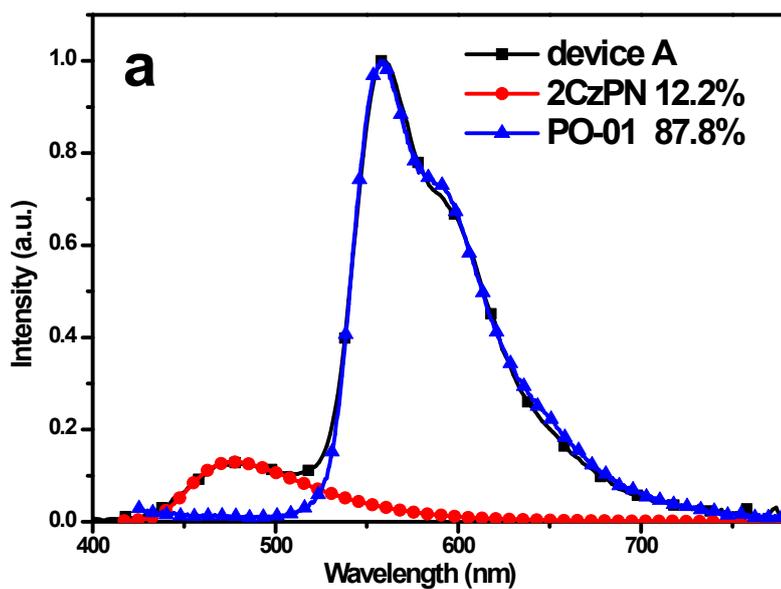


Figure S3: (a) The CIE coordinates of the device A with increasing voltage. (b) The CIE coordinates of the device B with increasing voltage. (c) The CIE coordinates of the device C with increasing voltage.



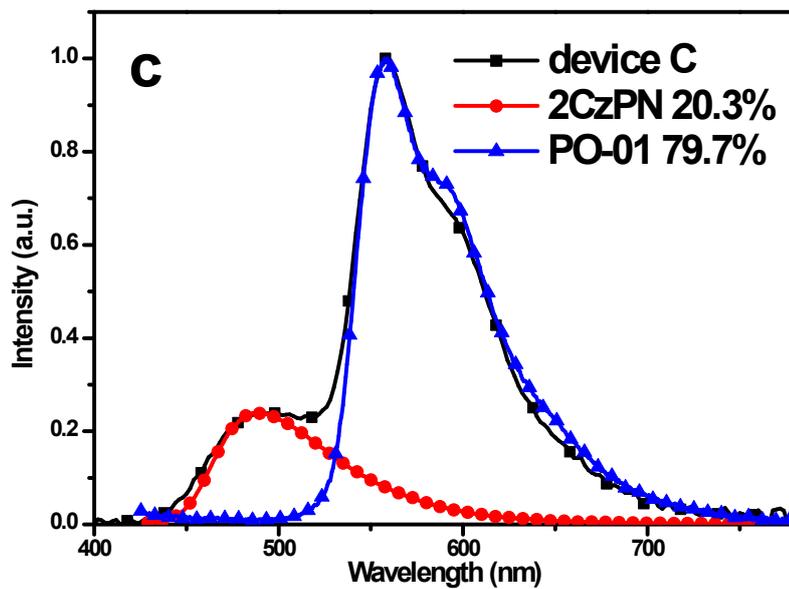


Figure S4: (a) The spectrum of device A and the separated spectra of 2CzPN and PO-01. (b) The spectrum of device B and the separated spectra of 2CzPN and PO-01. (c) The spectrum of device C and the separated spectra of 2CzPN and PO-01.

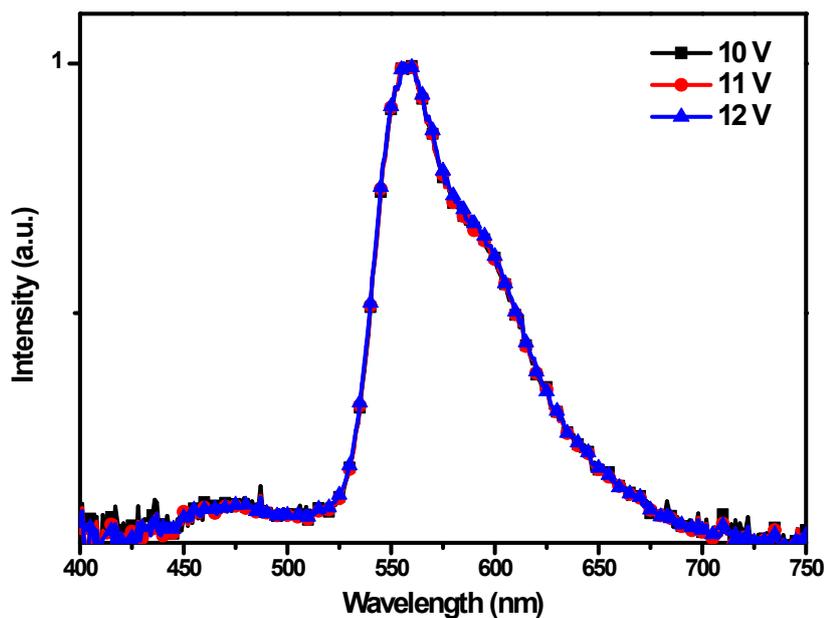


Figure S5: The spectra of device A measured using the integrating sphere.

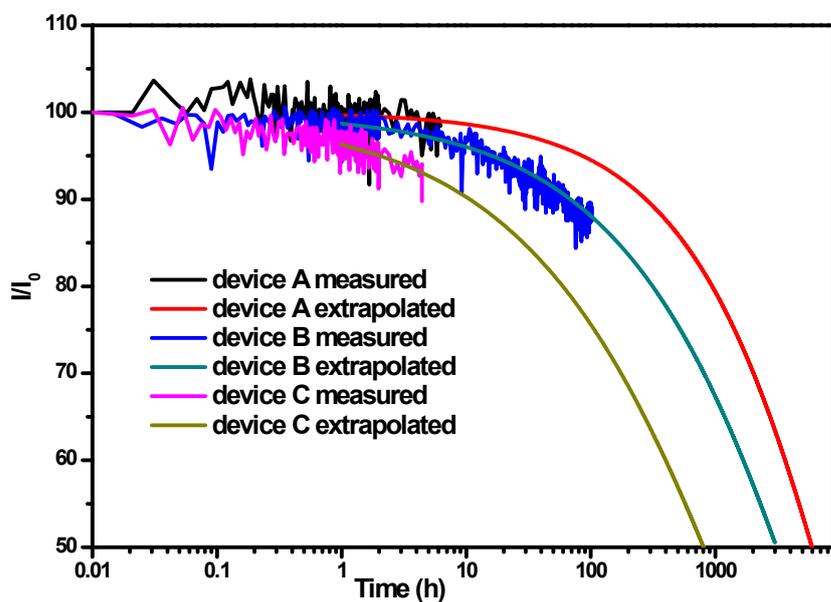
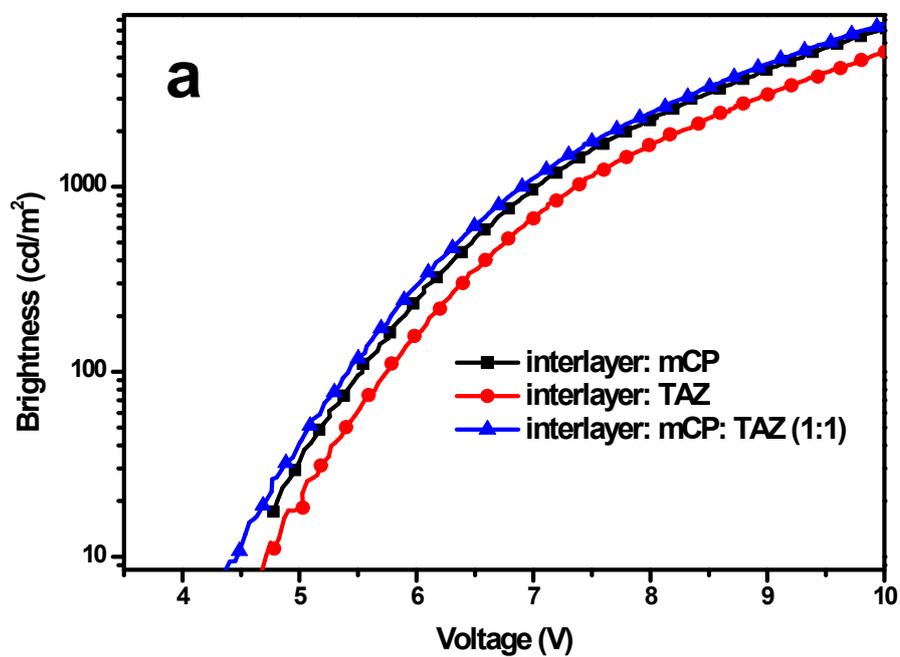
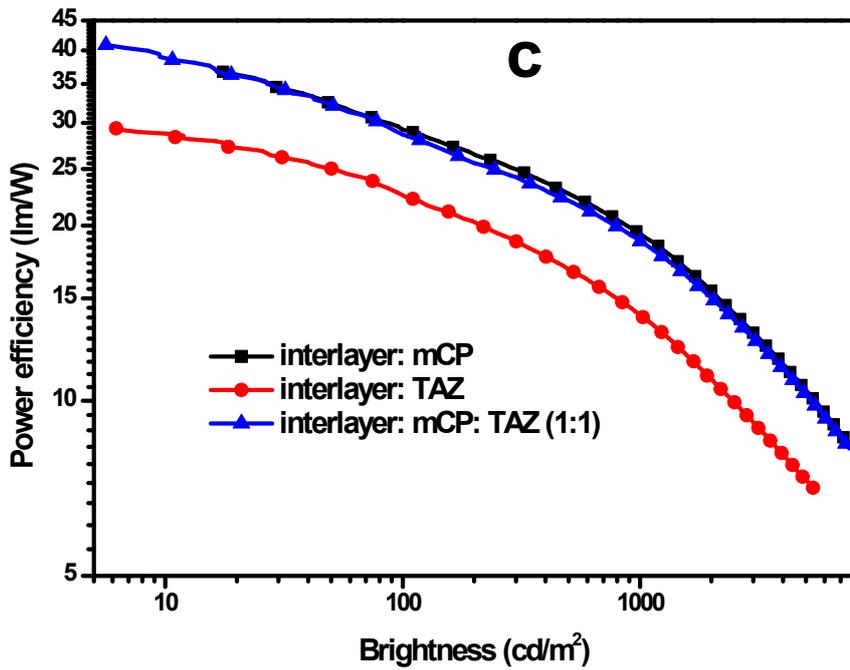
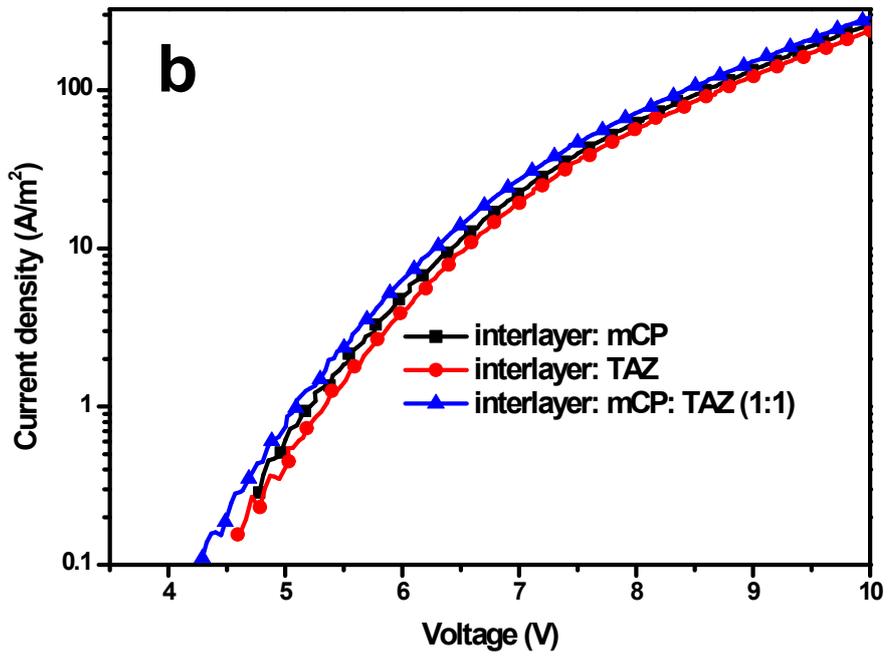


Figure S6: The lifetimes of the devices.





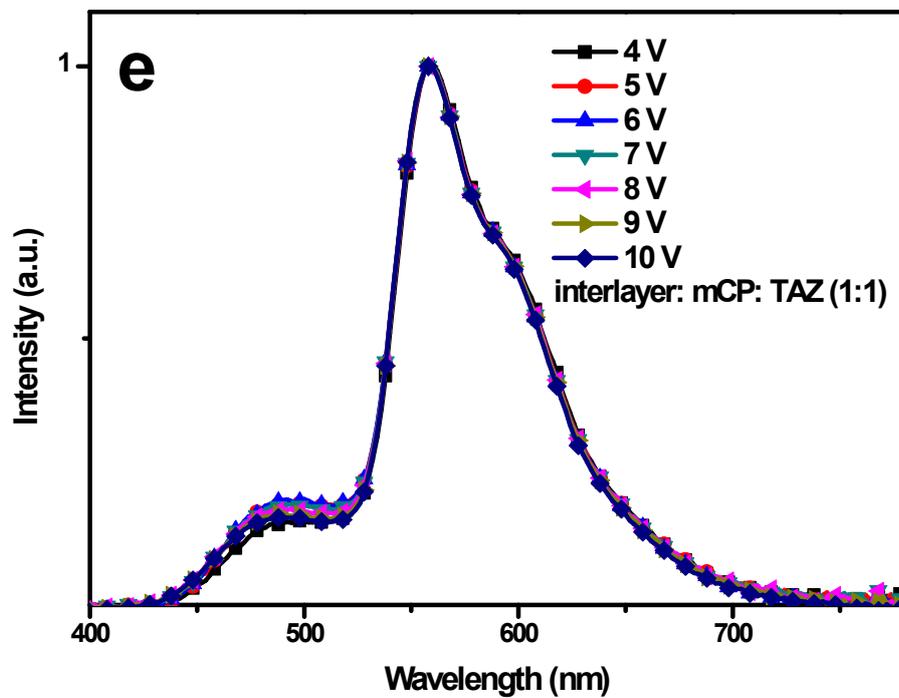
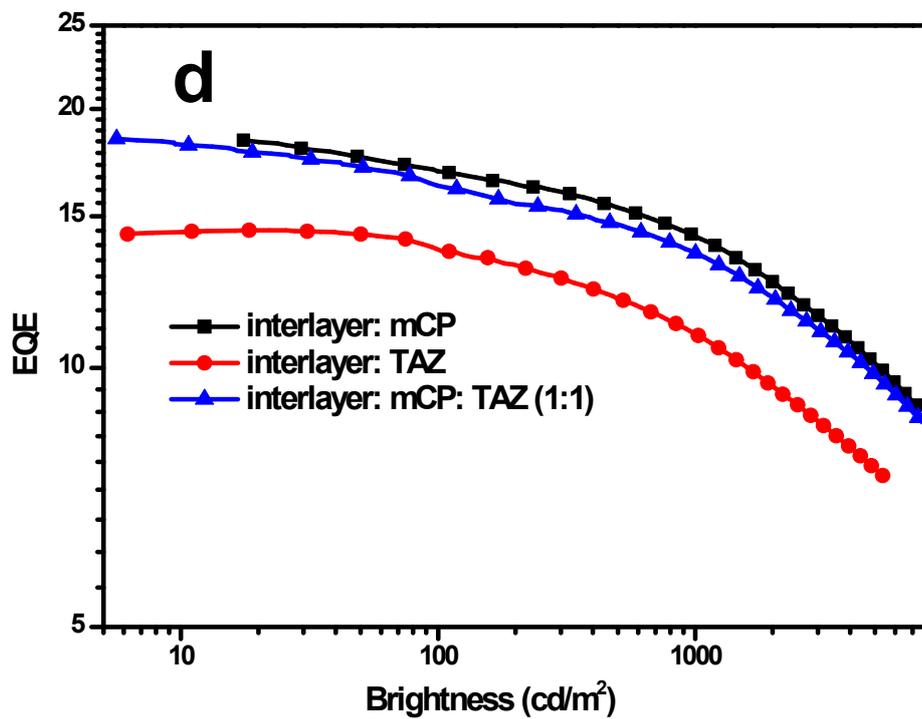


Figure S7: (a) Current density-voltage characteristics of devices with interlayer of mCP, TAZ or mCP: TAZ (1:1). (b) Voltage-brightness characteristics of devices with interlayer of mCP, TAZ or mCP: TAZ (1:1). (c) Power efficiency-brightness characteristics of devices with interlayer of mCP, TAZ or mCP: TAZ (1:1). (d) EQE-brightness characteristics of devices with interlayer of mCP, TAZ or mCP: TAZ (1:1). (e) Electroluminescence spectra of device with interlayer of mCP: TAZ (1:1).