

Supporting Information

Deep-red light-emitting electrochemical cells based on phosphor-sensitized thermally activated delayed fluorescence

Yin Chen,^{a+} Yun-Xin Wang,^{b+} Chin-Wei Lu,^{*,b} and Hai-Ching Su^{*,a}

^a *Institute of Lighting and Energy Photonics, National Yang Ming Chiao Tung University, Tainan 71150, Taiwan*

^b *Department of Applied Chemistry, Providence University, Taichung 43301, Taiwan*

⁺ *Equal contribution*

To whom to correspond:

E-mail: haichingsu@nycu.edu.tw; Tel: +886-6-3032121-57792

E-mail: cwlu@pu.edu.tw; Tel: +886-4-26328001-15213

Contents

1. Fitted contribution percentages of the host and the guest PL emissions of the host-guest films....	S2
2. Transient PL of the host-guest films at the host and the guest emission bands.....	S3-S5
<u>3. Temporal evolution of EL spectra of the deep-red LECs.....</u>	<u>S6</u>
4. Time-dependent current density, light output, and EQE of the host-guest LECs.....	S7-S9
<u>5. Time-dependent current density, light output, and EQE of the host-only LEC.....</u>	<u>S10</u>

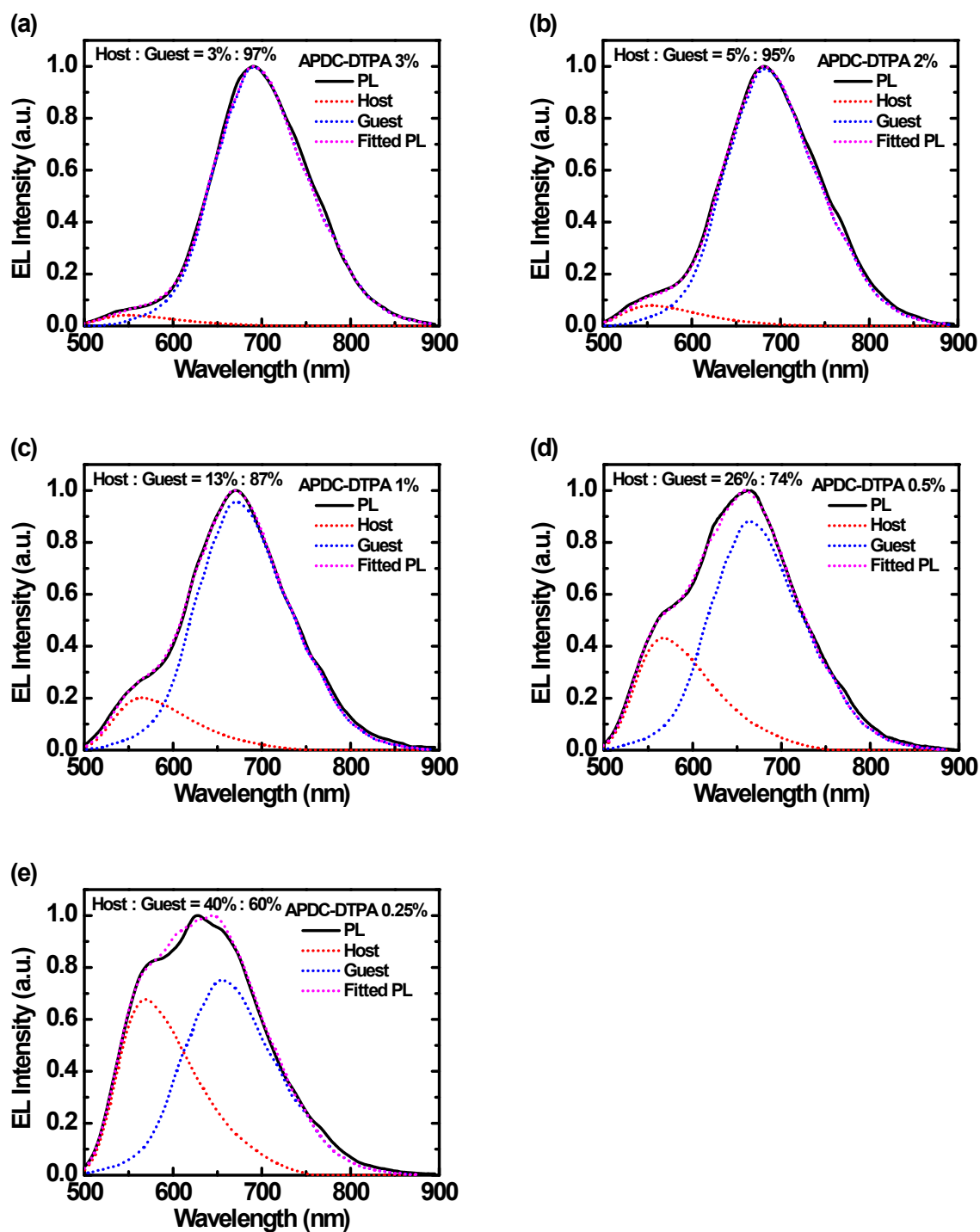


Fig. S1 Fitted contribution percentages of the host and the guest PL emissions of the host-guest films doped with guest of (a) 3, (b) 2, (c) 1, (d) 0.5, and (e) 0.25 wt.%.

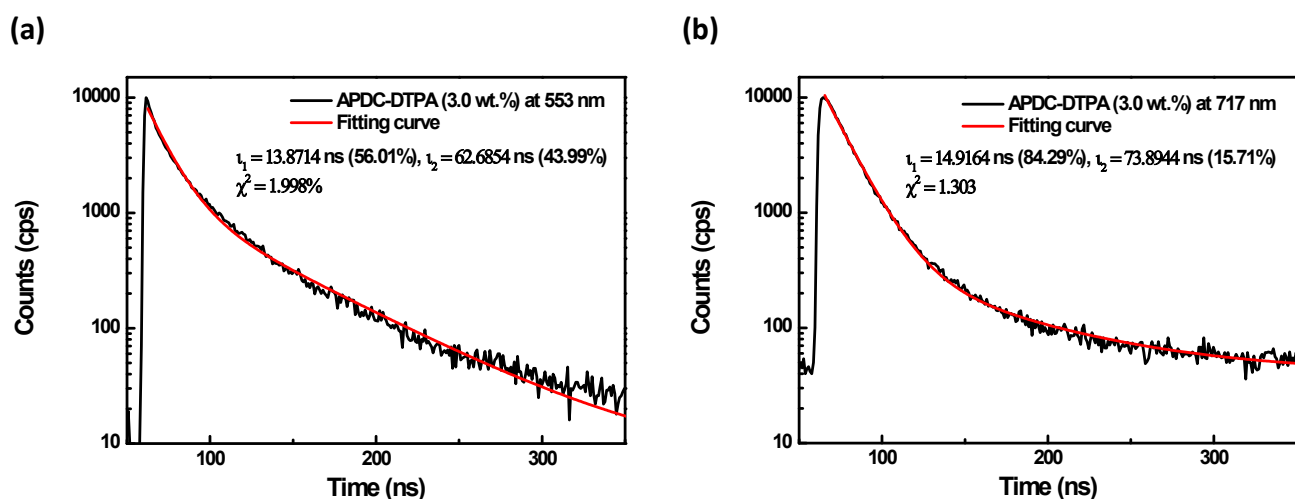


Fig. S2 Transient PL of the host-guest films (complex **1** (77 wt.%), APDC-DTPA (3 wt.%), and [BMIM⁺(PF₆)⁻] (20 wt.%)) at (a) the host emission band and (b) the guest emission band.

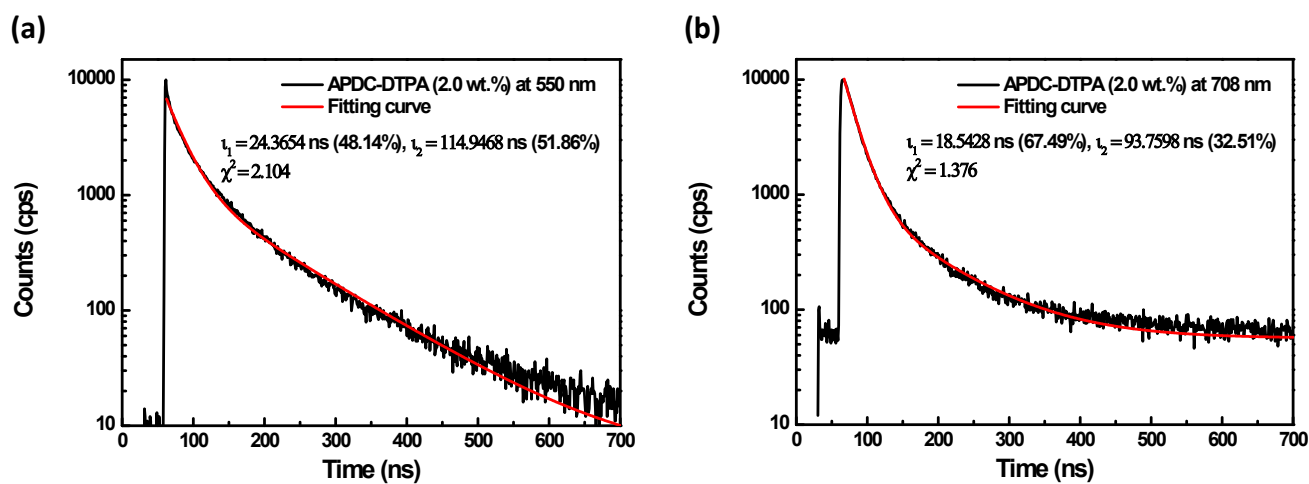


Fig. S3 Transient PL of the host-guest films (complex **1** (78 wt.%), APDC-DTPA (2 wt.%), and [BMIM⁺(PF₆)⁻] (20 wt.%)) at (a) the host emission band and (b) the guest emission band.

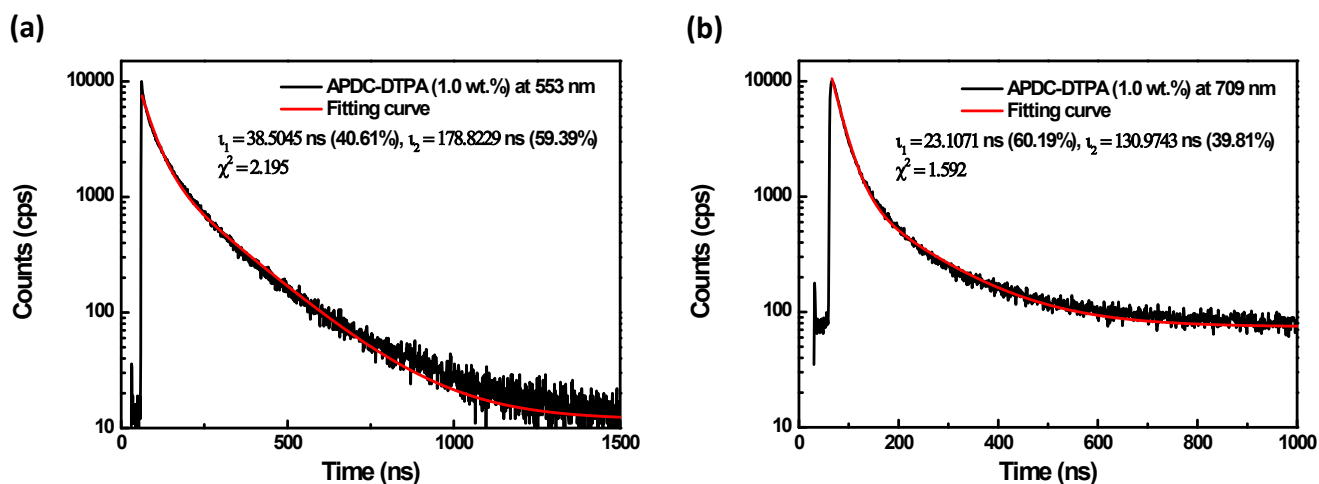


Fig. S4 Transient PL of the host-guest films (complex **1** (79 wt.%), APDC-DTPA (1 wt.%), and [BMIM⁺(PF₆)⁻] (20 wt.%)) at (a) the host emission band and (b) the guest emission band.

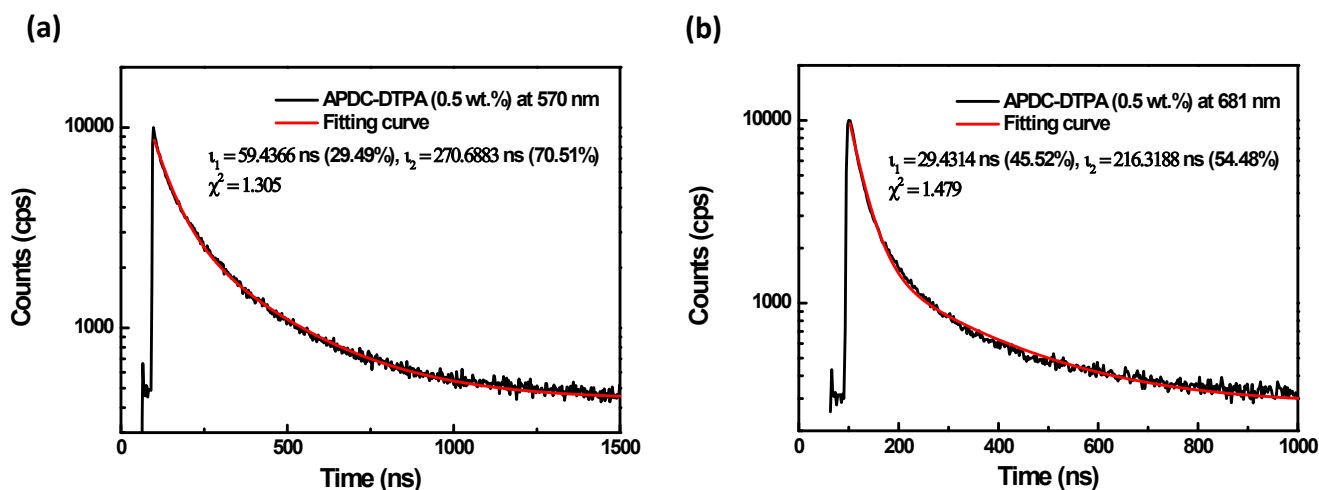


Fig. S5 Transient PL of the host-guest films (complex **1** (79.5 wt.%), APDC-DTPA (0.5 wt.%), and [BMIM⁺(PF₆)⁻] (20 wt.%)) at (a) the host emission band and (b) the guest emission band.

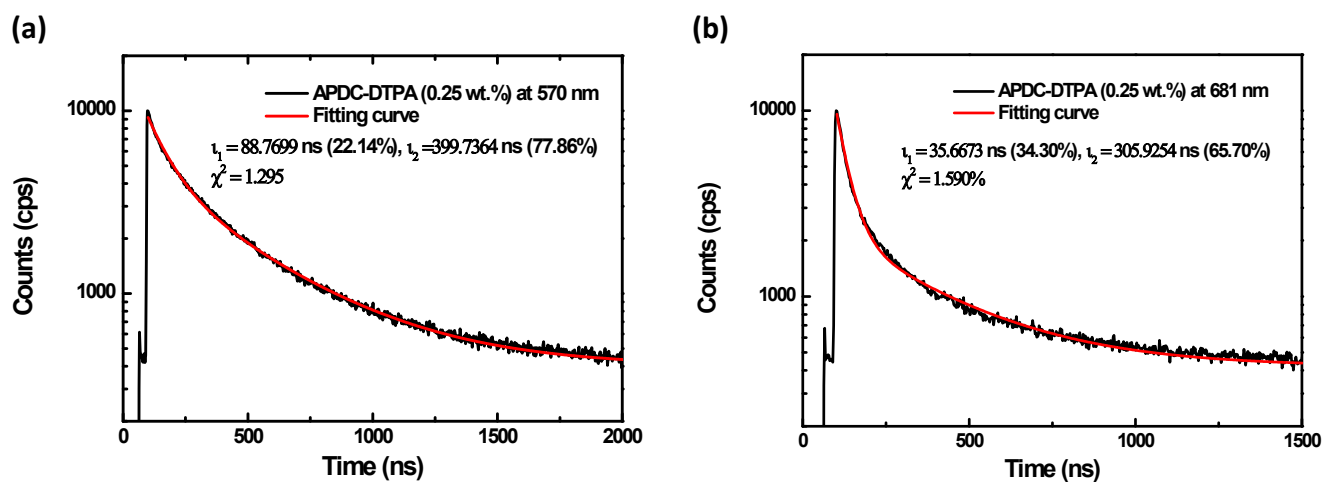


Fig. S6 Transient PL of the host-guest films (complex **1** (79.75 wt.%), APDC-DTPA (0.25 wt.%), and [BMIM⁺(PF₆)⁻] (20 wt.%)) at (a) the host emission band and (b) the guest emission band.

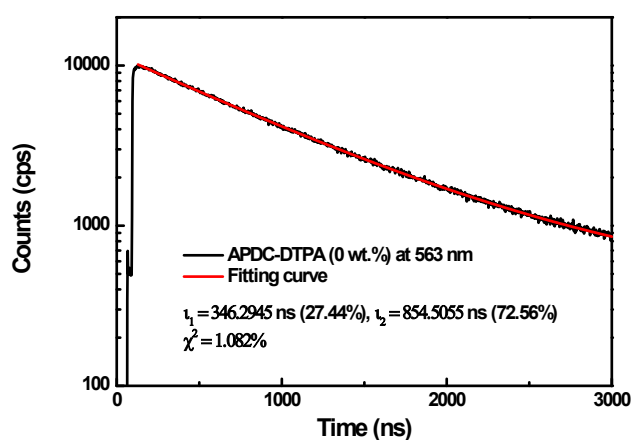


Fig. S7 Transient PL of the host films (complex **1** (80 wt.%) and [BMIM⁺(PF₆)⁻] (20 wt.%)).

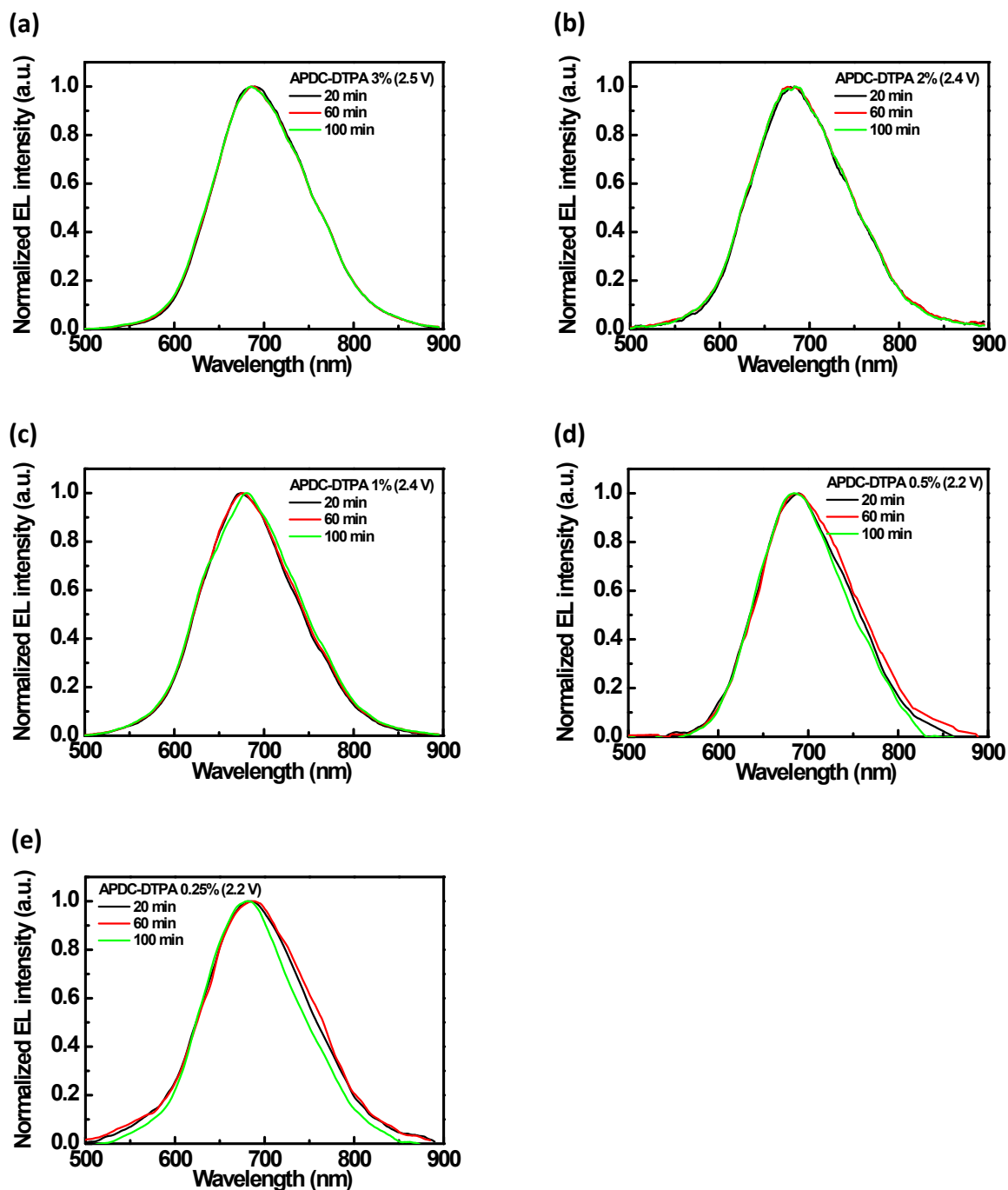


Fig. S8 Temporal evolution of EL spectra for the phosphor-sensitized deep-red TADF LECs based on complex **1** doped with [BMIM⁺(PF₆)⁻] (20 wt.%) and APDC-DTPA of (a) 3, (b) 2, (c) 1, (d) 0.5, and (e) 0.25 wt.%.

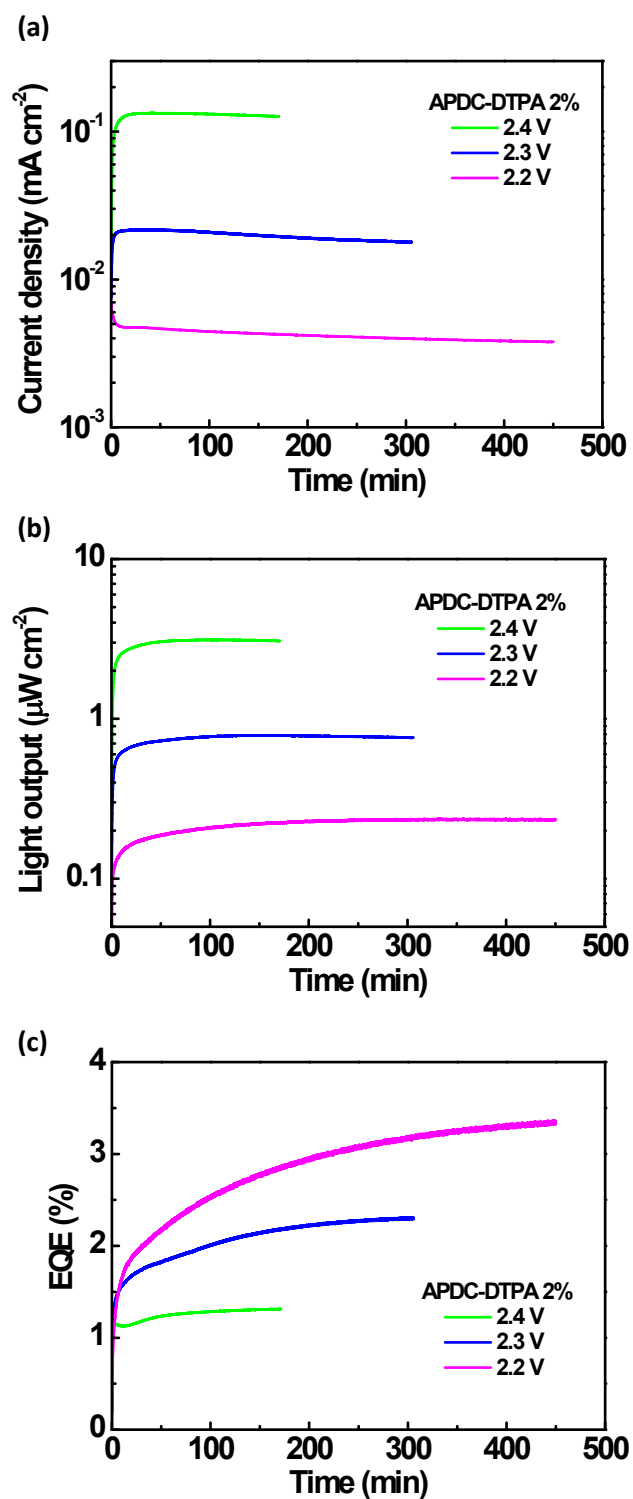


Fig. S9 Time-dependent (a) current density, (b) light output, and (c) EQE under 2.2, 2.3, and 2.4 V for the phosphor-sensitized deep-red TADF LECs based on complex **1** doped with [BMIM⁺(PF₆)⁻] (20 wt.%) and APDC-DTPA at 2%.

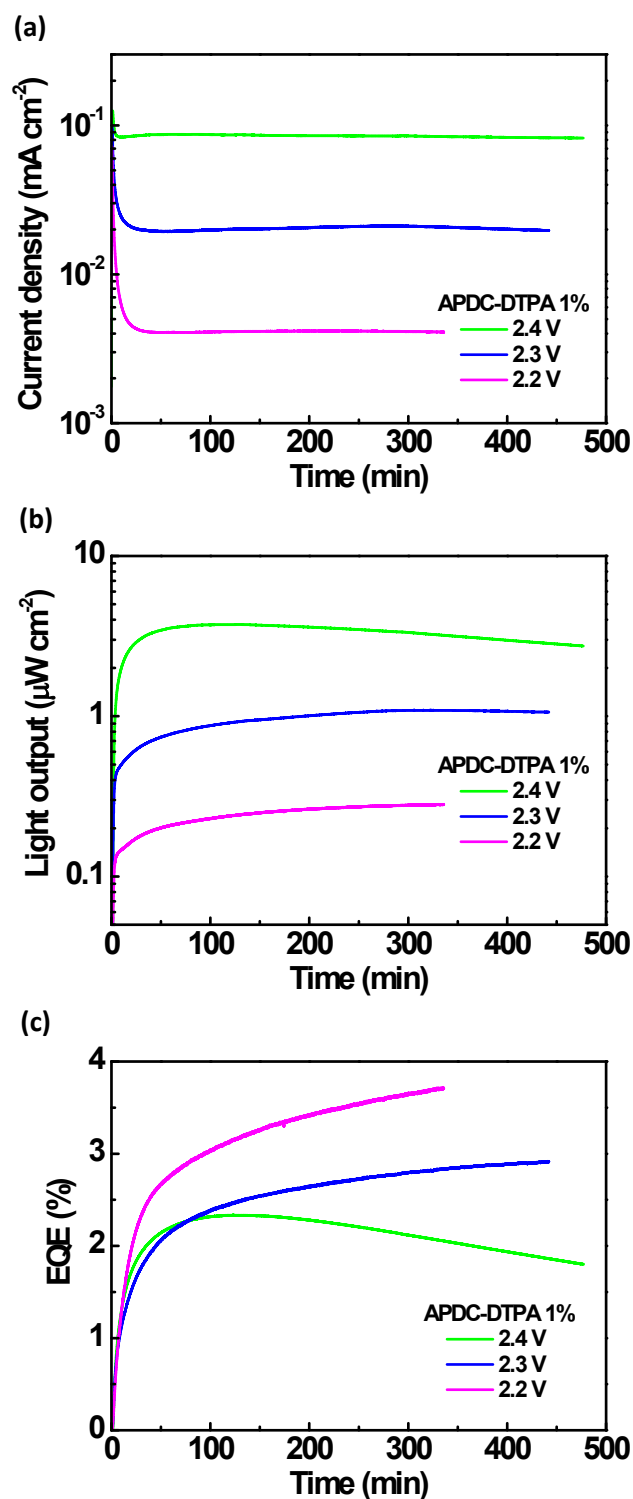


Fig. S10 Time-dependent (a) current density, (b) light output, and (c) EQE under 2.2, 2.3, and 2.4 V for the phosphor-sensitized deep-red TADF LECs based on complex **1** doped with $[\text{BMIM}^+(\text{PF}_6)^-]$ (20 wt.%) and **APDC-DTPA** at 1%.

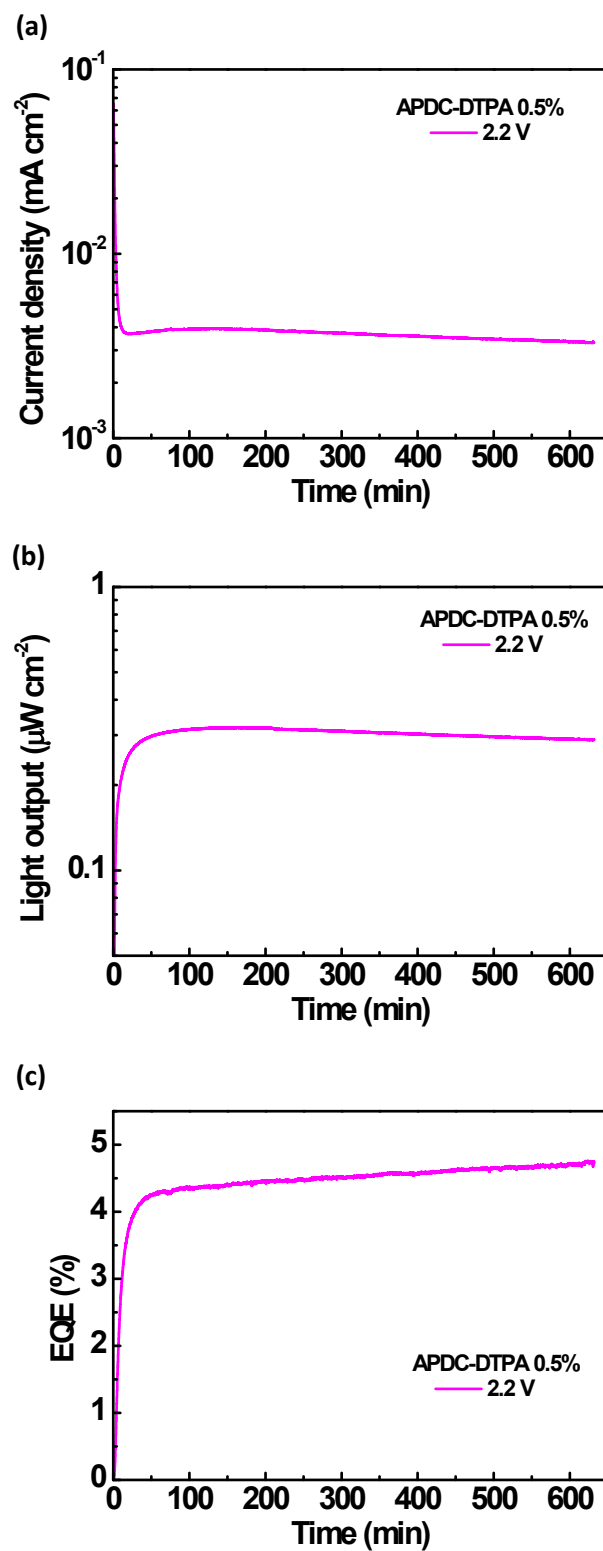


Fig. S11 Time-dependent (a) current density, (b) light output, and (c) EQE under 2.2 V for the phosphor-sensitized **deep-red** TADF LECs based on complex **1** doped with $[\text{BMIM}^+(\text{PF}_6)^-]$ (20 wt.%) and APDC-DTPA at 0.5%.

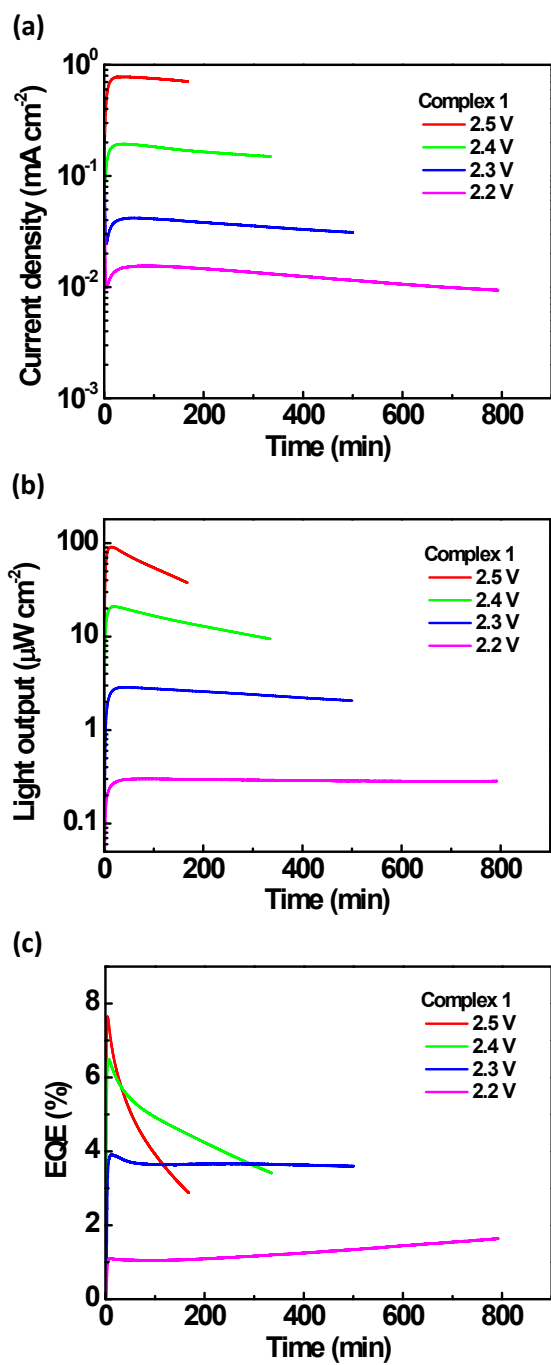


Fig. S12 Time-dependent (a) current density, (b) light output, and (c) EQE under 2.2, 2.3, 2.4, and 2.5 V for the LECs based on complex **1** doped with $[\text{BMIM}^+(\text{PF}_6)^-]$ (20 wt.%).