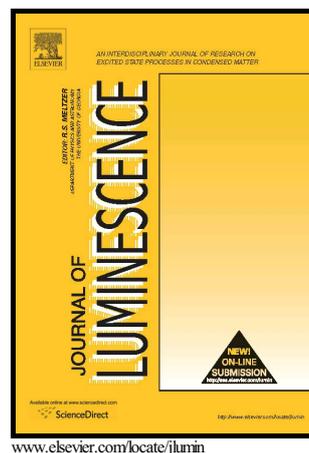


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# Solution-processable bipolar hosts based on triphenylamine and oxadiazole derivatives: synthesis and application in phosphorescent light-emitting diodes

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## ABSTRACT

Host material with enhanced and balanced charge injection/transport is essential for efficient phosphorescent organic light-emitting diodes (PhOLEDs). We synthesized two new bipolar hosts TPA-2OXD and TPA-3OXD, composed of hole-transporting triphenylamine core linked with two and three electron-transporting aromatic 1,3,4-oxadiazole derivatives respectively, aiming to enhance and balance charge injection and transport. They revealed good thermal stability ( $T_d > 300^\circ\text{C}$ ,  $T_g > 100^\circ\text{C}$ ) and homogeneous films were readily obtained by spin-coating process (roughness  $< 0.9$  nm). Multilayer PhOLEDs (ITO/PEDOT:PSS/EML/BCP/LiF/Al) have been successfully fabricated using Ir(ppy)<sub>3</sub>-doped hosts as emitting layer (EML). The maximum luminance and maximum current efficiency of TPA-2OXD-based device were 8190 cd/m<sup>2</sup> and 4.50 cd/A, much higher than 6299 cd/m<sup>2</sup> and 1.53 cd/A respectively of TPA-3OXD-based one. This has been ascribed to more appropriate ratio (2/1) of electron-/hole-transporting moieties in TPA-2OXD. The TPA-2OXD also excels conventional host PVK in terms of device performance (5774 cd/m<sup>2</sup>, 1.91 cd/A). Moreover, the turn-on voltages of TPA-2OXD- and TPA-3OXD-based devices were 4.3 V and 5.5 V respectively, much lower than 7.4 V of PVK-based one. Current results indicate that the bipolar TPA-2OXD and TPA-3OXD are promising host materials capable of being fabricated by wet processes.

Keywords: bipolar host; phosphorescent OLEDs; triphenylamine; oxadiazole

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