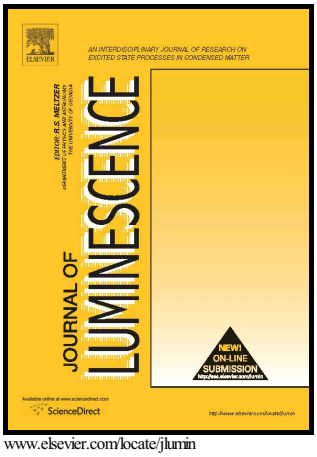

www.elsevier.com/locate/jlumin

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

Yu-Ru Pu, Yun Chen

PII: S0022-2313(15)30066-1
DOI: http://dx.doi.org/10.1016/j.jlumin.2015.09.026
Reference: LUMIN13612

To appear in: *Journal of Luminescence*

Received date: 5 June 2015
Revised date: 4 September 2015
Accepted date: 23 September 2015

Cite this article as: Yu-Ru Pu and Yun Chen, Solution-processable bipolar hosts based on triphenylamine and oxadiazole derivatives: synthesis and application i phosphorescent light-emitting diodes, *Journal of Luminescence* http://dx.doi.org/10.1016/j.jlumin.2015.09.026

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

Yu-Ru Pu and Yun Chen*

Department of Chemical Engineering, National Cheng Kung University, Tainan City, Taiwan.
E-mail: yunchen@mail.ncku.edu.tw

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^{o}C, T_g > 100^{o}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 $Ir(ppy)_3$-doped hosts as emitting layer (EML). The maximum luminance and maximum current efficiency of TPA-2OXD-based device were 8190 cd/m^2 and 4.50 cd/A, much higher than 6299 cd/m^2 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^2, 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