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Blue Emitting 1,8-Naphthalimides with Electron Transport Properties for Organic Light Emitting Diode Applications

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Abstract

In this article, the synthesis, characterization and use of two novel naphthalimides as electron-transporting emitter materials for organic light emitting diode (OLED) applications are reported. The molecules were obtained by substituting electron donating chloro-phenoxy group at the C-4 position. A detailed optical, thermal, electrochemical and related properties were systematically studied. Furthermore, theoretical calculations (DFT) were performed to get a better understanding of the electronic structures. The synthesized molecules were used as electron transporters and emitters in OLEDs with three different device configurations. The devices with the molecules showed blue emission with efficiencies of 1.89 cdA^{-1} , 0.98 lmW^{-1} , 0.71% at 100 cdm^{-2} . The phosphorescent devices with naphthalimides as electron transport materials displayed better performance in comparison to the device without any electron transporting material and were analogous with the device using standard electron transporting material, Alq₃. The results demonstrate that the naphthalimides could play a significant part in the progress of OLEDs.

Keywords: Blue, OLEDs, Electron-transport, Naphthalimide, Solvatochromism, DFT/TD-DFT.

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