DESIGN, PREPARATION AND STUDIES OF NAPHTHALIMIDE MATERIALS

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Development of orange red thermally-activated-delayed-fluorescence (TADF) emitters has been lagging behind when compared with blue and green fluorophores. TADF occurs due to reverse intersystem crossing. It is possible when the energy difference between excited singlet (S_1) and triplet (T_1) energy levels is very low [1]. External quantum effiencies (EQEs) of TADF OLEDs have been rapidly boosting in past few years The most efficient red TADF-OLED reported to date, based on a heptaazaphenalene derivative, has a state-of-the-art EQE of 17.5% with an EL emission maximum (λ_{EL}) at ≈610 nm and CIE coordinates of (0.60, 0.40). However, there is still much room for improving the overall performance due to poor color purity and significant roll-off at high current density. Thus, further developing high-performance pure-red TADF materials and their devices with CIE coordinates close to the National Television System Committee (NTSC) standard red (0.67, 0.33) is a key challenge for OLED technology. However, the highest EQEs of orange–red TADF OLEDs are significantly lower compared to those of blue and green TADF OLEDs [2].

Four 1,8-naphthalimide based compounds were synthesized. The synthesis of these compounds was carried out in three steps. It included bromination, imidazation and Buchwald-Hartwig coupling. The structures of the synthesized compounds were confirmed by nuclear magnetic resonance spectroscopy and mass spectrometry. Photophysical, electrochemical, thermal properties and performance in OLEDs will be reported.

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[2] You-Jun. Y, Xun. T, Ting. G, Yi. Y, Zuo-Quan. J, Liang-Sheng. L, Alleviating Efficiency Roll-Off of Hybrid Single-Emitting Layer WOLED Utilizing Bipolar TADF Material as Host and Emitter, Organic Electronics **73**, 240-246 (2019).