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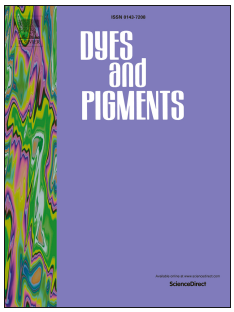

Highly efficient chrysene emitters based on optimized side groups for deep blue emission

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Highly efficient chrysene emitters based on optimized side groups for deep blue emission

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Abstract

Diphenylamine substituted with methyl groups was used as a side group to realize high efficiency chrysene deep blue emitters. Three chrysene derivatives substituted with side groups were successfully synthesized: tetra-o-tolylchrysene-6,12-diamine (o-DPAC), tetra-m-tolylchrysene-6,12-diamine (m-DPAC), and tetra-p-tolyl-chrysene-6,12-diamine (p-DPAC). The maximum PL (Photoluminescence) emission wavelengths of the three materials in solution and in a film were shortest for o-DPAC and longest for p-DPAC. The highly twisted structure of o-DPAC showed the narrowest FWHM (47 nm) in the deep blue region with a PL_{max} of 449 nm in the film state. The three synthesized materials showed excellent thermal stability with a high T_d over 370 °C. EML was applied to a non-doped OLED device considering the band gap of synthesized materials. Among the synthesized materials, the m-DPAC device achieved excellent EL performance of CIE x, y (0.14, 0.09), 4.89 cd/A, 3.60 lm/W, and an EQE of 6.18 %.

1. Introduction

Organic light emitting diodes (OLEDs) have been studied in various fields such as displays and biosensors due to their tunable optical and electronic properties. Organic light-emitting diodes (OLEDs) for displays were reported by the Tang group in 1987 and have been the subject of much research due to the applicability of full-color flat panel displays, next generation lighting, and flexible displays [1-6]. In OLEDs, electrons and holes are injected into the emitting layer, and emission is generated by the exciton formed inside. Thus, the characteristics of the emitting material are very important for determining the efficiency, wavelength, and lifetime of the OLED device. Therefore, it is essential to develop red, green, and blue emitting materials with pure color emission, high efficiency, and good thermal properties to realize full color OLED displays with high efficiency [7-12].

In particular, the Commission International de L'Eclairage (CIE) coordinates (x, y) = (0.14, 0.08)