

[Poster]

Green Phosphorescent Imidazole-Based Iridium(III) Complex with a Broad Full Width at Half Maximum for organic light-emitting diodes

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We designed and synthesized a green phosphorescent iridium(III) complex, bis(1,2-dimethyl-4,5-diphenyl-1H-imidazole)iridium(III)(2-(3-(trifluoromethyl)-1H-1,2,4-triazol-5-yl)pyridine) [(DMDPI)₂Ir(tftap)], for solution-processed organic light-emitting diodes (OLEDs). Photoluminescence (PL) spectra of (DMDPI)₂Ir(tftap) showed maximum emission peak (λ_{max}) of 532 nm in dichloromethane solution. The highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO) levels of (DMDPI)₂Ir(tftap) were measured to be -5.36 and -2.76 eV, respectively. The solution-processed green OLEDs based on (DMDPI)₂Ir(tftap) with the structure of ITO/PEDOT:PSS (30 nm)/26DCzPPy:(DMDPI)₂Ir(tftap) (11%) (40 nm)/TPBi (60 nm)/CsF (1 nm)/Al structure was fabricated. Electroluminescent (EL) spectra of (DMDPI)₂Ir(tftap) exhibited maximum emission peak at 522 nm with a broad full width at half maximum (FWHM) of 115 nm and CIE coordinates of (0.33, 0.54) at 1,000 cd/m². The device with 11% doping concentration of (DMDPI)₂Ir(tftap) exhibited maximum luminance of 6,304 cd/m², maximum luminous efficiency of 7.14 cd/A, power efficiency of 3.63 lm/W, and external quantum efficiency of 2.59%, respectively. Moreover, white light-emitting devices containing double emissive layer consisting of (DMDPI)₂Ir(tftap) as a green dopant and (PIQ)₂Ir(acac) as a red dopant were fabricated. The white devices exhibited Commission Internationale de L'Eclairage (CIE) coordinates of (0.42, 0.48) at 1,000 cd/m²; these values are close to the standard white warm light CIE coordinates of (0.44, 0.40).