

Brightness Enhancement of Organic Light Emitting Diode by Birefringent Twisted Conjugated Polymer

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Organic light emitting diodes (OLEDs) have been widely used due to their excellent display performances such as the superior color representation. However, to prevent high reflection of ambient light from metal electrode in the OLED, a circular polarizer should be laminated in front of the OLED, and thus only half of the emitted light was contributed to the OLED brightness. In principle, when an emitted light is a completely circular polarization, we can use whole emitted light [1]. Recently, we proposed a novel structure to increase the dissymmetry factor (g factor) of the circularly polarized light in the OLED by using the birefringent twisted emitting layer [2].

The birefringent twisted OLED was fabricated with a emitting layer of poly(9,9-di-n-octylfluorenyl-2,7-diyl)-alt-(benzo[2,1,3]thia-diazol-4,8-diyl) (F8BT) doped with chiral dopant of S5011 (Merck) on a rubbed alignment layer of AL22636 (JSR). As the electron and the hole injection/transport layers, 2,2',2''-(1,3,5-benzene triyl)-tris(1-phenyl-1-H-benzimidazole) (TPBi) and Copper phthalocyanine (CuPc) were used. Here, the circularly polarized emission was originated from the propagation of the linearly polarized light emitted at a recombination zone through the birefringent twisted structure. The g factor is governed by the emitting zone and the birefringent twisted structure, and higher g factor provides higher brightness of the OLED with a circular polarizer due to recycling the circularly polarized light from the metal reflection. The emitting zone was controlled by the thickness of the TPBi and thus higher g factor was obtained as shown in Fig. 1(a). As shown in Figs. 1(b) and (c), both LHC and RHC luminous intensities in the reference OLED were equal. However, the LHC luminous intensity was greater than the RHC intensity in the birefringent twisted OLED with S5011 and thus the brightness of the OLED was enhanced up to 36 % for g factor = 0.72. All theoretical analysis would be discussed.

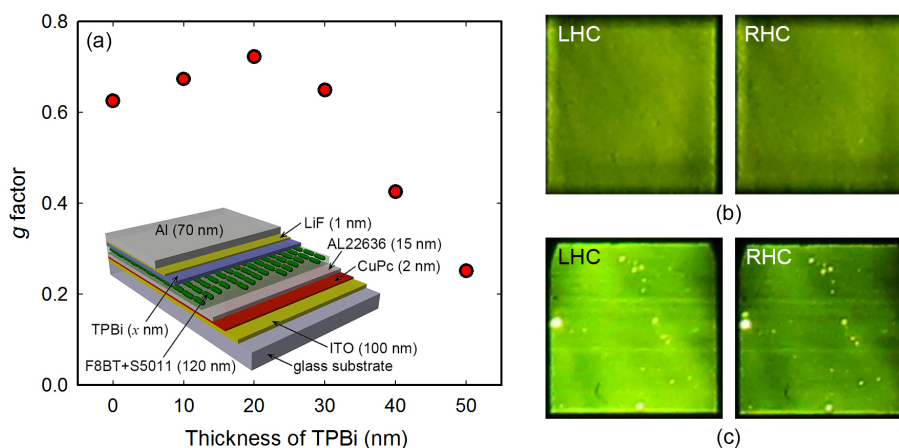


Fig. 1. (a) The g factor as function of a thickness of TPBi, and photographs of (b) the reference OLED without S5011 and the proposed OLED with S5011 under LHC and RHC polarizers. Inset represents schematic diagram of the proposed OLED.

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References

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