Linearily Polarized White OLED from a Single Emitting layer of Mesogenic Mixture

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White organic light-emitting diodes (OLEDs) were widely used in large-sized displays and lighting. Recently, liquid crystalline (LC) conjugated polymer has attracted much attention in polarized light-emitting devices such as displays, lightings, and biosensors since their polarized states were easily controlled by molecular ordering[1]. In general, a complicated evaporation process was required for stacking multiple emitting layers to generate white light from a single pixel in the OLEDs[2].

In this work, we demonstrated a linearly polarized (LP) white OLED from a single emitting layer by spin-coating a mixture of red (R), green (G), and blue (B) color mesogenic compounds. The R and G color guest compounds (synthesized from Kumoh National Institute of Technology) were mixed to the B color host polymer of poly(9,9-di-n-octylfluorenyl-2,7-diyl) (PFO). The mixture of three mesogenic compounds was spin-coated on the rubbed polyimide (SE-7492K, Nissan Chemical). For an electroluminescence (EL) device, an electron-transport layer of 2,2'-2''-(1,3,5-Benzinetriyl)-tris (1-phenyl-1-H-benzimidazole, an electron-injection layer of LiF, and Al cathode were sequentially evaporated.

Figure 1 shows EL spectra and the CIE color coordinates of the LP white OLED under parallel (0°) and perpendicular (90°) polarizers to the rubbing direction. As shown in Fig. 1(a), the double peaks below 480 nm are originated from the host PFO polymer, and the broad peaks around 530 nm and 620 nm are originated from the G and R guest compounds, respectively. The averaged polarization ratio was measured to be 15:1 in an entire visible range. The color difference of the LP white OLED from D65 standard light source was measured to be 0.007 for the parallel polarization to the rubbing direction as shown in Fig. 1(b).

![Graph of EL spectra and CIE color coordinates](image)

Fig. 1. (a) The EL spectra and (b) color coordinates of white OLED from a single emitting layer

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References