Effect of Green Emitter on Device Characteristics of Solution-Processed White Organic Light-Emitting Diodes

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OLED(Organic light-emitting diode) lighting is an emerging solid-state lighting technology. OLED lighting is close to the natural light then traditional lighting such as incandescent lighting, fluorescent lamp, etc. It is eco-friendly technology because it produces little or no heat and contains no heavy metals like lead and mercury. LED lighting is another candidate to lighting industry. It is also self-luminous device and has an advantage of low power consumption. However, this light has stronger blue light emission damaging to optic nerves than OLED lighting. Also, it needs light diffuser plate that diffuses the light from point light source unlike OLED lighting. OLED lighting is thin, light, and it can be flexible. So it can be produced as a variety of shapes.

PLEDs(Polymer light-emitting diodes) possible the solution process such as ink-jet printing, screen printing, roll-to-roll printing and others. The solution process is lower cost and easier for lager area deposition than the vacuum deposition. However, high solubility to the organic solvents is required for organic materials. To meet the needs, for example, aliphatic substituent is attached to the back bone structure.

To make perfect white light, it is recommended that the emission spectrum covers all of visible light region. However, it is not easy. Because commercial iridium emitters have emission peak at 470 nm(FIrpic, blue emission), 510 nm($Ir(mppy)_3$, green emission) and 620 nm($Ir(piq)_2(acac)$, red emission). In other words, the green emission peak is closer to the blue emission peak.

In this work, we compared the effect of variation of green emitter in solution-processed phosphorescent white OLEDs. We choose iridium complex with silyl substituent that provides increased solubility. Also, this complex has more red-shifted emission than pure green emitter, which would be beneficial to achieve high-quality white emission. The J-V-L curves of white OLEDs are depicted in Fig.1, which shows that iridium complex with silyl substituent shows the better device performance than pure green emitter, $Ir(mppy)_3$.

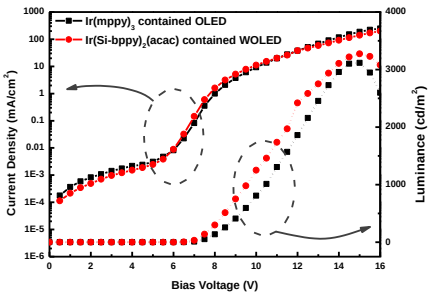

Fig. 1. Current density-bias-luminance(J-V-L) characteristics.

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