Micro-Cavity Effects in Color-Tunable Ultraviolet Organic Light Emitting Devices

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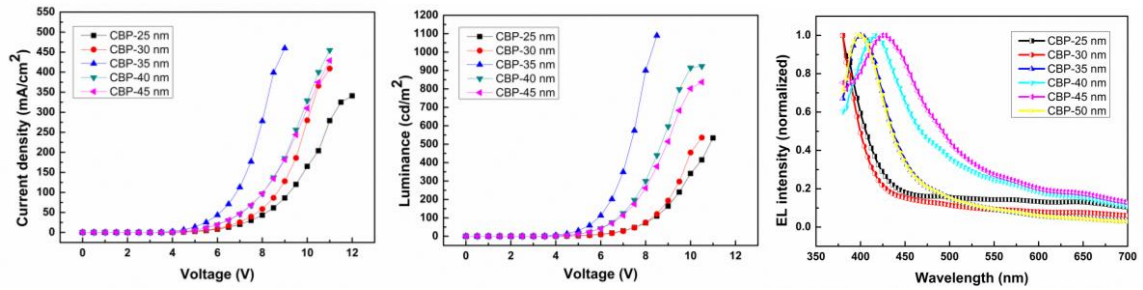
Organic light-emitting diodes (OLEDs) are considered as promising candidates for large-area, full-color, and flat-panel displays. In recent year, the commercial products have been sold on the market, like MP3 PDA and smart phone etc [1-3]. However, OLEDs have problems such as low external quantum efficiency, insufficient lifetime, and low operational stability for display applications. Very few researchs have been reported about ultra-violet-emitting OLED device, because the short-wavelength materials were not easy to get [4-5]. Moreover, The reported ultra-violet devices were not only low efficiency but also complex structures. Therefore, ultra-violet OLEDs (UV-OLEDs) have many disadvantages needs to be overcome. In this paper, we demonstrated the UV-emitting OLEDs with simple structure and investigate the characteristics of the UV-OLEDs.

In this article, a simple bilayer ultraviolet organic light emitting devices (UV-OLEDs) were fabricated by using two commonly materials 4,4'-bis (9-carba-zolyl) -2,2'-biphenyl (CBP) and 1,3,5-tris (N-phenylbenzimidazole-2-yl) benzene (TPBi). The device structure was ITO/ MoO_3 (1 nm)/ CBP (x nm)/ TPBi (100-x nm)/ LiF (1 nm)/ Al (100 nm). In order to effectively control the voltage, the thickness of the organic layer was set as 100 nm. The device performance with different thickness of CBP was show in fig. 1.



F*ig. 1. (a) Current density-voltage, (b) luminance-voltage characteristics for UV-OLEDs and (c) the electroluminescence spectrum characteristics with different thickness of the CBP and TPBi.*

In summary, an UV-emitting OLED with simple structure was presented. The redshift of UV-OLEDs with various thickness of the CBP and TPBi was found due to micro-cavity effects. The devices with CBP 35 nm and TPBi 65 nm had the maximum luminance of 1090 cd/cm^2 at 8 V.

References

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