Role of the Electron Blocking Layer in the Enhanced Lifetime of Blue Phosphorescent Organic Light-Emitting Diodes

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In recent years, Phosphorescence Organic Light-Emitting Diodes (PhOLEDs) have drawn tremendous attention due to their high efficiency.[1] Even though their commerical sucess in mobile displays and televisions, the use of blue PhOLEDs has been limited by its short lifetime. One of convenient ways to increase its opertational lifetime is the insertion of Electron Blocking Layer (EBL) between the Emitting Layer (EML) and Hole Transporting Layer (HTL). It is well known that EBL help electrons for more efficient recombination within the EML. In addition, EBL plays an important role in device to reduce the electron leakage.[2] In this paper, the effect of device lifetime on the 3,3'-bis (9-carbazolyl) -1,1'-biphenyl (mCBP) as an EBL was investigated by controlling the thickness of mCBP layer. To clearly verify the role of EBL, the relationship between the lifetime and device performance was also studied using simple blue PhOLED device structure (ITO/2TNATA/HTL/EBL/mCBP:Blue dopant(8%)/ETL/LiF/Al). As a result, as the thickness of mCBP layer increases, lifetime dramatically increased about 5 times (at T_{80}). Consequently, the lifetime and efficiency of the blue PhOLED device depends on the thickness of the EBL material.

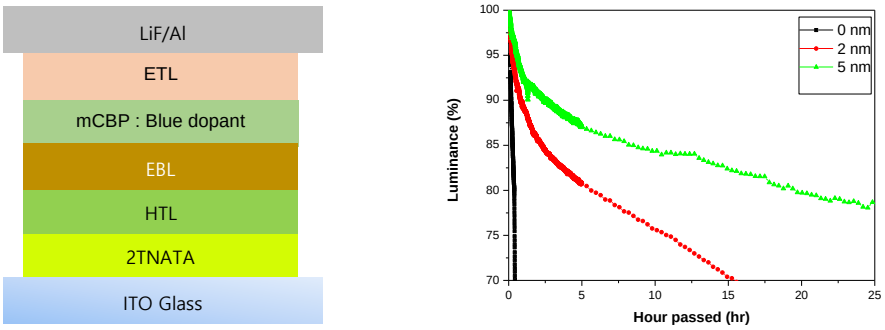

Fig. 1. Schematic view and lifetime graph of blue PhOLED with mCBP EBL

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