Optical and electrical properties of organic light emitting diodes with graphene bottom electrodes

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Graphene films offer important merits for transparent electrode; suitable optical transparency, high electrical conductivity and mechanical compliance [1-5]. In this work, we examine organic light emitting diodes (OLEDs) with graphene bottom electrodes from optical and electrical perspectives. To investigate the optical effects of graphene electrodes on efficiencies and spectral emission properties of OLEDs, we have performed optical simulations and fabricated actual graphene anode OLEDs. Compared to the case of ITO anode OLEDs, the correlations between the organic layer thickness and OLED characteristics, the luminous efficiencies and emission spectra, are low. Thus, there exists degree of freedom in designing the organics stacks of graphene anode OLEDs. We have obtained 25.3 lm/W of power efficiency in green phosphorescent OLEDs, which is reached over 80% of the efficiencies of ITO anode OLEDs. The efficiency and luminous uniformity of graphene anode OLEDs were investigated using electrical simulations and experiments. Luminous uniformity turns out to be hampered by the high sheet resistance of graphene. Details will be discussed in the presentation. Finally, we have demonstrated the OLED with the graphene electrode stable and larger emission area of 70mm^2 as shown in fig. 2.

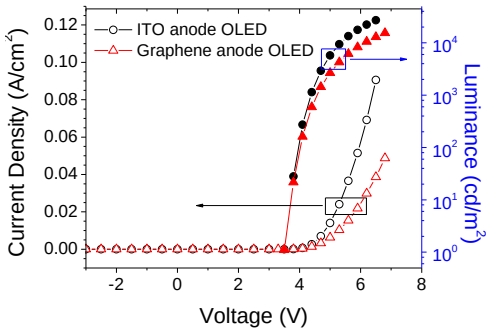

Fig. 1. The JVL characteristics of ITO anode and graphene anode OLEDs. .

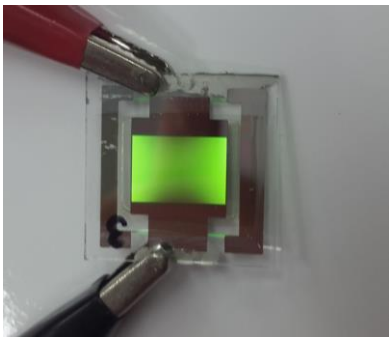

Fig. 2. The fabricated OLEDs with graphene electrode

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