Subwavelength-Patterned Electrode for Blue Organic Light-Emitting Diodes

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Organic light emitting diode (OLED) used in displays and lighting takes advantage of excellent electroluminescence performances, thin thickness, good flexibility, and low power consumption. Conventional Indium tin oxide (ITO) transparent electrode in OLED has high conductivity and transparency, but alternative transparent electrodes have been studied due to its limitation such as unstable supply of rare metals resulting high cost.

Thin metal films with nanohole array pattern are promising replacement for ITO. Though metallic thin films have high conductivity and low transparency, nanometer-thin film could be transparent but the resistance could be high. Periodic subwavelength hole patterning compensates this problem because the coupling of light with plamons on the interface between dielectrics and patterned metal film enhances transmission of certain wavelength more than the increase of the aperture ratio.

In this study, the perforated Ag films fabricated as the transparent anode for OLED by nanosphere lithography and then blue emission OLEDs were evaporated on the anodes. We investigated luminance, efficiency and angular dependency of OLEDs between the different types of anodes, ITO, Ag and Ag with nanohole array as well as the effects by the different size of period of array and cavity diameter.

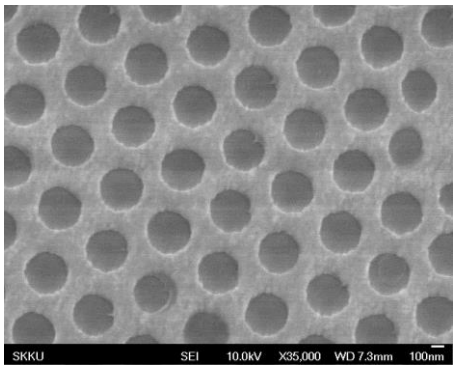

Fig. 1. Nanoperforated Ag

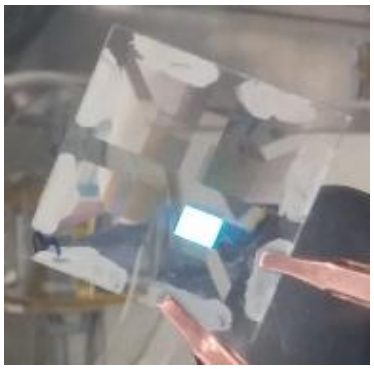

Fig. 2 OLED using patterned Ag

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