[Ⅲ~17]

Characteristics of Organic Light-emitting Diodes with the Mixing Compositions of Hole Transport Layer

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Organic light-emitting diodes (OLEDs) were fabricated using the thin polymeric film dispersing a hole transport material (HTM) into a soluble polyimide and the molecular film of a chelate complex. The soluble polyimide, HTM, and chelate complex used in the present work were poly(ether imide) (PEI)[(1),(2)], N,N'-diphenyl-N,N'-bis(3-methylphenyl)-1,1-diphenyl-4,4-diamine (TPD)[(3)], and tris(8-hydroxy-quinolinato) aluminum (Alq_3)[(4)], respectively. In order to vary the recombination zone for the generation of excitation[(5)], we have attempted to change the *mixing ratios of the PEI and TPD* in the hole transport layer between the anodic electrode and the molecular film of the chelate complex. The mixing compositions were varied from 5/95 to 50/50 by weight ratio. The structural investigation of the mixed layers was carried out using x-ray photoemission spectroscopy (XPS) and atomic force microscopy (AFM). Ultraviolet photoemission spectroscopy (UPS) was performed for the verification of the electronic structure of the mixed layers. According to the increment of weight percent of TPD against PEI, the emission color from the OLEDs was changed from red to green. The device performance such as brightness, turn-on voltage, and luminous efficiency were also improved as the TPD content was increased. At the mixing composition of 50/50, the charge injection of the device was initialized at the applied voltage of 4.3 V and the brightness was over 10^3 *cd/m*^{2} *at 7 V*. The dramatic enhancement in the oscillator strength was observed from the electroluminescent spectra with the mixing composition of HTM increased.

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