

Combinatorial studies on the work function characteristics for Nb or Zn doped indium-tin oxide electrodes

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Abstract : Indium-tin oxides (ITO) films have been widely used as transparent electrodes for optoelectronic devices such as organic light emitting diodes (OLEDs), photovoltaics, touch screen devices, and flat-paneldisplay. In particular, to improve hole injection efficiency in OLEDs, transparent electrodes should have high work-function besides their transparency and low resistivity. Nevertheless, few studies have been made on engineering the work function of ITO for use as an efficient anode.

In this study, the effects of a wide range of Nb or Zn doping rate on the changes in work functions of ITO anode were investigated. The Nb or Zn doped ITO films were fabricated on glass substrates using combinatorial sputtering system which yields a linear composition spread of Nb or Zn concentration in ITO films in a controlled manner by co-sputtering two targets of ITO and Nb₂O₅ or ITO and ZnO.

We have also examined the resistivity, transmittance, and other structural properties of the Nb or Zn-doped ITO films. Furthermore, OLEDs employing Nb or Zn-doped ITO anodes were fabricated and the device performances were investigated concerned with the work function changes. Abstract