URN etd-0407109-183704-216
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Author's Email Address No Public.
Statistics This thesis had been viewed 38 times. Download 0 times.
Department
Year 2004
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Investigation of the Effect of Surface Ni-doped ITO Anode on the Lifetime of Organic Light-Emitting Diode
Date of Defense 0000-00-00
Page Count 57

Keyword
Lifetime of Organic Light-Emitting Diode
Indium Tin Oxide
ITO
Surface Ni-doped ITO Anode

Abstract
Investigation of the Effect of Surface Ni-doped ITO Anode on the Lifetime of Organic Light-Emitting Diode
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Abstract
Surface Ni-doped ITO (Indium Tin Oxide, ITO) thin films were deposited on glass substrates with a Ni-ITO co-sputter approach at low temperature. The performances of OLED dependent on Ni-concentration and Ni-doped ITO thickness were investigated. The influence of Ni on the lifetime of OLED was also studied.
Results show that un-doped ITO film has a sheet resistance of 28 Ω/sq, a optical transmittance of 79.4 % and a surface roughness of 7.43 nm. OLED devices with a structure of Al(100nm)/Alq3(35nm)/NPB(20)/ITO(150nm)/Glass without Ni-doping performed a turn-on voltage of 7.8 V. For Ni-doped ITO films with Ni sputter power of 10W, 30W, 50W, the lowest sheet resistance was 15.72 Ω/ sq, optical transmittance reduced to 75.4 % and surface morphology to 0.46 nm. The turn-on voltage of Ni-doped OLED improved is 5.8V, improved by 2V compared with that of the un-doped OLED. By means of reliability test, the optimal ITO film process conditions were determined with the performances in OLED’s voltage-current, voltage-luminance, time-luminance, dark spots and cathode morphology. It was found that ITO had the optimal performance at sputter pressure of 2.35 mtorr, RF power of 50W and the substrate temperature at 45℃
In the study of the influence of Ni-doping on the OLED lifetime, SiO2 was used for passivation film, glass for back plate and BaO for the getter material. It was found that ITO film with Ni=50W and Ni-doped ITO thickness = 50nm gives the best OLED lifetime, 1.7 times longer than that of undoped ITO OLED device.
Advisory Committee Ching-Ming Hsu - advisor

Files No Any Full Text File.

Date of Submission 2005-08-03