Transparent contact of Indium Tin Oxide on GaN LED

Student: Wei-Lun Peng

Advisor: Prof. S.C. Wang
Prof. Y. F. Chen

Institute of ElectroPhysics
National Chiao Tung University

ABSTRACT

In this thesis, the ITO films deposition were carried out by R.F. magnetron sputtering system and the films were deposited on both glass and p-GaN substrate at room temperature. Two main issues were investigated. First, we deposited the ITO films on glass substrate to study the process parameter effects on the optical and electrical properties. Then the contact properties between ITO and p-GaN were studied . The behavior of LEDs with ITO and Ni/Au was discussed.

The lowest sheet resistance of the ITO films deposited at room temperature was obtained by post rapid thermal annealing at 600^{O}C for 30sec in N_2 ambient. XRD measurement showed that the (222) preferred orientation was obtained after annealed in nitrogen ambient, and (400) preferred orientation in oxygen ambient. The transmittance spectra peak shift to short wavelength with increased the nitrogen composition in annealing ambient.

Using NiO as an interlayer between the ITO and p-GaN can reduced specific contact resistance to 2.26 x10^{-3} Ω-cm^2. Light output power of LED with ITO transparent contact was enhanced about 50% compared with LEDs with Ni/Au transparent contact.