Effect of thickness of p-type ZnO on ZnO light emitting diodes

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Zinc oxide (ZnO) has become an interesting and potential candidate for ultraviolet (UV) light emitters due to the increasing demands for short wavelength light-emitting diodes (LEDs). The main difficulty in observation of the near-bandedge emission (NBE) from ZnO-based emitters has been the lack of carrier confinement structure to increase radiative recombination efficiency of electron-hole pairs. Therefore, the insertion of $Mg_xZn_{1-x}O$ layers in ZnO LEDs can improve the efficiency of LED by confining carriers in the active region because it is an appropriate candidate as barrier material for ZnO quantum wells. We report on the ZnO homojunction with different p-type ZnO layers grown by radio-frequency (rf) sputtering deposition on c-Al_2O_3. $Mg_xZn_{1-x}O$ layers were inserted in ZnO LED structure in order to improve the efficiency of LED by confining carriers in the high quality ZnO because it is an appropriate candidate as barrier material for ZnO quantum wells. ZnO LEDs showed rectifying I-V characteristics with typical of the threshold voltage of 3.2 V. ZnO LED with thinner p-type ZnO shows higher intensity of NBE and the ratio of NBE to deep level emission due to lower absorption of the NBE in the defect-related deep levels in p-type ZnO film