

Characterization of ZnO Thin Films on MgO (100) Substrates Deposited by PLD

Fukai Shan, Y. S. Yu, B. C. Shin, H. S. Lim, B. I. Kim, J. Y. Sohn

Donggeui University - BUSAN

Abstract

Because of the high quality of the plasma produced by the excimer laser, pulsed laser deposition (PLD) is one of the most excellent method in depositing thin films and multi-layer hetero-structure of various materials, especially in depositing metal oxide thin films. The quality of the thin films can be controlled by adjusting some experiment parameters, which are the repetition rate and power of the laser, the distance between the target and the substrate, the oxygen pressure inside the chamber, and the temperature of the substrate et al. In this work, KrF excimer laser (248 nm) is used to ablate ZnO target. The high quality plume is produced during this ablation, and ZnO is deposited on MgO (100) substrates at different substrate temperatures (100, 200, 300, 400, and 500oC, respectively). The crystal structure of the thin films is determined by X-ray diffractometer (XRD). It is found that the thin films are of preferred (002) orientation. The surface morphology is investigated by atomic force microscope (AFM) and scanning electron microscope (SEM). Photoluminescence (PL) and Raman spectroscopy are used to characterize the optical properties of the thin films. PL results indicate that the samples grown at the substrate temperature of 300oC shows the strongest near band emission (379 nm) and small green-yellow emissions (600 nm). The green-yellow emissions are believed to be from the oxygen vacancies. As time goes on, the green-yellow emissions disappear. Raman measurements reveal the Raman peaks locate at 99 and 437 cm⁻¹ E2 mode, which indicate that the wurtzite structure is formed in the thin films.