[ZnO-12]

Resonant Luminescence of Bound Exciton (A_0,X) and Electron Transport Observed in Zno Grown by Plasma-Assisted Molecular Beam Epitaxy

정연식*, Oleg Kononenko, 최원국
**한국과학기술연구원 박막재료연구센터,
**Institute of Microelectronics Technology and High Purity Materials, Chernogolovka, Russia

We want to discuss very interesting optical and electrical properties of ZnO based on the observation of radiative recombination and in terms of n and . High quality ZnO thin films were grown on LT-ZnO/c-Al_2O_3(1000) single crystal substrate by oxygen plasma assisted molecular beam epitaxy. The ZnO film deposited at 720 oC showed the full-width at half maximum of -rocking curve for ZnO(0002) diffraction line of 80 arcsec and concentration of $n=2.5x10^{17}/cm^3$ with the high mobility of =105 cm^2/Vs. From the PL measurement at 10K-300K, one (D_o, X) and two (A_0,X) lines were well resolved at 10 K and were identified as I_3, I_{10}, and I_{11} respectively by calculating the activation energy obtained from curve fitting of changing intensity. In particular, great increase of the intensity I_{10} in PL at 50 K was observed and be reasoned by resonance due to the excitation of exciton bound neutral acceptor energy level. From the temperature dependent Hall measurement (T-Hall), it was found that mobility increased from 30 K to 130 K (maximum) and then decreasing and (T) vs. T was fitted by the solving the Boltzmann transport equation using Rode's method. From the results, at lower temperature region mobility strongly depended on both dislocation density and compensation ratio N_A/N_D(ratio of acceptor to donor concentration) and at high temperature the polar optical phonon scattering was regarded as main scattering factor. By the analyzing n vs. T, one donor level of 36 meV for 60K-110K and the other for 110K-300K was obtained. The electron transport and the origin of two shallow donors in undoped high quality ZnO thin film will be discussed.