P-035

PHOTOLUMINESCENCE OF THE InGaAs QUANTUM WIRES GROWN ON V-GROOVES BY CHEMICAL BEAM EPITAXY, SUNG-BOCK KIM, J. -R. RO, K. W. PARK, and E. -H. LEE (Basic Research Lab., Electronics and Telecommunications Research Institute, Taejon, 305-600, Korea)

We have studied the characteristics of photoluminescence(PL) of InGaAs/GaAs quantum wires(QWRs) for the applications to optical devices such as semiconductor laser diodes(LDs). In this work, we fabricated InGaAs/GaAs multiple QWRs on V-grooves with resharpening effect of GaAs barriers by chemical beam epitaxy (CBE). The transmission electron microscopy(TEM) image showed that three crescent-shaped InGaAs QWRs with a size of 300 Å x 500 Å were formed at the bottom of V-grooves. In order to clarify confinement of carriers in the QWRs experimentally, PL measurement was carried out for QWRs prepared by etching of the top- and side-quantum wells(QWLs). In the PL spectrum taken at 77K, we observed distinct peak at 1.322eV, which was associated with the exciton ground state of the QWRs at the bottom. The red shift of QWRs PL peak is in good agreement with TEM result of QWRs. The full width at half maximum (FWHM) of luminescence of QWRs has a value of about 60meV and the PL peak of QWRs is very strong and still is observed even at a temperature of 200K. This result indicates a strong optical confinement in InGaAs QWRs, which is a promising property for the application to QWR optical devices.

P-036

THEORETICAL AND EXPERIMENTAL ANALYSIS OF HIGH POWER Al-FREE InGaAsP/GaAs LASER DIODE, HYUK JONG YI, and MANIJEH RAZEGHI (Center for Quantum Devices. Dept, of Electrical and Computer Engineering, Northwestern University, Evanston, Illinois 60208, U.S.A.)

Al-free InGaAsP/GaAs material systems is very attractive highly reliable high power laser source, which can replace AlGaAs/GaAs-based devices. Device and material characteristics of this new type of lasers are analyzed in both theory and experiment in this study. In order to make accurate and meaning analysis, theoretical models for these lasers were developed from a first-principle non-equilibrium Green's function method, which provides the most general and accurate model for semiconductor lasers so far. Physical origins for measured temperature and cavity-length dependence of J_{th}, optical loss are revealed in this approach. Our novel experimental approach also shows that radiative recombination of the lasers remain almost 100% up to 100℃

P-037

EVALUATION OF THE IMPURITY RADII IN GAN FROM THE DONOR-ACCEPTOR PAIR DECAY, EUN-JOO SHIN, N. W. SONG, J. I. LEE and D. KIM (Spectroscopy Group, KRISS, Taejon, 305-600, Korea), D. LEE (Dept. of Physics, Chungnam National Univ., Taejon 305-764, Korea), S. -G. LEE, K. J. CHANG(Dept. of Physics, KAIST, Taejon 305-701, Korea), Y. -H. CHOI(Optoelectronics Group, L. G. CIT, Seoul 137-140, Korea), C. -H. HONG(SPRC, Jeonbuk National Univ. Jeonju 560-756, Korea)

Time-resolved studies of donor-acceptor pair luminescence in GaN:Mg are presented. From the measurements of time-decay of relatively close donor-acceptor pairs, the recombination rate constant $W_0 \sim 1.0 \times 10^8$ s^{-1} and effective radii of donors $a_D \sim 21$ Å and acceptors $a_A \sim 2$ Å have been determined. The donor-acceptor pair luminescence decay in sample after thermal annealing is faster than that of as-grown. It is considered as due to the increase of nonradiative decay channels due to the enhancement of interactions among donor-acceptor pair states. It shows another aspect of the activation of Mg acceptors after annealing through the reduction of luminescence decay of donor-acceptor pair.

P-038

HOMOEPITAXIAL GROWTH OF HIGH QUALITY 6H-SiC THIN FILMS USING BIS-TRIMETHYLSILYLMETHANE BY CHEMICAL VAPOR DEPOSITION, JAE KYEONG JEONG, HOON JOO NAH, and HYEONG JOON KIM (School of Materials Science and Engineering, Seoul National University, Seoul 151-742, Korea)

High-quality, monocrystalline 6H-SiC thin film has been epitaxially grown on 6H-SiC (0001) substrates, which were 3.5 off-axis from [0001] toward [1120], at 1320℃ by organo-metallic chemical vapor deposition. We used a non-toxic and non-flammable organosilicon source having an alternate SiC bond structure, bis-trimethylsilylmethane [$C_7H_{20}Si_2$]. Lateral growth of SiC film is observed by scanning electron microscope and atomic force microscope analysis. Triple axis crystal diffraction analysis shows free strain epitaxial layer with 21arcsec of full width of half maximum, whose quality is comparable to that of the substrate. Photoluminescence spectrum reveals no incorporation of 3C-SiC polytype in the epitaxial layers.