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Radiative and nonradiative recombination rates of Si:InN thin films S.-F. WANG, D. -J. JANG, C.-F. TZEN, Department of Physics, National Sun Yat-sen University, M.-E. LEE, Department of Physics, National Kaohsiung Normal University, L.-W. TU, Department of Physics, National Sun Yat-sen University — Silicon doped InN thin films with background carrier densities vary from 6.2×10^{18} to 1.27×10^{20} cm^{-3} were investigated by time-resolved photoluminescence (TRPL) upconversion technique. The radiative and nonradiative decay rates as a function of carrier density were derived from the TRPL signals. The Shockley-Read-Hall, radiative recombination, and Auger recombination coefficients were obtained by fitting the derived decay rates with the rate equation. The defect density can be determined from the differences of doped and undoped carrier densities. We found that the SRH coefficient is proportional to the defect density. The capture cross sections, determined from the SRH coefficient, defect density, and thermal velocity, were $1.5\sim3.0 \times 10^{16}$ cm.^{2} The radiative decay times determined from the rate equation were compared with those determined by a model developed by Gourdan and Lavallard, which is recently used to determine radiative lifetimes of InN by several reports. We found the discrepancy of radiative lifetimes determined by these two approaches is attributed to the large nonradiative recombination rates in these samples.

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