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Carrier recombination lifetime in InGaN/GaN multiquantum well LED ANTARYAMI MOHANTA, DER-JUN JANG, Department of Physics, National Sun Yat-sen University, Kaohsiung 80424, Taiwan, R.O.C., TAI-FA YOUNG, Department of Mechanical and Electromechanical Engineering, National Sun Yat-sen University, Kaohsiung 80424, Taiwan, R. O. C. — Carrier dynamics in InGaN/GaN multiquantum well LED with 5% In content in InGaN wells is studied by time-resolved photoluminescence (TRPL) using time-correlated single photon counting detection system. The excitation energy is 3.06 eV, frequency-doubled output of a Ti: sapphire laser operating at 808 nm (1.53 eV) with 100 fs pulse width and a repetition rate of 80 MHz. TRPL spectra are fitted biexponentially to obtain decay times. The fast decay process is carrier relaxation and slow decay is the carrier recombination process. The fast relaxation decay time shows insignificant variation with the photon energies and pump fluences. On the other hand carrier recombination time increases with increase of photon energies attaining maximum near photoluminescence peak energy and then decreases again on further increase of photon energies. The carrier recombination life time shows increasing behavior with increase of pump fluences and is obtained as long as ~ 7 ns at pump fluence of 0.21 μJ/cm^2 at room temperature. As the temperature decreases, the carrier recombination life time increases indicating the dominating nature of radiative decay process at low temperatures.

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