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Differential reflectance study of InN M.-S. WANG, D. -J. JANG, 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 — Time-resolved differential reflectance (TRDR) of Si:InN thin films grown on sapphire substrates by plasma-assisted molecular beam epitaxy were investigated. The background carrier densities of 4.4 $\times 10^{18}$ $\sim$ 1.27$\times 10^{20}$ cm^{-3} were measured by van der Pauw Hall geometry for undoped and Si doped InN thin films. The energy of the degenerated pump and probe beams were tuned from 1.37 to 1.65 eV. All the signals were measured at room temperature. The intensity and the temporal position of the TRDR peak intensity increase with the pumping intensity and show trivial dependence on photoexcitation energy. The TRDR intensity exhibits single-exponentially decay for photogenerated carrier density up to 6×10^{18} cm^{-3}. For higher excited carrier density, two decay times must be employed to describe the decay behavior. The rate equation includes the Shockley-Read-Hall, radiative, and Auger recombination were used to fit the decay rate. While the Auger recombination is insignificant for low photoexcitation, it becomes the dominated recombination mechanism within 10 ps for high photoexcitaiton. The dominated recombination mechanism for different pumping energy will be discussed.

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