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Carrier dynamics in InGaAs/GaAs quantum dots excited by degenerate pump-probe technique K.N. CHAUHAN, D.M. RIFFE, Physics Department, Utah State University, Logan, UT 84322 — We have studied ultrafast carrier dynamics in a single layer of self-assembled $In_{0.4}Ga_{0.6}As$/GaAs quantum dots (QDs) using femtosecond degenerate pump-probe differential reflectivity. The measurements were done with an 800 nm, 28 fs Ti-sapphire oscillator. The growth process of QDs consists of two steps, low temperature growth and high temperature annealing. Specifically, the InGaAs QD structures are fabricated on n-type GaAs(001) using molecular beam epitaxy (MBE). The $In_{0.4}Ga_{0.6}As$ layer is deposited at 390-400 °C followed by QDs self assembly at 450-540 °C. Finally, these QDs are caped with a 10 nm or 100 nm layer of GaAs. Measured width and height of these QDs are typically 33 nm and 6 nm respectively. Dots annealed at higher temperature have larger base area (width and length) and reduced height as compared to those annealed at lower temperature. We have developed a rate equation model to describe the carrier dynamics and fit the reflectivity data. Dynamics depends on the size of the quantum dots: larger QDs have faster dynamics as compared to smaller dots. Additionally, dynamics are slower at higher excitation levels.

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