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Time-resolved infrared spectroscopy of a DMS InGa(Mn)As film[1]

H. ZHANG, D.H. REITZE, C.J. STANTON, D.B. TANNER, University of Florida, G. KHODAPARAST, Virginia Tech, J. KONO, Rice University, H. MUNEKATA, Tokyo Institute of Technology, G.L. CARR, Brookhaven National Laboratory — We report a two-color, time-resolved, differential absorption study of the dilute magnetic semiconductor InGa(Mn)As. We varied the temperatures above and below the nominal Curie point of 50 K. The sample is an (In0.53Ga0.47)0.87Mn0.13As layer grown on InGaAs buffer layers on InP. The study was performed using near-IR pulses from a Ti:sapphire laser to photoexcite the sample and pulsed far-infrared synchrotron radiation (at beamline U12IR of the NSLS) to probe the relaxation process. Our time resolution is ∼200 ps. A two-step decay process was observed, with the initial decay in the few ns range followed by a much slower decay lasting ∼100 ns or longer. The relaxation time for the faster decay was found to increase as the temperature decreased below 60 K. The slower decay may be due to thermal relaxation of the sample into its surroundings. Details of the photo-induced far-infrared spectra, as well as the dependence on photoexcitation fluence and wavelength, will also be discussed.

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