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Polarization Dynamics of Twin Free GaAs/AlGaAs Core-Shell Nanowires S. PERERA, L.M. SMITH, H.E. JACKSON, University of Cincinnati, J.M. YARRISON-RICE, University of Miami, H.J. JOYCE, Y. KIM, Q. GAO, H.H. TAN, C. JAGADISH, Australian National University, X. ZHANG, J. ZOU, University of Queensland — We use polarized time-resolved photoluminescence to study exciton dynamics in GaAs/AlGaAs core-shell nanowires (NWs) at 20 K. By pumping the nanowire with lasers polarized parallel and perpendicular to the nanowire, the polarization dynamics reflect the exciton dipole distributions within the nanowires. The NWs were prepared by Au catalyzed MOCVD and excited by a pulsed titanium-sapphire laser at 798 nm. The polarization of the emitted PL was monitored at the exciton emission peak (1.515 eV) as a function of time after excitation by a polarized pulse. The diameter of the nanowire is much larger than the exciton Bohr radius so that the exciton dipoles are degenerate regardless of orientation; thus in thermal equilibrium the density of excitons parallel and perpendicular dipoles should be equal. At low excitation intensities we find that the excitons are created out of thermal equilibrium, but relax within several hundred picoseconds. At higher excitation powers, the exciton dipoles relax much more rapidly within a time. This suggests that exciton dipole relaxation is very sensitive to carrier-carrier scattering. We acknowledge the support of the NSF (0701703 and 0806700) as well as the Australia Research Foundation.

L.M. Smith
University of Cincinnati

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