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Non-Equilibrium Exciton Spin Dynamics in Resonantly Pumped Single Core-Shell GaAs-AlGaAs Nanowires THANG B. HOANG, L.V. TITOVA, H.E. JACKSON, L.M. SMITH, University of Cincinnati, J.M. YARRISON-RICE, Miami University, A.O. GOVOROV, Ohio University, Y. KIM, H.J. JOYCE, H.H. TAN, C. JAGADISH, Australian National University — We use spatially-resolved photoluminescence (PL) imaging in combination with polarized resonant excitation to investigate the non-equilibrium exciton spin states in single core-shell GaAs-AlGaAs nanowires ($\sim$40 nm core diameter) at low temperature. The large dielectric mismatch between the nanowire and the vacuum results in a strong polarization of excitonic dipoles in the nanowire. This leads to strong polarization of both exciton excitation and emission along the nanowire. Resonant excitation shows two resonances at 1-LO and 2-LO phonons of GaAs and a third resonance likely from electronic states of the AlGaAs. More interestingly, we observe that the polarization of the PL emission is strongly enhanced as the excitation energy comes closer to resonance with the exciton emission. This strong polarization enhancement indicates that resonant excitation creates non-equilibrium exciton spin distributions near resonance. Rate equation modeling allows us to estimate the spin relaxation times which range from $\sim$5ps at high energies to $\sim$50ps at energies close to resonance. Financial support for this work was provided by the University of Cincinnati, Ohio University and the Australian Research Council.

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