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Direct and indirect exciton lifetimes in InAs/GaAs coupled quantum dots KUSHAL C. WIJESUNDARA, MAURICIO GARRIDO, SWATI RAMANATHAN, ERIC STINAFF, Department of Physics and Astronomy, and Nanoscale and Quantum Phenomena Institute, Ohio University, Athens, OH 45701, USA, ALLAN BRACKER, DAN GAMMON, Naval Research Laboratory, Washington, DC 20375, USA — Coupled quantum dots (CQDs) have potential as components in next generation electronic devices as well as being excellent systems for investigations into quantum mechanical coupling. Understanding the lifetimes of various excitations is a key element for potential applications of these systems. Time-resolved photoluminescence was used to study the temporal dynamics of excitons in InAs/GaAs CQDs where the carrier distribution was controlled with an applied electric field along the molecular axis. We observed an overall increase in the exciton lifetimes with applied electric field. Indirect excitons demonstrated lifetime increase of more than a factor of 3 relative to the lifetimes of spatially direct excitons. This is attributed to the reduction in wave function overlap between electron and hole with applied electric field. The dependence of these lifetimes on barrier thickness along with time-resolved polarization measurements gives additional insight into the dynamics of these molecular states.

Kushal C. Wijesundara
Ohio University

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