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Coupled quantum dot / quantum shell systems: optical gain, ultrafast charge transport, and single particle blinking. PATANJALI KAMBHAMPATI, D.M. SAGAR, EVA DIAS, SAMUEL SEWALL, RYAN COONEY, McGill University, AMY GRIMES, DOUGLAS ENGLISH, University of Maryland — The CdSe/ZnS/CdSe core/barrier/shell nanostructure forms an electronically coupled quantum system that is a spherical analog to the quantum well superlattice. The core's brightness is enhanced via light harvesting by the shell. This material offers an opportunity to study charge transport in spherical nanoscale materials. Here, we present new results on the femtosecond dynamics of radial charge transport in these materials. With a combination of excitonic state selectivity and femtosecond time resolution, we monitor the ultrafast relaxation dynamics of either the core or the shell, having optically excited either phase. The femtosecond experiments reveal strong optical gain as well as evidence of spatially separated biexcitons, and coupling between phases. Finally, we present single dot data on the two-color blinking kinetics of these coupled quantum dot quantum shell systems.

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