Abstract Submitted
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Electric field induced manipulation of static and dynamic optical properties of coupled quantum dots[1] Y.K. VERMA, S.N. GHOSH, C.G.L FERRI, M. GALLARDO, D. KELLEY, S. GHOSH, School of Natural Sciences, University of California, Merced, CA 95343 — A system of coupled quantum dots (QDs) provides pathways for efficient and controlled energy transfer. In such a system, electronic excitations get delocalized over the several QDs and lead to the creation of macroscopic electronic states. We present a novel way to induce structural order in chemically synthesized GaSe QDs by embedding them in a matrix of nematic liquid-crystal (NLC) molecules. Photoluminescence (PL) from the QD-NLC mixture exhibits large red-shift in the emission spectrum ($\sim$200 meV) which implies the formation of strongly coupled QD aggregates. Dynamic Light Scattering measurements on isolated and QD-NLC matrix reveal the aggregates to be composed of several tens of QDs, while PL measurements show that their emission is highly anisotropic, being strongly polarized along the axis of aggregation. These structures can further be spatially re-aligned in situ without destroying the inter-dot coupling by the application of an in-plane electric field. Time-resolved measurements reveal a faster excitonic recombination in the QD-NLC matrix in comparison to that in isolated QDs which is attributed to facile energy transfer processes.

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