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Self Assembling Quantum Dot Aggregates in Liquid Crystal Matrices[1] CHRISTOPHER FERRI, M. GALLARDO, Y. VERMA, D. KELLEY, S. GHOSH, School of Natural Sciences, University of California, Merced CA 95343
— A system of colloidal quantum dots (QDs) embedded in a matrix of highly directional and ordered liquid crystal (LC) molecules at room temperature offers the novel potential of promoting controllable aggregation of the QDs. Photoluminescence (PL) of GaSe QDs embedded in a LC matrix, studied using a confocal-microscopy setup, shows considerable red-shift in the emission spectrum of the QD-LC composite. While bare QDs in solution emit at 485 nm, mixing with LC molecules results in an emission centered at 500 nm, system suggesting their aggregation into longer structures in the matrix. A high resolution two-dimensional spatial map of the PL on the sample provided evidence of the organization of QDs into these ordered domains. Application of in-plane electric fields further enhances the aggregation effect of the QDs and emission spectrum is red-shifted to around 525 nm. Furthermore, as the aligning electric field increases the degree of ordering of the liquid crystal molecules, the polarization (P) of the emission of the aggregated QDs rotates in step with that of the LCs' directionality. Unlike the disc-shaped GaSe QDs, investigations on LC and CdSe QD system failed to show such dramatic aggregation effects.

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