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Magnetic field detector consisting of magnetic and semiconducting nanoparticles co-assembled in a liquid crystalline matrix[1] JOSE AMARAL, ANDREA RODARTE, JACKY WAN, CHRISTOPHER FERRI, MAKIKO QUINT, RON PANDOLFI, MICHAEL SCHEIBNER, LINDA HIRST, SAYANTANI GHOSH, University of California, Merced — An exciting area of research is using nano-constituents to create artificial materials that are multifunctional and allow for modification post-fabrication and in situ. We are investigating the ensemble behavior of iron-oxide magnetic nanoparticles (MNPs) and CdSe/ZnS quantum dots (QDs) when dispersed in an electro-optically active liquid crystalline (LC) matrix. The directed assembly of NPs in the matrix is driven by the temperature-induced transition of the LC from the isotropic to the nematic phase as the NPs are mostly expelled into the isotropic regions, finally ending up clustered around LC defect points when the transition is complete. Our results show a two-fold intensity increase of QD photoluminescence intensity with low magnetic fields (less than 100 mT). We speculate this increase is due to MNP rearrangement which produces a compaction of the clusters, resulting in the detection of increased QD emission. The individual components work together to act as a magnetic field detector and since they are direct assembled in a LC medium, they could potentially be used in a wide range of fluid-based applications. This work was funded by NSF grants DMR-1056860 and ECC-1227034.

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jose amaral
University of California, Merced

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