

Abstract Submitted
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Temperature dependence of band gap of highly confined CdSe and PbSe nanocrystals JASON BYLSMA, PRASENJIT DEY, JASON REJMAN, University of South Florida, AARON ZAUBI, SARATH WITANACHCHI, PRITISH MUKHERJEE, DENIS KARAIKKAJ, MATTHEW C. BEARD COLLABORATION¹ — We have recorded fluorescence spectra from PbSe and CdSe quantum dots in hexane/toluene respectively between 5K and 300K in order to investigate the temperature dependence of the electronic band gap of these highly confined nanostructures. The band gap for CdSe follows the known blue shift with decreasing temperature ($dE/dt = -225 \mu\text{eV/K}$). Olkhovets et. al. first reported a red shift of the band gap energy with decreasing temperature for small ($d < 4 \text{ nm}$) PbSe and PbS quantum dots [1]. Such behavior would contradict the expected blue shift of the band gap with decreasing temperature. We have measured the temperature dependence of the band gap of PbSe quantum dots for two different diameters below 4 nm and indeed observe a red shift of the band gap with decreasing temperature ($dE/dT = 58 \mu\text{eV/K}$), which is stronger for the smaller size quantum dots ($dE/dt = 82 \mu\text{eV/K}$). The origin of this peculiar behavior is not well understood and we are pursuing further theoretical and experimental studies in order to elucidate the mechanism behind it. [1] A. Olkhovets, et. al. Phys. Rev. Lett. 81, 3539 (1998).

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