Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Observed Shifts in Unoccupied States for Cu Doped CdSe Quantum Dots Observed via Synchrotron Techniques JOSHUA JOSHUA, ROBERT MEULENBERG, University of Maine — Recent work has been targeted on examining the optical properties of guest ions in quantum dot (QD) lattice; however, very few studies have attempted to understand the effect the dopant has on the host electronic structure. In this talk, we will present data that suggests copper doping of CdSe QDs leads to trapped states below the conduction band (CB) minimum of the host CdSe particle. We propose that one possible reason for this could be hybridization between copper and cadmium, lowering the energy for the cadmium 5s states below the CB minimum of bulk CdSe. X-ray absorption near edge structure spectroscopy measurements at the Cd M_3-edge for bulk, undoped, and doped QDs are compared and an unexpected lowering in the CB minimum is observed. We also present a first order theoretical model, for describing our results considering the effects caused by confinement, doping, and hybridization. Numerical approximations for atomic interactions suggest the hybridization parameter can lead to a lowering of the CB minimum by as much as 1.5 eV, as observed experimentally. Future work will include more in depth modelling of hybridization starting from tight binding calculations, developing a predictive model, applicable to more than existing data.

Joshua Wright
University of Maine

Date submitted: 28 Oct 2011 Electronic form version 1.4