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Effects of dopants on the band structure of quantum dots ROBERT MEULENBERG, JOSHUA WRIGHT, STUART LAWSON, Univ of Maine — Understanding the role that chemical dopants play in modifying the properties of quantum dots (QDs) has been an active field of research for the last decade. In this presentation, we will discuss our efforts towards investigating the effects of copper doping in CdSe QDs. Extended x-ray absorption fine structure (EXAFS) spectroscopy measurements provide conclusive evidence for substitutional doping of Cu in the CdSe lattice. EXAFS suggests the local coordination environment is reduced, likely due to surface doping. Both x-ray absorption near edge structure spectroscopy (XANES) and theoretical modeling are used to examine effects of hybridization on the conduction band minimum (CBM) in doped CdSe quantum dots (QDs). Experimentally, Cd M_3-edge XANES provides evidence for a lowering of the CB minimum for Cu doped CdSe QDs that is dependent on Cu concentration. Theoretical modeling suggests the effects of hybridization between Cu and Cd atoms in the QD can explain our experimental results. The hybridization effect leads to active emissive states below the CBM resulting in tunable near-infrared photoluminescence. Our work shows that a simple chemical model can provide a predictive tool towards probing the effects of hybridization on the CB levels in QDs.

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