Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Control of sp-d exchange interactions in pseudo-type II Mn:ZnSe/CdSe core-shell nanocrystal quantum dots DAVID BUSSIAN, MING YIN, LANL, SCOTT CROOKER, NHMFL, LANL, VICTOR KLIMOV, LANL — Dilute magnetic semiconductors (DMSs) have been the focus of considerable research due to their potential usability in spin-based electronic devices. Unpaired electrons of dopant atoms, such as Mn^{2+}, can couple strongly to electrons of the semiconductor (sp-d exchange interaction), which should allow for the manipulation of the spin degree of freedom using traditional microelectonic circuitry. We have developed a novel approach for manipulating sp-d interactions between the dopant and the semiconductor wherein Mn ions are incorporated into cores of ZnSe/CdSe core-shell semiconductor nanocrystal quantum dots (NQDs). These NCs represent quasi-type II hetero-structures that allow one to tune both the band edge transition energy and dopant-carrier wavefunction overlap by changing the size of the core and/or shell thickness. We will report our recent results from a set of doped heterostructures for which we demonstrate tunability of both the magnitude and the sign of the sp-d exchange interaction energy as a function of hetero-NQD geometry.

David Bussian
LANL

Date submitted: 04 Dec 2007 Electronic form version 1.4