Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Polarized Magneto-Photoluminescence from Mn-doped ZnSe/CdSe Core/Shell Nanocrystals

RANJANI VISWANATHA, SCOTT A. CROOKER, JEFFREY M. PIETRYGA, DONALD J. WERDER, VICTOR I. KLIMOV, Los Alamos National Laboratory, Los Alamos — We study the low temperature magneto-optical properties of Mn-doped ZnSe/CdSe core/shell nanocrystals using magnetic circular dichroism (MCD) and circularly polarized luminescence (PL) as a function of magnetic field. MCD studies reveal giant field- and temperature-dependent Zeeman splittings of the band-edge exciton, demonstrating a strong *sp-d* exchange coupling of electrons and holes to the embedded paramagnetic Mn atoms [1]. Magneto-PL studies surprisingly reveal a strongly circularly polarized PL from internal Mn transitions at ∼2.15 eV with applied magnetic fields, which follows the same field- and temperature-dependent (Brillouin-like) magnetization of the Mn spins. Notably, the intensity of the right- and left-circularly polarized Mn PL increases and decreases with applied field, respectively, in strong contrast to similar studies in bulk ZnMnSe and in ZnCdMnSe quantum wells. We discuss the effects of strong quantum confinement on coupling between spin-polarized excitons and the local Mn spins. [1] D. A. Bussian *et al.*, Nature Materials **8**, 35 (2009).

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Date submitted: 20 Nov 2009 Electronic form version 1.4