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Observation of Exchange Enhanced Zeeman Splitting in (Zn,Mn)Se Nanowires B. J. COOLEY, T. CLARK, B. LIU, C. EICHFELD, E. DICKEY, S. MOHNEY, N. SAMARTH, Materials Research Institute, Penn State University., S. A. CROOKER, National High Magnetic Field Lab, Los Alamos., C. E. PRYOR, M. E. FLATTE, Dept. of Physics, University of Iowa. — Magnetic semiconductor nanowires (NWs) are of potential interest as model systems for studying the physics of spin polarized 1D Fermi liquids. A high degree of spin polarization is anticipated from the sp-d exchange-enhanced Zeeman splitting of band edge states. Here, we report the vapor-liquid-solid growth of magneto-optically active (Zn,Mn)Se nanowires that show large Zeeman shifts in band edge photoluminescence (PL) at low temperatures. Transmission electron microscopy reveals the formation of single crystal wurtzite NWs oriented along the c-axis and with diameters as narrow as ~ 10 nm (approaching the 1D regime). Low temperature magneto-PL measurements of as- grown NW ensembles show Zeeman shifts of ~ 5 meV/T. The Zeeman shifts show a Brillouin-like functional dependence on magnetic field and temperature, consistent with mean field expectations for an exchange-enhanced spin splitting. We discuss the magnetic field dependence of the Zeeman shifts and the modified selection rules for PL polarization resulting from quantum confinement and the NW geometry. Supported by NSF MRSEC and the NNIN.

N. Samarth
Materials Research Institute, Penn State University.

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