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Magneto-Optical Studies of PbSe Colloidal Nanostructures J.G. TISCHLER, T.A. KENNEDY, E.R. GLASER, E.E. FOOS, T.J. ZEGA, R.M. STROUD, AL.L. EFROS, S.C. ERWIN, Naval Research Laboratory — PbSe is an unusual semiconductor material with a direct band gap at the L point of 150 meV at 4 K. The band structure at this symmetry point is four-fold degenerate for both electrons and light holes, and conduction and valence bands possess similar effective masses and g-factors. Since both masses are relatively small, quantum confinement effects are easily achieved by reducing the nanostructure size to dimensions of the order of the large exciton Bohr radius, a_B=46 nm. We synthesized high quality PbSe nanocrystals and characterized them using transmission electron microscopy and optical methods. We probed the g-factor and fine structure of excitons in undoped PbSe quantum dots using optically detected magnetic resonance (ODMR) at 24 GHz and polarized photoluminescence in a magnetic field. The ODMR reveals that the g-factor is large for electron and holes (g=7.6) compared to other semiconductor nanocrystal systems. The photoluminescence polarization increases linearly with increasing magnetic fields up to 6 T, indicating that the fine-structure splitting is rather small.

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