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Spin dynamics in colloidal n-type and Mn^{2+}-doped ZnO quantum dots STEFAN OCHSENBEIN, DANIEL GAMELIN, Department of Chemistry, University of Washington — Spins in semiconductor quantum dots (QDs) have been proposed as qubits for quantum computing. We have explored the reversible introduction of additional unpaired electrons into colloidal QDs, and have examined the spin properties of these electrons by electron paramagnetic resonance (EPR) spectroscopies. These experiments have revealed that the added electron resides in the conduction band and is delocalized over the entire QD. EPR linewidth analysis has allowed the transverse spin relaxation time constant, T_2, to be determined. Reducing the concentration of spin active ^{67}Zn nuclei in the QDs is shown to increase T_2 substantially. The spins of Mn^{2+} dopants in ZnO QDs have also been explored. Pulsed EPR experiments show that Mn^{2+} spins additionally interact with nuclear spins of the QD surface capping ligands, despite large spatial separation. This study quantifies the interactions that determine T_2 of electron and dopant spins in ZnO QDs, and demonstrates manipulation of these interactions by chemical means. These results have bearing on consideration of spins in semiconductor nanostructures for information processing. Relevant references: K. M. Whitaker, S. T. Ochsenbein, V. Z. Polinger, and D. R. Gamelin, J. Phys. Chem. C **112**, 14331 (2008). W. K. Liu, K. M. Whitaker, A. L. Smith, K. R. Kittilstved, B. H. Robinson, and D. R. Gamelin, Phys. Rev. Lett. **98**, 186804 (2007).

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