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Tuning Hole g-Factors in Self-Assembled InAs/GaAs Quantum Dots with an Electric Field JOSEPH PINGENOT, CRAIG E. PRYOR, MICHAEL E. FLATTÉ, Optical Science and Technology Center, The University of Iowa — The g-factors of holes in quantum dots (QDs) determine the energy splittings of the spin states in a magnetic field, influencing spin precession, spin lifetimes, and photoluminescence polarization. Modulation of the g-factor by an electric field may permit spin manipulation for quantum information processing. Hole g-factors in quantum wells have a large anisotropy between the in-plane (g= 0) and growth (g=2.3) directions[1]. Calculations of hole g-factors for InAs/GaAs[2], CdTe[3], and Ge/Si QDs[4] have also indicated size dependency. Using 8-band k.p theory, we calculated electric field dependent hole g-factors on a variety of InAs/GaAs QDs. We find a large anisotropy: g=0.75 and 2.5 for B along (1-10) and (001) respectively for an elliptical dot with Eg=1.136, and g=0.059 and 2.8 for a round dot with Eg=1.133. A 100kV/cm field along (001) changes the (1-10) g-factor from 0.75 to 1.1 in the elliptical dot (0.059 to 0.058 for the round dot), and the (001) g-factor changes from 2.5 to 2.3 (2.8 to 2.9). [1] Sapega et al., PRB 45, 4320 (1992). [2] C. Pryor and M. E. Flatte, PRL 96, 026804 (2006). [3] Prado et al., PRB 69, 201310(R) (2004). [4] Nenashev et al., PRB 67, 205301 (2003).

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