Modeling of magnetic polaron properties in (Zn,Mn)Te quantum dots$^1$ JAMES PIENTKA, St. Bonaventure University, B. BARMAN, L. SCHWEIDENBACK, A.H. RUSS, Y. TSAI, J.R. MURPHY, A.N. CARTWRIGHT, I. ZU-TIC, B.D. MCCOMBE, A. PETROU, SUNY Buffalo, W-C. CHOU, W. C. FAN, National Chiao Tung University, I.R. SELLERS, University of Oklahoma, A.G. PETUKHOV, R. OSZWALDOWSKI, South Dakota School of Mines and Technology — Magnetic polarons in (Zn,Mn)Te quantum dots (QD) show unconventional behavior [1]. These structures exhibit a small red shift of the photoluminescence peak energy in the presence of a magnetic field $B$ and they also have a weak dependence of the polaron energy $E_{\text{MP}}$ on temperature $T$ and $B$. We attribute these properties to a large molecular field $B_m$ that is proportional to the heavy holes spin density [2]. We have calculated $B_m$ using the QD diameter and height as adjustable parameters. Assuming hole localization, this calculation yields values of $B_m > 20$ T. The assumption that the hole localization diameter can be smaller than the QD diameter is justified due to alloy and spin disorder scattering [3]. Using the magnetic polaron free energy, we calculate $E_{\text{MP}}$ as function of $T$ and $B$ for a variety of $B_m$ values. To get a weak dependence of $E_{\text{MP}}$ on $T$ and $B$ we must assume that the polaron temperature is higher than $T$. [1] B. Barman et al., Phys. Rev. B 92, 035430 (2015). [2] J. M. Pientka et al., Phys. Rev. B 92, 155402 (2015). [3] K. V. Kavokin et al., Phys. Rev. B 60, 16499 (1999).

$^1$This work was supported by U.S. DOE BES, Award DE-SC0004890, NSF DMR-1305770 and U.S. ONR N000141310754.