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Magnetic Polarons in type-II (Zn,Mn)Te columnar quantum dots[1] M. EGINLIGIL, I.R. SELLERS, R. OSZWALDOWSKI, V.R. WHITESIDE, A. PETROU, I. ZUTIC, B.D. MCCOMBE, University at Buffalo, A.G. PETUKHOV, South Dakota School of Mines , W-C CHOU, National Chiao Tung University, Tawian — We present the results of a time-resolved photoluminescence (TRPL) study of type-II (Zn,Mn)Te/ZnSe quantum dots. The sample consists of 5 layers of (Zn,Mn)Te QDs separated by ZnSe spacers. We observe magnetic ordering in these QDs through measurements of the peak energy (E) of the PL vs. time. The large red shift with time ($\sim$ 40 meV at low temperatures) is attributed to the formation of magnetic polarons (MPs) in the QDs, induced by the exchange interaction between the spins of photoexcited holes and those of Mn within the QDs. The MPs are detected at temperatures up to $\sim$ 200 K, with a binding energy that is very weakly dependent on temperature. We find two separate time scales for all temperatures. The shorter time (0.7 ns) is assigned to the MP formation while the origin of the longer time (11 ns) is not well understood [1]. The TRPL measurements on a control ZnTe QD sample showed a much different behavior (initial blue shift of E over about 20 ns followed by a very gradual red shift). We also present magnetization measurements of these two samples. [1] I. R. Sellers et al. pre-print.

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