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Exchange coupling between magnetic and non-magnetic quantum dots LEIGH M. SMITH, SEBASTIAN MACKOWSKI, TAK GURUNG, AZIZ M. MAJIDI, MARK JARRELL, HOWARD E. JACKSON, University of Cincinnati, FEDIR V. KYRYCHENKO, CHRIS J. STANTON, University of Florida, GRZEGORZ KARCZEWSKI, Institute of Physics PAS, Warsaw, Poland — We study the exchange interaction between non-magnetic CdTe and magnetic CdMnTe quantum dots (QDs) grown epitaxially in the same layer by means of single dot magneto-photoluminescence spectroscopy. Very narrow emission lines ($\sim$0.1 meV) exhibiting negative exciton g-factors are attributed to non-magnetic QDs. On the other hand, much broader PL lines ($\sim$3-4meV), which for circularly polarized resonant excitation at B=0 T feature strong polarization of the emission confirm the presence of magnetic CdMnTe QDs. We demonstrate that in applied magnetic field the exciton Zeeman splitting in a single CdTe QD is larger for resonant σ^- (against the field) excitation than for σ^+ (along the field) excitation. We interpret these results as an indication of the exchange interaction between excitons in the CdTe QD and ferromagnetically aligned magnetic inos confined to neighboring CdMnTe QDs. Remarkably, in spite of the external field, the spin alignment of Mn ions in QDs can still be controlled by the polarization of the excitation. Thus, the excitons in non-magnetic QDs provide an extremely sensitive probe of the light-induced magnetization. The work was supported by NSF grants 9975655, 0071797, 0325474, and 0312680 and PBZ-KBN-044/P03/2001.

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