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Tunable magnetic exchange interactions in manganese-doped inverted core-shell ZnSe-CdSe nanocrystals[1] DAVID BUSSIAN, SCOTT CROOKER, MING YIN, Los Alamos National Lab, MARCIN BRYNDA, University of California-Davis, ALEXANDER EFROS, Naval Research Lab, VICTOR KLIMOV, Los Alamos National Lab — Magnetic doping of semiconductor nanostructures is pursued for applications in magnetic memory and spin-based electronics. A primary goal is to control interactions between carriers (electrons and holes) and the embedded magnetic atoms. We have demonstrated* a tunable magnetic *sp-d* exchange interaction between electron-hole excitations and paramagnetic Mn^{2+} ions using 'inverted' core-shell nanocrystals composed of Mn^{2+}-doped ZnSe cores overcoated with undoped shells of narrower-gap CdSe. Magnetic circular dichroism studies reveal giant Zeeman spin splittings of the band-edge exciton that are tunable in magnitude *and sign*. Effective exciton g-factors are controllably tuned from -200 to +30 at 1.6 K by increasing the CdSe shell thickness, demonstrating that strong quantum confinement and wavefunction engineering in heterostructured nanocrystals can be utilized to manipulate carrier-Mn^{2+} wavefunction overlaps *and* the *sp-d* exchange parameters themselves. *D. Bussian et al., Nature Materials, *in press*.

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