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Spin-Dependent Light-Harvesting in Colloidal Nanocrystals by Controlling Electronic Trap States with Optically Detected Magnetic Resonance K.J. VAN SCHOOTEN, University of Utah, J. HUANG, D.V. TALAPIN, University of Chicago, C. BOEHME, University of Utah, J.M. LUPTON, Universität Regensburg — Colloidal synthesis of semiconductor nanocrystals offers high levels of control over both particle size and geometry, leading to the development of novel optoelectronic device architectures (e.g. CdSe/CdS tetrapods). Unfortunately, realization of such devices is forestalled due to the ubiquitous existence of energetic "trap" states which compete with quantum-confined band-edge excitonic states and drive down device efficiencies. Although the existence of such states is readily confirmed via observation of single particle photoluminescence blinking and delayed photoluminescence decay dynamics, little detail is actually known as to the characteristics of these trap states due to difficulties in directly accessing them experimentally. We use pulsed optically detected magnetic resonance spectroscopy in order to begin to probe the chemical and electronic nature of these long-lived states, shedding light on their relation to band-edge states. Ultimately, it is found that spin coherence extends up to $T_2 = 328 \pm 22$ ns at 3.5 K, allowing for the coherent control of light harvesting in heterostructured nano-tetrapods which permits remote readout of spin information.

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