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Enhanced Physical Properties of Quantum-Confined Europium Sulfide Nanocrystals MARCELA REDIGOLO, DMITRY S. KOKTYSH, SANDRA J. ROSENTHAL, JAMES H. DICKERSON, Vanderbilt University — Synthesis and characterization of sub-2.0 nm europium sulfide nanocrystals is presented. Of particular interest is the behavior of the optical, magnetic, and magneto-optical properties as the nanocrystal diameter decreases, approaching the quantum confinement regime. The physical properties of these materials are dominated by 4f ionic transitions, which are affected directly by the nanocrystal size, due to nearest and next-nearest neighbor couplings. We believe that nanocrystal size, surface strain, and surface passivation will enhance the observable physical characteristics of the nanomaterials. To our knowledge, this would be the first evidence of quantum confinement effects in europium chalcogenide nanocrystals. Calculations of the Bohr radii of the 4f transition establish the upper limit on the nanocrystal size that exhibits blue shifts in the fluorescence and, perhaps, enhancements on the magnetic moment (μ_{eff}). Structural properties are characterized by transmission electron microscopy, selected area electron diffraction, and x-ray diffraction. Absorption and photoluminescence spectroscopy measurements also are presented to describe the optical properties of the nanocrystals.

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