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Core and shell size dependences on strain in core@shell Prussian blue analogue (PBA) nanoparticles and the effect on photomagnetism.[1]
J. M. CAIN, C. F. FERREIRA, A. C. FELTS, S. A. LOCICERO, J. LIANG, D. R. TALHAM, Dept. of Chemistry, Univ. of Florida, M. W. MEISEL, Dept. of Physics and NHMFL, Univ. of Florida — $Rb_xCo[Fe(CN)_6]_y@K_aNi[Cr(CN)_6]_b$ core@shell heterostructures have been shown to exhibit a photoinduced decrease in magnetization that persists up to the $T_c = 70$ K of the KNiCr-PBA component, which is not photoactive as a single-phase material. A magnetomechanical effect can explain how the strain in the shell evolves from thermal and photoinduced changes in the volume of the core. Moreover, a simple model has been used to estimate the depth of the strained region of the shell, but only one size of core (347 ± 35 nm) has been studied. Since the strain depth in the shell is expected to be dependent on the size of the core, three distinct RbCoFe-PBA core sizes were synthesized, and on each, three different KNiCr-PBA shell thicknesses were grown. The magnetization of each core-shell combination was measured before and after irradiation with white light. Our results suggest the strain depth, as expected, increases from ≈ 56 nm in heterostructures with a core size of 328 ± 29 nm to more than 90 nm in heterostructures with a core size of 575 ± 113 nm. The data from the smallest core size also shows features indicating the model may be too simple.

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Mark Meisel
Univ of Florida - Gainesville

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