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Anomalous Hall Effect and Electron Transport in Co_2Si Nanocluster Films BALAMURUGAN BALASUBRAMANIAN, TOM GEORGE, BHASKAR DAS, RALPH SKOMSKI, DAVID SELLMYER, Nebraska Center for Materials and Nanoscience and Department of Physics and Astronomy, University of Nebraska — Magnetic nanoparticles or clusters are of fundamental and technological importance, since they exhibit entirely different and/or improved magnetic and electronic properties as compared to bulk alloys. Our recent research shows large average magnetic moments of up to $0.70\mu_B$/Co at 10K and $0.49\mu_B$/Co at 300K for cluster-deposited Co_2Si nanoparticles, in sharp contrast to the nearly vanishing bulk magnetization. In this talk, we present interesting electron-transport properties in Co_2Si nanoparticle films. The film shows a room-temperature negative magnetoresistance (MR) of 0.14% at to kOe, which become as high as 1.8% at low temperatures. We also observed anomalous field-dependent Hall resistivities (ρ_{xy}) in the nanoparticle film, which corroborate the magnetic hysteresis loops. Interestingly, the longitudinal metallic resistivity (ρ_{xx}) shows a resistivity minimum at around 10K, similar to Kondo effects observed in the case of non-magnetic metals due to dilute magnetic impurities. The transport properties will be discussed in terms of the underlying spin correlations in the Co_2Si nanoparticle films. This work is supported by the U.S. DOE-BES-DMSE (Grant No. DE-FG02-04ER46152) and NCMN.

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