Abstract Submitted
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Anomalous Magnetoresistance Effect in Topographical Nanoengineered Material[1] DEEPAK SINGH, University of Maryland, College Park / NIST, Gaithersburg, STEFAN DICKERT, RUKSHAN THANTIRIGE, MARK TUOMINEN, University of Massachusetts, Amherst — Recent developments in nanofabrication allow for the engineering of a broad range of topographical materials with strong implications in spin caloritronics of condensed matter physics. We have applied the top down approach to create a series of nanoengineered materials, which consists of locally hexagonal periodic array of Co dots (12 nm in diameter and 3 nm in thickness, with a periodicity of 28 nm) in direct multidirectional contact with encapsulating thin layer of polycrystalline Cu film (15-30 nm). The electrical transport measurements on the nanoengineered materials unveiled a host of interesting properties that includes the giant thermal hysteresis, which is onset above the room temperature, and anomalous magnetoresistance (MR) behavior. The thermal hysteresis exhibits strong magnetic field dependence, applied perpendicular to the substrate. The most unusual behavior, perhaps, is manifested by MR oscillations, which occur only in the initial field scan in a very unusual temperature range of 100 K <T <200 K. The qualitative interpretation of the experimental results suggests that the spin-orbit-type coupling between giant localized moments in periodic sites and the surrounding conduction electrons play important role in the anomalous MR oscillation.

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