Abstract Submitted
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**Unusual size-dependent magnetic anisotropy in Co nanomagnets made from self-organized fast laser processing**[1] H. KRISHNA, Dept. of Physics, Washington University in St. Louis, MO, C. MILLER, Dept. of Electrical and Systems Engineering, Washington University in St. Louis, MO, Z. NUSSINOV, A.K. GANGOPADHYAY, R. KALYANARAMAN, Dept. of Physics, Washington University in St. Louis, MO — Unusual size-dependent magnetic anisotropy has been observed in hemispherical polycrystalline Co nanomagnet on $SiO_2$ substrates produced by fast pulsed-laser-induced self-organization. The magnetic states of these particles have been characterized by using magnetic force microscopy (MFM) and hysteresis measurements. The results for single domain particles up to a diameter of 180 nm, the magnetization direction of smaller sized particles tends to be in-plane, while the larger particles tend ot have out-of-plane orientation. This finding is not consistent with shape anisotropy which predicts a size-independent in-plane alignment. Microstructural analysis revealed that particles had a granular microstructure with the grain size increasing with particle size. This unusual behavior has been attributed to large residual tensile strain in the hemispherical nanoparticles due to the large heating/cooling rates ($\sim 10^{10}$ K/s) under ns laser self-organization, the large thermal expansion mismatch and the negative magnetostrictive constant for polycrystalline Co.

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