

Abstract Submitted  
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**Soft Magnetic Films Made of Iron-Iron Oxide Core-Shell Nanocluster Impact for High Frequency Applications**<sup>1</sup> QI YAO, M. KAUR T. SINGH, RYAN SOUZA, YOU QIANG, Department of Physics, University of Idaho, Moscow, Idaho 83844-0903, NANOPHYSICS LAB TEAM — High-frequency soft magnetic thin films, are increasingly in demand with rapid improvement and miniaturization in electromagnetic devices. To achieve high permeability in high frequency up to GHz, high resistivity, saturation magnetization and uniaxial anisotropy field are required. Accordingly, Fe/Ferrite core-shell nanocluster thin films are prepared at room temperature directly on the top of CMOS by novel energetic cluster impact. To avoid high-temperature field deposition or post-annealing, bias voltage up to 20 kV is applied to the oblique substrate to induce in-plane shape anisotropy. The high magnetic moment of Fe cores and the insulated Fe oxide shells jointly cause the combination of high saturation magnetization and high resistivity of the nanocluster thin films. Consequently, the thin films exhibit high permeabilities in up to 1.5 GHz, which are measured by a shorted transmission-line perturbation method. Moreover, the core fraction and the surface density are adjusted, which shows remarkable effects on the thin films' high-frequency permeabilities.

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