Assembly of Magnetic Nanoclusters

BALAMURUGAN BALASUBRAMANIAN, RALPH SKOMSKI, BHASKAR DAS, Nebraska Center for Materials and Nanoscience and Department of Physics and Astronomy, University of Nebraska, Lincoln, NE - 68588, GEORGE HADJIPANAYIS, Department of Physics and Astronomy, University of Delaware, Newark, DE -19716, DAVID SELLMYER, Nebraska Center for Materials and Nanoscience and Department of Physics and Astronomy, University of Nebraska, Lincoln, NE - 68588 — Nanostructured Co or Fe-rich magnetic materials are of interest for a wide range of applications because of their novel structures and spin phenomena [1, 2]. In this presentation, the synthesis and stability of nanoparticles of (Co-Fe):X alloys (X = Hf, Sm, Si) having unusual crystal structures will be discussed. The nanoparticles are produced using a single step-process in a cluster-deposition system and are smaller than 10 nm with an rms standard deviation of \( \sigma/d \leq 0.15 \). In particular, Co-rich nanoparticles such as HfCo\(_7\) and SmCo\(_5\) exhibit high magnetocrystalline anisotropies \( (K_1 > 10 \text{ Mergs/cm}^3) \) and saturation magnetic polarizations \( (J_s > 10 \text{ kG}) \). The nanoscale effects on the magnetism including spin structure, magnetic polarization, and other intrinsic properties, and the potential of the nanostructures for various applications will be presented.


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Balamurugan Balasubramanian
Nebraska Center for Materials and Nanoscience and
Department of Physics and Astronomy, University of Nebraska,
Lincoln, NE - 68588

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