Development and Characterization of Novel Nanoparticle Ferrite Materials

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New application requirements have led to increased development efforts on base LTCC ferrite materials and compositions to meet the needs. The single greatest technology gap for these materials seems to be the properties of the existing ferrite composition and has led to limiting further reduction in size and cost of monolithic components. This work will present results on efforts to develop novel nanoparticle LTCC ferrite material(s) with significantly improved magnetic performance, allowing for a size and cost reduction compared to the existing "state of the art" designs/materials used in these applications. Specifically, the objective is to provide new LTCC ferrite materials with an increased saturation magnetization and magnetic permeability as compared to the existing LTCC ferrite, which directly enables size reduction without sacrificing component performance. By enabling significant size and cost reduction, the newly developed LTCC ferrite material will be able to broadly address overall performance requirements and general needs for technology. Therefore, nanoparticle polycrystalline NiCuZn based ferrites have been prepared under controlled experimental conditions and magnetic and electrical properties have been measured.

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Nanostructured Materials and Devices

Symposium LL: New Trends and Developments in Nanomagnetism

New Trends and Developments in Nanomagnetism

Research on nanoscale magnetic systems is driven by scientific interest as well as commercial needs. The demand for smaller feature sizes and higher speed of magnetic devices requires a fundamental understanding of the processes involved that can only be achieved by aligning activities in basic research with device developments. Hereby, it is crucial that the reduced dimensions, which are currently addressed, have become comparable to the characteristic lengths of metallic systems, i.e., spin-diffusion length or mean-free path. On these scales, new experiments become feasible, such as research on spin-current and spin-Hall effects.

Another example is the very recent work on spin caloritronics, which hold promises for novel technological applications, especially for reducing energy consumption of digital devices. Currently, the pros and cons of nonvolatile systems are evaluated; and ferromagnetic nanosystems seem to be very promising candidates.

To further push the size reduction and to tailor specific properties, new fabrication processes and characterization techniques have to be developed. As the request for even faster devices goes in unison with the size reduction, the most recent developments in characterization techniques cover the aspect of tools with increased temporal and high-spatial resolution.

This symposium is focusing on recent trends in nanoscale magnetism and related technologies like advanced characterization techniques and fabrication processes that foster or initiate new

development. The goal is to emphasize the strong mutual interaction between current research and present and future technologies.

Abstracts are solicited for (but will not be restricted to) the following topics:

- Fabrication of magnetic nanostructures
- Patterned thin films and media
- Magnetic behavior of single nanostructures and interactions of nanoparticles
- Magnetic imaging and microscopy of nanostructures
- Spin dynamics and ultrafast switching
- Current driven magnetization processes and magnetization dynamics
- Spin current and spin injection in metallic systems
- Spintronics application and nanomagnetic devices
- Spin caloritronics
- Magnetoplasmonics
- Biomagnetic applications

Invited speakers include:
J. Ansermet (EPFL, Switzerland), **B. Dieny** (Spintec, France), **C. Fadley** (Univ. of California, Davis), **E. Fullerton** (Univ. of California, San Diego), **A. García-Martín** (Inst. de Microelectrónica de *Madrid*, Spain), **G. Grübel** (DESY, Germany), **A. Hoffmann** (Argonne National Lab), **A. Kikutsu** (Toshiba Corp., Japan), **E. Rozhkova** (Argonne National Lab), **R. Ruiz** (Hitachi GST), **E. Saitoh** (Tohoku Univ., Japan), **D. Sander** (Max Planck Inst.-Halle, Germany), **C. Schneider** (Forschungszentrum Jülich, Germany), **K. Takanashi** (Tohoku Univ., Japan), **P. Vavassori** (CIC nanoGUNE, Spain).

Symposium Organizers

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