EIIRIS Special Seminar

特別講演会のご案内

EIIRIS
Electronics-Inspired
Interdisciplinary
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【日 時】平成27年2月27日（金）**11:00-12:00**

【場 所】EIIRIS2（VBL）3階 プロジェクト
研究交流室（大会議室）

【講演者とタイトル】

Dr. Jyoti Ranjan Mohanty

Assistant Professor, Department of Physics
Indian Institute of Technology Hyderabad

“ Title: Magnetism at nanoscale: Nano-small meets Ultra-fast ”（英語使用）

【内容】

Modern magnetic devices (GMR read heads, magnetic sensors, hard disks and spintronics devices) relies on storing or manipulating magnetic information in smaller length scales (nm’s) at faster time scales (nano-seconds to femto- seconds). To advance nanoscience and nanotechnology, one needs to understand how materials behave at the nanoscale. Advancement of nano-science allows us to prepare structure in nanometer size both by self-assembly and lithography. X-ray magnetic characterization provide us information on nanoscale with element specificity, chemical sensitivity, sensitivity to charge, orbital and spin ordering, high spatial resolution, polarization capability and faster time scales (dynamics using coherence, for coherent diffraction imaging and XPCS). In this talk I will present an overview of thin film magnetism and ultrafast magnetic dynamics of magnetic multilayers exhibiting ordered stripes due to perpendicular magnetic anisotropy (PMA). I will present a rather new and demanding technique to take *image without a lens*. One can see magnetic structure at the nanoscale level without using any lenses. One immediate application of this lens-less X-ray microscope is the development of smaller data storage devices for computers that can hold more memory.

I will present the evolution of self-assemble magnetic systems as a function of magnetic field, temperature and strain to identify the role of disorder in formation and stability of the domains and their dynamics in these systems using magnetic force microscope (MFM) [1] and x-ray resonant magnetic scattering [2]. The application of an ultra-short laser pulse on a ferromagnetic film allows changing its magnetization in the femto-second time scale. This scientifically fascinating effect has also technological implications, e.g., regarding the ultimate speed at which information can be stored and processed in magnetic media. Even today, the microscopic understanding of laser induced ultrafast demagnetization remains a challenging issue. The recent development of ultra-short soft X-ray pulses by X-ray free electron lasers opens new perspectives in this field. I will give an overview on this topic with our recent findings [3]. On theoretical point of view I will present micromagnetic simulations to understand the energetic and dynamics of the nanoscale magnetic systems.

References:
[1] J. Mohanty et al.,Appl. Phys. Lett. 83, 2829-2831 (2003), Appl. Phys. Lett. 82, 2308-2310 (2003), Phys. Rev. B. 73, 104441 (2006).
[2] A. Tripathi, J. Mohanty et al., Proc Natl Acad Sci USA 108(33), 13393-13398 (2011).
[3] Phys. Rev. Lett., 108, 267403 (2012), Nature Communication 3, 1100, 2012: DOI: 10.1038/ncomms2108.

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