Center for Magnetic Recording Research
SEMINAR
Tuesday, April 19, 2011
3:30 PM – Refreshments - CMRR Lobby
4:00 PM – Seminar - CMRR Auditorium

Multifunctional Magnetic-Photonic Nanostructures for Biomedical Applications

Prof. Young Keun Kim

Visiting Research Scientist, Center for Magnetic Recording Research, UCSD;
Professor, Department of Materials Science & Engineering, Korea University;
Director, Pioneer Research Center for Biomedical Nanocrystals,
National Research Foundation of Korea

Nanostructured materials such as nanoparticles and nanowires promise immense opportunities in nano-converging technology, ranging from nanoelectronic devices to ultrasensitive bioassaying [1], cell separation [2], and immunotherapy in biomedicine. In particular, nanostructures possessing both magnetic and photonic functionalities as well as biocompatibility are of emerging interest because a multifunctional nanostructure can offer separation, diagnostic, and therapeutic needs within one platform. Inorganic core(Fe_3O_4) - shell(Au, CdSe, ZnO, etc.) nanoparticles have been chemically synthesized and applied in cell separation and immuno cancer therapy. A metallic (e.g. Ni) nanowire array structure called nanohair combining with viral nanoparticles has been applied to detect troponin level of patients with a higher risk of acute myocardial infarction. The sensitivity increased more than 6 orders of magnitude compared to conventional ELISA assays. Moreover, the Ni nanohairs are proven to be reusable and can reproducibly differentiate healthy sera from unhealthy ones. The fabrication of barcode nanowires [3] appears appealing not only to magnetic devices but also to bio-applications as a result of magnetic and optical functionalities. Moreover, physical properties can be tuned by controlling the diameter, segment length, and segment ratio of the nanowires. In this talk, the synthesis, physical properties of magnetic-photonic nanostructures, and their applications in various fields of biomedical technology will be discussed.

[1] J.-S. Park, *et al.*, 'A highly sensitive and selective diagnostic assay based on virus nanoparticles', *Nat.Nanotechnol.* 4, 259 (2009).
[2] H. L. Liu, *et al.*, 'Synthesis of streptavidin-FITC-conjugated core-shell Fe3O4-Au nanocrystals and their application for the purification of CD4+ lymphocytes', *Biomaterials* 29, 4003 (2008).
[3] J. H. Lee, *et al.* 'Iron-gold barcode nanowires', *Angew. Chem. Int. Ed.* 46, 3663 (2007).

Bio: Prof. Young Keun (Young) Kim is a professor of Materials Science and Engineering at Korea University. Currently he is taking his sabbatical leave at the Center for Magnetic Recording Research at UC San Diego hosted by Prof. Eric Fullerton. He is the immediate past President of Korea University's Research and Business Foundation, in charge of managing university research funds and intellectual property rights. He is the PI and Director of the Pioneer Research Center for Biomedical Nanocrystals, an interdisciplinary center program for developing innovative nano-bio converging technologies sponsored by Korea Ministry of Education, Science and Technology since 2008. Prof. Kim received his B.S. and M.S. degrees in Metallurgical Engineering from Seoul National University, Seoul, Korea, in 1985 and 1987, respectively, and the Ph.D. degree in Materials Science and Engineering from MIT, Cambridge, Massachusetts, USA, in 1993. In the past, he worked for Quantum Corporation in USA and Samsung Electro-Mechanics in Korea before he joined Korea University in 2000. He is an editorial board member of the *IEEE Transactions on Magnetics* and the *Journal of Magnetism and Magnetic Materials*. He has published over 150 peer reviewed international journal papers, and invented over 30 patents. His research interests include materials development for magnetic information storage and nanostructures for biomedical applications.

Hosted by: Prof. Eric E. Fullerton

Please observe the "No Food or Drink in the Auditorium" policy.