

**Physics Colloquium
Oral Presentations
Michigan Technological University
Thursday, March 5, 2015
3:30-5:00 pm
Fisher Hall 139**

Functionalized boron nitride nanotubes for switching device applications

Boyi Hao

Advisor: Yoke Khin Yap

Abstract: Boron nitride nanotubes (BNNTs), structurally similar to carbon nanotubes (CNTs), is a wide band gap (~6eV) material. Different approaches have been applied to functionalize BNNTs, such as by metallic quantum dots (QDs) or graphene. They all shown promising results to be used for switching devices. Great effort have been put into the fabrication of QDs functionalized BNNTs based one dimensional device in the past 2 years. The most recent progress will be discussed in my talk.

Multi-band Transmission Cloak Based on Geometrical Optics

Ran Duan

Advisor: Elena Semouchkina with Co-Advisor Ravindra Pandey

Abstract: The geometric optics principles are used to design transmission cloak for hiding objects with dimensions substantially exceeding the incident radiation wavelengths. The designed cloak works at multiple bands due to periodicity of phase delay. The capability of scattering suppression is confirmed by full-wave simulations.

Reducing Dy Content in Hot-deformed Nd-Fe-B Magnets with Enhanced Magnetic

Jie Li

Advisor: Peter Moran

Abstract: The goal is to determine whether specific microstructural modifications to Neodymium-Iron-Boron ($\text{Nd}_2\text{Fe}_{14}\text{B}$) bulk magnets can result in the increased resistance to demagnetization (coercivity), which is now only obtainable by substituting ~10wt% dysprosium (Dy) for some of the neodymium (Nd) in $\text{Nd}_2\text{Fe}_{14}\text{B}$ magnets. The approach is to reduce the size of individual crystallographically-aligned grains in the magnet so that each grain can only support a single magnetic domain and to simultaneously dilute the Nd-Fe inter-granular phase present in conventional magnets with a non-Fe-containing Nd-rich phase (Nd-Cu). A developed hot deformation process, which can produce bulk magnets with crystallographically-aligned submicron crystallites by means of a selective dissolution and re-precipitation mechanism, is proposed to result in a bulk magnet with the microstructural features described above.

Synthesis, Functionalization, and Cutting of Boron Nitride Nanomaterials and Their Biocompatibility Studies

Bishnu Tiwari

Advisor: Dr. Yoke Khin Yap and Co-Advisor: Dr. Dongyan Zhang

Abstract: Nanostructured materials have found many potential biomedical applications such as in bio-sensing and delivery of drugs, proteins, and genes. Among these nanomaterials, the applications of boron nitride nanomaterials; boron nitride nanotubes (BNNTs) and boron nitride nanosheets (BNNSs) are relatively unexplored due to the difficulty in the synthesis of high-purity boron nitride nanomaterials.

Here I will present our recent results in synthesis, functionalization, and cutting of BNNTs and BNNSs for biomedical investigations. I will also report our recent *in vitro* biocompatibility results of these nanomaterials.

Hao Zhou

Advisor: Petra Huentemeyer

Abstract: