

Physics Colloquium

Michigan Technological University

February 17 (Thursday) 4:00 to 5:00 pm
Room 139, Fisher Hall

First success on growing boron nitride nanotubes on substrates

Jiesheng Wang

Adviser: Dr. Yoke Khin Yap

Boron nitride nanotubes (BNNTs) have stable electronic properties (band gap of ~5.5 eV), which is independent of the tube diameter, number of walls, and chirality. Furthermore, this band gap can be tuned by substitution of carbon. Thus BNNTs will complement applications of carbon nanotubes in nanoscale science and technology. Previously, powder form BNNTs have been synthesized at temperatures >1100 °C. These products are mixed of various impurities. Here we succeeded for the first time on growing BNNTs directly on substrates at 600 °C. Furthermore, these BNNTs are vertically-aligned on the substrate surface and can be grown at desired patterns and locations. Results obtained by scanning electron microscopy and transmission electron microscopy will be discussed.

Acoustic biosensors based on PMN-PT single crystal

Ziyou Zhou

Advisor: Dr. Miguel Levy

Medical diagnostic, chemical analysis and biotechnology application require more advanced detecting tools that can be used in gas/liquid environment. The acoustic biosensor is the most promising to solve this kind of problem. This talk concentrates on the basic principals and the fabrication of bulk biosensor (surface acoustic wave (SAW) mode) and film biosensor (flexural plate wave (FPW) mode). Changes in the mass load on the device will result in detectable changes in resonant frequency, which can be used to identify target substances depositing on the surface. PMN-32%PT ($\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - 32% PbTiO_3), a new type of single crystal with very strong piezoelectric response, has the potential to allow very sensitive determination of mass load.