T_CSUH Bi-Weekly Seminar

Texas Center for Superconductivity at the University of Houston

Shoujun Xu
Assistant Professor
Department of Chemistry and TcSUH
at the University of Houston

Friday, April 20, 2012
Room, 102, University of Houston Science Center
12:00 noon – 1:00 p.m.

Magnetic Molecular Sensing and Laser-Detected MRI: Sensitivity, Resolution, and Molecular Specificity

ABSTRACT

Magnetic molecular sensing is widely used in biomedical research via labeling molecules with magnetic particles. Several techniques have been developed for achieving high sensitivity, spatial resolution, and molecular specificity. For sensitivity, atomic magnetometers are used for detection. The spatial resolution is obtained by a scanning magnetic imaging technique. To achieve molecular specificity, a force-induced remnant magnetization spectroscopy technique is invented, which measures the magnetization of the magnetic particles as a function of molecular binding forces. Applications in molecular and cellular recognition will be presented.

We also demonstrate the technique of using atomic magnetometry in magnetic resonance imaging (MRI): laser-detected MRI. Contrary to conventional high-field MRI, we conduct spatial encoding in the Earth's magnetic field. Spatial resolution in millimetre has been achieved. One unique feature of laser-detected MRI is that the low Larmor frequency can penetrate metallic materials. Other advantages include enhanced contrast, low cost, portability, and low power consumption. Future applications and technical difficulties will be discussed.

BIO

Shoujun Xu obtained his Bachelor's degree from Nanjing University and a Master's from Peking University. Xu attended Johns Hopkins University for his Ph.D. in chemical physics, working for Dr. Kit Bowen in the field of photoelectron spectroscopy. He was a postdoctoral fellow for Dr. Ahmed Zewail at Caltech, where he developed ultrafast electron diffraction techniques. He also was a postdoctoral fellow for Alex Pines at Berkeley where he invented laser-detected MRI. He joined UH in 2007 and has been working on developing new magnetic-based techniques to investigate fundamental physical chemistry problems.

Persons with disabilities who require special accommodations in attending this lecture should call (713) 743-8213 as soon as possible.

TcSUH