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Materials Council Seminar Series

Georgia Institute of Technology

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Ohio University

“STM Atom/Molecule Manipulation: Realizing
Single Molecule Switches and Device”

Tuesday, September 18, 2007
Room 299 – Love Building
3:00-4:00PM

ABSTRACT

Scanning tunneling microscope (STM) manipulation of single atoms and molecules on surfaces allow construction of novel quantum structures on an atom-by-atom basis and demonstration of single molecule devices on a one molecule at-a-time basis. STM is not only an instrument used to ‘see’ individual atoms by means of imaging, but also a tool used to ‘touch’ and ‘take’ atoms/molecules or to ‘hear’ their vibration by manipulations. Therefore, STM can be considered as the ‘eyes’, ‘hands’ and ‘ears’ of the scientists connecting our macroscopic world to the exciting atomic and nanoscopic world. In our research projects, we combine STM manipulation schemes with a variety of tunneling spectroscopy measurements to investigate properties specific to the type of atoms/molecules. These innovative experiments are tailored to address several critical issues covering both fundamental understanding, and demonstration of novel atom/molecule based nano-devices. In this talk, our recent results of single atom/molecule manipulations using low-temperature STMs will be presented. The presentation will include measurement of lateral force to move an atom, atom manipulation on 3-D nanoclusters, manipulation of nanoscale bio-molecules to realize a multi-step single molecule switch, manipulation of molecular Kondo effect, and an atom-molecule hybrid device.

BIOGRAPHY

SAW-WAI HLA received his MSc at the University of Yangon, Myanmar in the area of experimental solid state physics/high-Tc (YBCO) in 1990. Following this, he was awarded a spot at the prestigious theoretical physics school ICTP in Trieste, Italy. There he received a diploma in theoretical condensed matter physics in 1993 on the topic of ZnSe/ZnCdSe superlattices. He then worked on his PhD in experimental thin film physics in ICTP-Slovenia joint program, and received a PhD from the University of Ljubljana in 1997. He was then a postdoctoral fellow at the ELETTRA Synchrotron Facility in Trieste, Italy, from 1997-1998, after which he became a member scientist/post-doc at the Freie Universitaet and the Paul Drude Institute for Solid State Electronics, in Berlin, Germany, working in the group of Prof. K.H. Rieder from 1998 to 2001. In 2001, Saw-Wai joined Ohio University, Athens, OH as an Assistant Professor, and he was appointed to Associate level with tenure in 2005. He is an expert in the area of low-temperature scanning tunneling microscopy, particularly focusing on the area of STM manipulation of single atoms and molecules. He has worked on single molecule devices, such as molecular switches, and on molecular electronics, and most recently focusing on the molecular Kondo effect. Saw-Wai received numerous scholarship and fellowships from ICTP, and at Ohio University he received the College of Arts and Sciences Dean’s Outstanding Teacher Award in 2006.

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