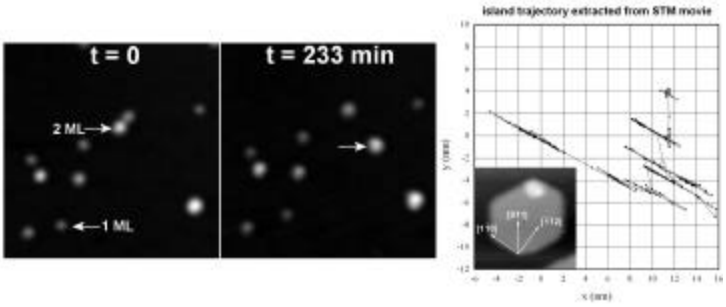
# NANOHOUR

Wednesday, April 25, 2007
3:00 PM
Beckman Institute - Room 3269

## Migration of Strained Nanostructures via Misfit-Dislocation Glide

**Andrew W. Signor**
Graduate Student, Dept. of Materials Science and Engineering, working with Prof. John Weaver

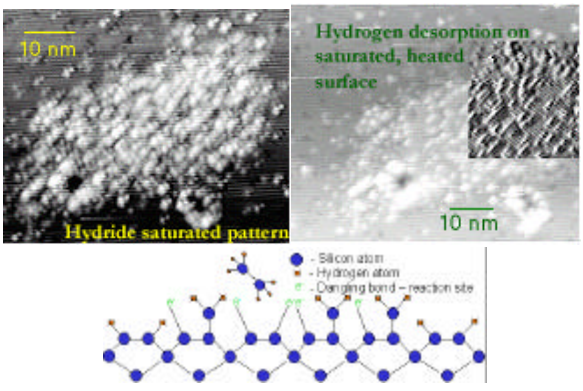



Experimental studies of island migration, an important process in crystal growth and nanostructure synthesis, have mostly been limited to homoepitaxial systems. In these systems, either diffusion or evaporation and condensation of adatoms at the island edge gives rise to motion of the entire structure. The present work is focused on Cu-Ag(111), a lattice-mismatched system, and provides strong evidence for a misfit dislocation glide mechanism. Here, the entire structure is moved by one Burger's vector as the dislocation nucleates and glides through the island. STM movies collected at 130-200 K reveal this surprising diffusion phenomenon for 1- and 2-monolayer Cu islands ranging in size from ~15-200 atoms.

**AND**

## Selective Silicon Epitaxy at the Nanometer Scale

**Matthew M. Sztelle**
Graduate Student, Electrical and Computer Engineering, working with Prof. Joe Lyding




We use the scanning tunneling microscope (STM) to controllably define patterns of reactive clean silicon, which can be used to generate 3D nanostructures of crystalline silicon. The initial hydrogen-passivated silicon surface generates an inert, low defect and contaminate-free surface, which is subsequently used as a patterning resist. By using the STM, hydrogen atoms can be removed from the surface revealing the highly-reactive, underlying clean silicon. [1] Disilane ($Si_2H_6$) is introduced to the system which deposits silicon-hydride species in the patterned region. This process is self-passivating while leaving the rest of the surface unaltered. The deposited species, having the same chemistry as the original system, can undergo repeated hydrogen removal and disilane exposure sequences. At room temperature, this process generates amorphous growth due to the inability of silicon atoms to diffuse. However, initial experiments at elevated substrate temperatures suggest crystalline growth is possible due to the enhanced mobility of the silicon atoms.

[1] J.W. Lyding, T.-C Shen, J.S. Hubacek, J.R. Tucker, and G.C. Abeln, Appl. Phys. Lett. 64, 2010 (1994).

**Coffee and cookies will be served.**

http://nanohour.beckman.uiuc.edu