

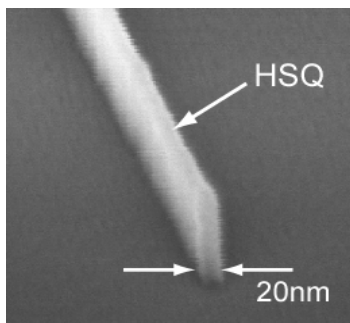
# Nanotechnology Seminar

Wednesday, January 28th, 4:00-5:00 pm

453F F. Paul Anderson Tower (Conference Room)

**Nano-fabrication with Electron Beams: Capabilities and Challenges**  
Dr. J. Todd Hastings, Department of Electrical and Computer Engineering

Electron beams can be focused to nanometer size spots and deflected easily with electric and magnetic fields; as a result, they are widely used to produce nanoscale patterns with arbitrary geometries. This is typically accomplished with scanning electron-beam lithography (SEBL), the process of patterning electron-sensitive thin films coated on suitable substrates. For example, figure 1 shows a 20-nm wide line patterned with SEBL. This seminar will address the current capabilities of electron-beam lithography, some technical and physical limits on pattern size and accuracy, and current challenges and opportunities for further research. Spatial-phase locked electron-beam lithography (SPLEBL), a new technique that achieves nanometer-level pattern-placement accuracy while reducing system cost and complexity, will be described in detail. The SPLEBL approach, shown in figure 2, uses the signal from a reference grid on the substrate to provide closed-loop control of the beam position. As a result, spatial-phase locking can provide 1-nm placement-accuracy while eliminating many of the expensive components and time consuming procedures usually associated with e-beam lithography.



**Figure 1.** Scanning electron micrograph of a 20-nm wide, 100-nm tall line patterned in hydrogen-silsesquioxane (HSQ) using scanning electron-beam lithography.

**Nano-scale Engineering Education for Undergraduates: A Certificate Program**  
Dr. Pinar Mengüç, Department of Mechanical Engineering

The College of Engineering has established a novel “Nano-Scale Engineering Certificate Program” (NECP) to educate undergraduate engineering students at the University of Kentucky on nanotechnology. The program will begin in July of 2004. Classes are being offered in the Spring and planned for the Fall that may be applied to the Certificate Program. Dr. Mengüç will be presenting the details of this new program.

**All students and faculty  
are invited to attend.  
Refreshments will be provided.  
Hope to see you there!**