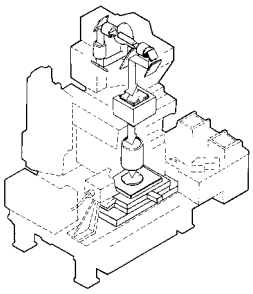
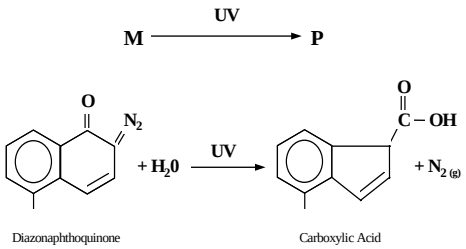
Fall, 2006 -- EE 60598
Semiconductor Microlithography

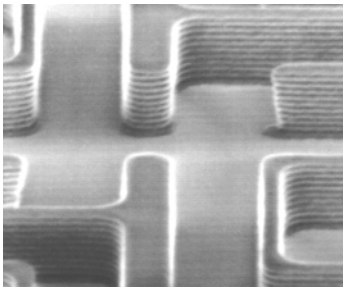
TTh 9:30-10:45am Room: 129 Hayes-Healy

Instructor: Chris Mack, www.lithoguru.com

Lithography is the patterning technique used in the fabrication of semiconductor integrated circuits. Advances in lithography over the last two decades have fueled the explosive growth of the microelectronics industry. In fact, future advances in microelectronics are being gated by advances in lithography. This course will cover the basic theory and technology of today's state-of-the-art in semiconductor lithography. Some topics include:







I. Optics of Projection Tools

Diffraction is the underlying imaging phenomenon. The theory of imaging will be described from the point of view of diffraction. The effects of partially coherent illumination will be included. Aberrations, which cause a deviation of the imaging behavior from the ideal “diffraction limited” case, will be discussed, as well as Illumination systems. Applying the principles of optical imaging, an aerial image can be computed. The aerial image can be analyzed to determine the effects of various optical parameters such as numerical aperture, wavelength, and defocus.

II. Photoresist Technology

The chemistry of standard optical photoresists will be discussed with emphasis on how the chemistry affects performance. Topics will include the optical properties of photoresists, the basic kinetics of resist exposure and chemical amplification, and the development properties.

III. Lithography for Manufacturing

Manufacturing aspects of lithography will be discussed with special emphasis on feature size control. Equipment and processes used in IC manufacturing will be described. Process control strategies will be reviewed.

IV. Resolution Enhancement Technology

The current trends in lithography will be discussed, including such topics as immersion lithography, optical proximity correction, off-axis illumination, and phase-shifting masks. The basic principles of lithography can be used to point out the areas of potential improvement.