Metrology of multilayer coated optics for EUV lithography

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EUV lithography is under intensive development as a production technology for the manufacture of integrated circuits sometime in the next decade. This technology is based on the use of multlayer coated optics at a wavelength between 11.3 and 13.5 nm. The requirements on the quality of these optics are extremely stringent. In this talk, I will discuss two advanced, at-wavelength metrology projects that support characterization of the optics at the very highest level.

A wavefront measuring interferometer, operating at the EUV wavelength, has been developed at the Advanced Light Source in Berkeley to perform system level characterization and final alignment of the projection/reduction optics. Results of our characterization of a newly completed 4-mirror system with multilayer coated aspherical elements will be presented.

The mask blank for EUV lithography is a multilayer coated optical flat, upon which an absorber pattern is fabricated. The blank must have uniform reflectivity, in both amplitude and phase, down to the sub-100 nm spatial scale. Small irregularities, or defects, will cause fatal errors in the circuit. It is difficult to fabricate such defect-free coatings, but it is a major challenge to even detect such very small defects. A type of rapidly scanning EUV microscope has been developed at the Advanced Light Source as a mask blank inspection system in order to address this challenge. This instrument is being used to support research on the development of alternative, visible-light based inspection equipment for commercial application. Extensive cross-correlation experiments between at-wavelength and visible-light inspection are the primary vehicle for conducting this research. Recent results of this activity will also be presented.

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