

Phase Contrast EUV microscope for EUV Mask Defect Inspection

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EUV lithography (EUVL) will introduce as next generation lithography of 32 nm node in 2009. Defect-free mask fabrication is one of the technical issue to achieve EUVL. There are two types of defects in EUVL mask: amplitude defect and phase defect. However, phase defect due to the multilayer fabrication can not be resolved with an existing inspection tool. Thus, we constructed the EUV microscope for actinic mask inspection which consists of Schwarzschild optics and X-ray zooming tube. Furthermore, this microscope has a plan to build a Mirau interferometer which can detect the phase defect (as shown in Fig. 1). Magnification of Schwarzschild optics is 30X, and X-ray zooming tube can change the magnification in the range from 10 X to 200 X. So, the total magnification of the microscope is 300 X to 6000 X. And the numerical aperture of Schwarzschild optics is 0.3, so, it can inspect the defect of 10 nm in size. Figure error of mirrors are less than 0.4 nm and surface roughness of mid-frequency was less than 0.15 nm. These Zerodur mirrors were fabricated by ASML Tinsley. D-graded Mo/Si multilayer was coated on these optics by X-ray, Company in Russia. D-spacing matching of less than 0.01 nm has been achieved at the wavelength of 13.5 nm.

Up to now, the characteristics of optics are evaluated. Using this system, Mo/Si glass substrates are inspected, which defects have been already inspected by DUV inspection system. Inspection results and furthermore information will be presented in conference.

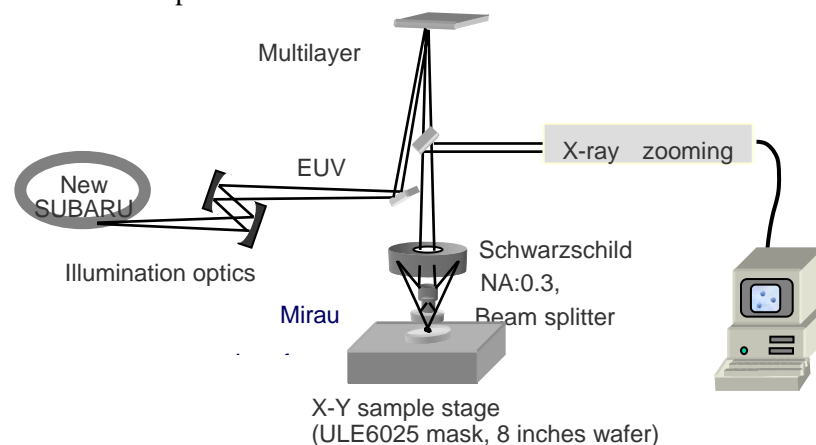


Fig. 1 Configuration of EUV microscope.