

“Reflective coatings for Extreme Ultraviolet Lithography optics”

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In current day commercial microlithography tools, printing of integrated circuits is based on the optical projection of reticle patterns on wafers through demagnifying transmission optics. The projected pattern size is continuously decreasing due to the ever-present demand for higher numbers of devices per chip. This reduction of the pattern size calls for a reduction in the wavelength of the light used to project the pattern. Using transmission optics, a lower limit of the illumination wavelength is currently reached due to high absorption. A solution to this fundamental problem is to use *reflective* optics, instead of *transmissive* optics. Due to the low reflection amplitudes of single layers of materials at low wavelengths, reflective optics consisting of multilayers will be used for next generation lithography tools.

The Laser Plasma and XUV optics group at Rijnhuizen, has a rich history in the field of producing and characterizing multilayer optics. In recent years, the main focus of the work has been on Mo/Si based multilayers for application in Extreme Ultra Violet Lithography (EUVL). The main part of this work is carried out under contract with Carl Zeiss SMT AG, in collaboration with ASML, Philips, and TNO laboratories.

Due to the high wafer throughput requirements for EUVL, obtaining high multilayer reflectance is a key area of research. In addition to throughput, strict requirements exist for the illumination fields in lithography tools, yielding challenging requirements for multilayer coatings such as low residual stress, high thermal stability, reflected wavelength matching, sample (including edge) uniformity, low roughness, and long lifetime during tool operation. This seminar will present an overview of recent research performed at LPX, and the technological challenges that have been identified and overcome to enable coating of real optics for EUVL applications.