"Specific Multilayer Applications in EUV Lithography machines"

P.U.Pennartz*, N. Grupido*, L.Jiang*, L. Pina**, P. Oberta **,*Rigaku Innovative Technologies Inc, Auburn Hills Michigan, USA, ** Rigaku Innovative Technologies Prague, CZ Republic

In recent years, EUV Lithography has developed into the leading method used for the production of highly integrated semi-conductors. The so-called 13.5 nm technology is changing the production process from light-based lithography to x-ray-based (better EUV based) lithography processes, which need big investments into production processes, fabrication plants and machines by the semiconductor industries.

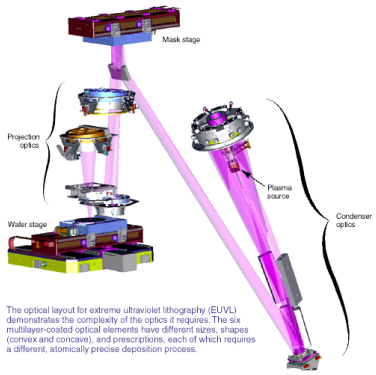
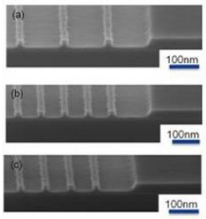


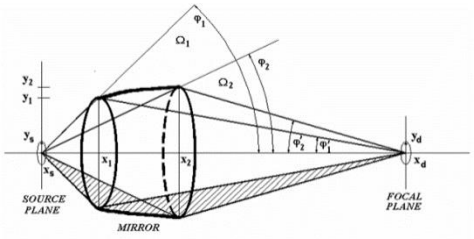
Figure 1 (left) shows a typical beam path for an EUVL semiconductor production machine.

Figure 2 (below) shows standard structures which are produced by this EUVL technology. (Image courtesy of imec and Lawrence Livermore National Laboratory)



We will show results obtained with condenser optics coated with Mo/Si ML structures.

Besides ML condensers and other structures for EUVL, we also will show results obtained with replicated optics, which are generally used as condensers for metrology tools in EUVL technology. These principles are also finding application in outer space optics such as Walther Objectives. Figure 3 below shows the shape of an replicated optics.



The geometrical parameters of the shape can be adapted to the needs of the optical specifications and design. The idea of such optics is to produce a mandrel of high precision, which is then used as the core and all 'outer' layers are put on top of this core. At the end the core is extracted and the hollow pipe-like structure is used.

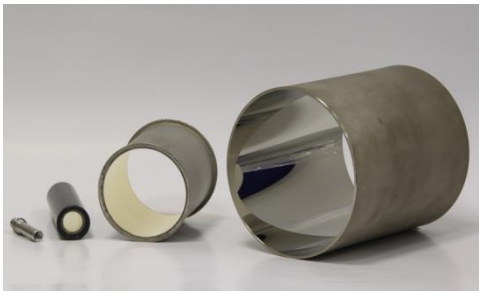


Figure 4 (left) shows different structures of these replicated optics which can be used from hard x-rays (8 keV leftmost in the picture) to several 100 eV (rightmost in the picture).

In the presentation we will show the most recent results obtained with this technology.