

Optics development in French (PREUVE) and European EUV Program (MEDEA); Application of Multilayer Coatings necessary in demonstrative tools

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EUV Programs, with similar objective than American consortium SEMATECH and ASET in Japan are in development with perpetual changes in road map with a first tool in 2006-2007. In addition equipment prices are not well defined and they can be a severe limitation of the 50 nm node. For the French part, European EUV MEDEA program involves 2 CEA lab, 3 Factory, and 2 CNRS Labs.

In our laboratory, we are in charge, in relationship with SAGEM, SESO and SOPRA in coating development for optics in demonstration tools as BEL (Lithography Bench test) or Spectrophotometer and inspection EUV microscope. Most of these equipments need gradient multilayers especially adapted to use large angle of the optical design. Some of them, as Schwarzschild lenses (M1+M2) in which, the small one, need strong variation of the period of the multilayer need specific sputtering system. We will present some aspects of metrology and system used to perform such very high variation of thickness (0.2 nm/cm). In addition, several structure of multilayers can be obtain in relation with the deposition parameter of the magnetron sputtering system used to perform such coatings.

We will also present some of two structure multilayers and stability of such stack in relation with their structure. We will describe the two magnetrons system in operation in our laboratory and how to take into account layers structure in order to increase reflectivity up to 70%.

Stability multilayers performances with high flux increasing temperature acceptance with high reflectivity are now in progress and these two parameters will be the key of future EUV development

In situ stress monitoring is a simple way to have useful information's about structure changing most of times better than in situ measurements at 0,154 nm with a X-Ray produced with a copper $K\alpha$ tube

Metrology development made by SOPRA allows us to have now an out situ measurement of performances of the optics' EUV. A more simple system can be envisaged to set in situ during the process of EUV multilayer mirror realization.

Despite of delay and technical problems which are now in good way to be solved, our knowledge in EUV Lithography will be destined to be always for the "next generation".