

Ultra-precision Surface Finishing of EUV- and X-Ray Optics by Ion Beam Techniques – Figuring and Smoothing

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The poster shows present status results on ion beam finishing technology development in IOM namely figuring and smoothing of surfaces for EUV and x-ray optics.

IOM's research work on ion beam related ultra precision surface finishing includes the development of equipment and components for production purposes and the technologies to achieve nanometer and sub-nanometer depth accuracies over the entire spectrum of spatial surface wavelength from the full aperture size down to the microroughness level of only micrometer lateral feature size. The R&D is aimed to close gaps in the chain of figuring and polishing steps to fabricate high-end optics surfaces. So far results of the finishing of high-end optical surfaces demonstrate the outstanding performances of the techniques with topography and roughness control on the atomic scale.

Present ion beam figuring technology development is aimed to correct surface errors of millimeter spatial size range down to below nanometer dimension in height to meet the demanding requirements of the MSFR especially for lithography DUV, EUV, synchrotron and future FEL optics. Additionally, low-energy ion beam techniques (ion energy < 2 keV) have been developed as alternative tools that can be beneficially used to tailor the microscopic surface roughness of solid surfaces on a nanometer and micron lateral scale. Due to the combination of two techniques (i) ion beam direct smoothing and (ii) ion beam planarization together with the utilization of additional sacrificial layers smoothing from atomistic scale up to some tens of microns in spatial wavelength and for various materials has been achieved.

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