Laboratory-based EUV metrology for scientific and industrial applications

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As the modern technology becomes increasingly nanoscale, microscopy and metrology methods relying on visible and UV wavelengths can no longer fully satisfy scientific and industrial needs. Reduction of the working wavelength to the extreme ultraviolet (EUV, 5 to 50 nm) region is a promising way to extend the applicability of optical techniques to cutting-edge nanotechnology. Short wavelengths and efficient interaction of EUV radiation with matter provides spatial and depth resolution on the nanoscale, which enables not only ultra-high-resolution lithography, but also microscopy, high-precision thin film analysis and dimensional metrology of nanostructures.

The presentation is focusing on laboratory-based applications of EUV radiation enabled by compact plasma-based EUV radiation sources. The topics of nanoscale imaging, defect detection, thin film analysis and critical dimensions metrology will be discussed. The developed laboratory tools, such as multi-angle spectroscopic EUV reflectometer and EUV dark-field microscope, will be presented together with latest obtained experimental results. Thin film analysis with sub-nm precision will be demonstrated and benchmarked against state-of-the-art X-ray reflectometry. General limits of applicability of the EUV radiation for industrial and scientific metrology will be discussed together with an outlook to further perspectives of the EUV-based optical metrology.