Application of lens-less imaging techniques for nano-scale microscopy employing plasma-based EUV source

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Abstract

The success of modern nano-science and nano-technology is greatly benefited from the development of new methods of high-resolution metrology. A subject of this lecture is a demonstration of new laboratory-based EUV and soft X-ray imaging methods. Illumination by short-wavelength light in the spectral region between 1 nm and 50 nm is highly advantageous for achieving high resolution and elemental contrast at the same time. The former is due to highly reduced diffraction limit, and the latter is because absorption edges of many common elements are located within the mentioned spectral range. This lecture is focused on application of lens-less coherent diffractive imaging (CDI) techniques including also scanning probe (ptychographic) CDI for phase-sensitive EUV microscopy with only partially coherent gas-discharge light source. The core of these techniques is in analyses of diffraction patterns produced when sufficiently coherent short-wavelength radiation illuminates a nano-structured sample. Results of experiments demonstrating CDI using compact high-radiance plasma sources developed for EUV lithography applications are presented.

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