MULTILAYER LAUE LENSES FOR HARD X-RAY MICROSCOPY

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Recent progresses in thin film deposition and nanofabrication techniques have broadened the possibilities for the fabrication of new devices with larger design flexibility. Thus, Multilayer Laue lenses (MLLs), which consists of a depth-graded multilayer which is subsequently sectioned into a high–aspect ratio structure to become a usable optic have been receiving increased attention in the past few years [1]. Sectioning of multilayer films into high aspect ratios structures presents enormous challenges in order to produce high quality MLLs, especially as the aperture size continues to increase. Many grand challenges in growth, post-processing and characterization have been overcome in the past few years, allowing the production of a nearly-perfect MLL with focusing resolution approaching the diffraction limit [2]. Our developments led to the fabrication of MLL optics delivering a 15 x 15nm^2 focus at 12keV [3] to users for science experiments at the HXN beamline of the NSLS-II, and the fabrication of the largest MLL reported to date (102 microns) [4]. To reach higher spatial resolution and efficiency, wedged MLLs optics are needed. Wedged MLLs are based on the challenging deposition of profiled and depth-graded layers to form the multilayer. Our recent advances on wedged MLLs fabrication will also be presented.

References

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