Multilayer Laue lens for hard x-ray nano-focusing optics

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The Multilayer Laue Lens (MLL) is a new concept for hard x-ray nano-focusing optics, technically challenging to fabricate, but having theoretically promising performance [1,2]. A MLL is a diffractive x-ray focusing optic operated in transmission Laue geometry, and can be fabricated by depositing a thick graded-spacing multilayer on a flat substrate and then sectioning it to produce a high-aspect-ratio optical structure. It differs from a "sputtered-sliced" zone plate [3] in that the thinnest layers can be deposited first and the two halves of the structure can be tilted to the optimum diffraction angle for high efficiency. We have successfully fabricated MLL structures by employing deposition and sectioning techniques. The methods used to fabricate the MLL structures will be presented [4], as well as the measured x-ray diffraction and focusing properties of these MLL structures. X-rays at an energy of 19.5 keV were focused to <60 nm FWHM in a one-dimensional line focus. This is close to the expected theoretical focus size, indicating that the MLL is a promising candidate for future hard x-ray nano-focusing optics.

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