A Multilayer Laue lens[1] is an x-ray focusing optic which is produced by depositing many layers of two materials in a well-defined sequence in order to satisfy the Fresnel zone plate equation. When this multilayer is sectioned to allow side-illumination with radiation, the diffracted wave converges at the focal point. Several reports of MLL development have been published recently in Germany[2] and Japan[3] after the first MLLs were developed in 2006 at Argonne National Laboratory. The multilayer deposition system[4] at NSLS-II contains many design features in order to facilitate growth of combined depth-graded and laterally-graded multilayers with precise thickness control and low interfacial roughness over many thousands of layers, providing total film growth in one run of up to 100μm thick or greater. The design, commissioning, and performance of the deposition system will be discussed. Growth techniques to achieve reduced film stress while maintaining an acceptably low level of interfacial roughness involve reactive sputtering and other growth parameter modification. Metrology of many thousands of layers is a challenge that may be approached using scanning electron microscopy and image processing[5]. Sectioning methods that have been successfully reduced to practice for fabrication of usable MLL optics originally were based on manual thinning and polishing, however alternative techniques such as focused ion-beam sectioning and reactive ion etching[6] may also be employed.

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