# Multilayer Laue Lenses for Nanofocusing of Hard X-Rays

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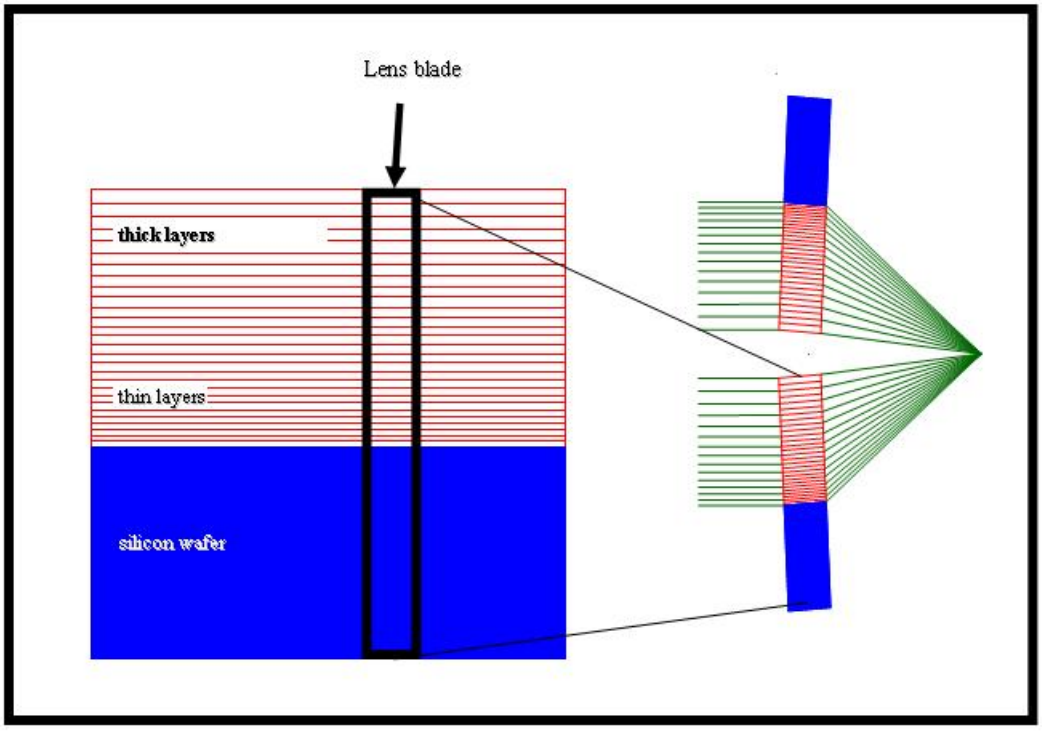


Hard x-rays can now be focused by transmitting x-rays through the "sides" of a lens sliced from a multilayer wafer. The lens is obtained by cutting out a cross sectioned piece and thinning it to the desired optical depth. The x-ray lens technology developed by Argonne National Laboratory consists of many individual layers (or Fresnel zones) precisely sputtered onto a silicon wafer. The outer-most zone is the thinnest and is the first to be deposited. Many layers with a gradually increasing thicknesses are then grown to form a Fresnel lens structure. An advantage over standard x-ray zone plates is that very thin outer-most zones combined with arbitrarily large optical depths are available. Single blade lenses comprised of 728 zones with an outer-most zone thickness of only 10 nm have been tested at the Advanced Photon Source with x-rays having a wavelength of 0.64 nm (19.5 keV). A focus of 30 nm was measured. In the future the smallest possible focal spot will be explored by reducing the outer-most zone thickness. Initial applications may include visualizing features in microelectronics, mapping trace metals in cells, and detecting micro-flaws in materials.

This work is supported by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under contract No. W-31-109-ENG-38