

High density dispersive multilayer gratings for soft x-ray spectrometers.

D. Voronov¹, E. Anderson², R. Cambie³, E. Gullikson², F. Salmasi², T. Warwick¹, V. Yashchuk¹, H. A. Padmore¹

¹*Advanced Light Source, Lawrence Berkeley Laboratory, Berkeley, California, United States*

²*Center for Xray Optics, Lawrence Berkeley Laboratory, Berkeley, California, United States*

³*Engineering Division, Lawrence Berkeley Laboratory, Berkeley, California, United States*

There is a need for higher resolution spectrometers as a tool for inelastic x-ray scattering. Currently resolving power around $R=10,000$ is advertised, yet measured RIXS spectra are often limited by instrumental resolution and higher resolution spectrometers using conventional gratings would be prohibitively large.

We are engaged in a development program to build multilayer lithographic grating structures for use with soft x-rays at line-densities several times higher than is possible using metal coated-gratings. The higher dispersion then provides higher resolution and operation away from grazing incidence increases the angular acceptance.

We report one approach that seems particularly effective. It uses etched asymmetrically-cut silicon substrates as blazed gratings onto which multilayers are coated. These structures have been fabricated and exhibit diffraction efficiency in high diffracted order consistent with electromagnetic computations. Novel spectrometer designs are being developed for resolution tests.

This work was supported by the U.S. Department of Energy under contract number DE-AC02-05CH11231.