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Title:	Upgraded varied-line-space PGM beamline at CAMD
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Upgraded varied-line-space PGM beamline at CAMD

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Abstract

The Center for Advanced Microstructures and Devices'(CAMD) aging plane-grating soft x-ray monochromator beamline was upgraded to a varied-line-space plane-grating monochromator (VLSPGM) beamline. Preliminary measurements indicate significant performance improvements in both the resolving power and the throughput over its predecessor. However, it was found that the VLSPGM has less than the calculated resolving power. A possible reason is discussed.

07.85.Qe Synchrotron radiation instrumentation

Key words: synchrotron, beamline, plane grating monochromator

Introduction

The plane grating monochromator (PGM) beamline at CAMD [1] was commissioned in 1992. After serving over a decade, the PGM's performance no longer meets demands for critical modern research. This led to a strong demand for an upgrade to a higher performance beamline working over the 200 -1200 eV energy range. The PGM was a SX700-type monochromator [2]; the energy-scan mechanism included a

spectral resolution is very sensitive to the spherical mirror position. The simulation result is given in Fig 1a which shows a very rapid degradation of the resolving power once the spherical mirror is off-position from its ideal. Since the old PGM mechanism (where translational and rotational motions of the premirror are coupled) was utilized in the VLSPGM, we could optimize the spherical mirror position by adjusting only its translational position. This optimization was done by measuring total electron yield spectra of the oxygen 1s x-ray absorption edge of CuO. The relatively sharp peak at 530 eV was used for FWHM and intensity analysis (Fig. 1b). It can be seen from Fig. 1c that the optimal position of the spherical mirror provides not only the maximum resolution but also the maximum intensity, which is a clear indication of successful positioning. After the spherical mirror position was finalized, the same procedure was used for optimizing the beamline exit slit position.

Throughput

Measured beamline ta-/pmTw[(b of wo8ul p)5.1r

Theoretical flux values at the selected photon energies for the VLSPGM are also given in Fig. 2. The calculation includes CAMD synchrotron source, beamline transmission, reflectivity of the gold-coated mirrors, and efficiency of the VLS grating calculated by the manufacturer. The measured throughputs are in reasonable agreement with the calculated values.

Resolution

Although theoretical resolving power of the old PGM was 3000, actual performance was substantially

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Figure 1

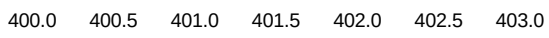

Figure 3

N_2 (1s → *) gas total electron yield spectra measured at the different tilt angles of the exit slit.