

High reflective water window collector optics

Hagen Pauer^a, Marco Perske^a, Tobias Fiedler^a, Torsten Feigl^a,
Christian Laubis^b, Frank Scholze^b

^a*optiX fab GmbH, Hans-Knöll-Str. 6, 07745 Jena, Germany*

^b*PTB Berlin, Abbestr. 2-12, 10587 Berlin, Germany*

The soft x-ray (SXR) region between the K-absorption edges of oxygen ($\lambda_{O_2} = 2.3$ nm; $E_{O_2} = 539$ eV) and carbon ($\lambda_C = 4.4$ nm; $E_C = 283$ eV) offers a good natural contrast between materials containing carbon and water. Furthermore, SXR allow extremely high resolutions of less than 30 nm by using water window microscopes^[1].

Laser produced plasma (LPP) emission is an efficient way to produce SXR. This method allows a more cost-effective and flexible “table-top microscope” experimental set-up compared to synchrotron beamlines, which are very large and have a limited capacity. In order to collect as much SXR radiation as possible, near normal incidence collector mirrors with high reflective multilayer coatings are indispensable.

This paper shows the latest results of the multilayer optimization and coating of a LPP collector mirror with a diameter of 58 mm for the required wavelength of 2.478 nm. Different aspects of the optimization of the Cr/V based multilayer, e.g. use of barrier layers, coating parameters or its improved homogeneity over the whole collector surface will be discussed.

A detailed reflectance mapping measurement of the collector surface has been performed at the BESSY II beamline at PTB Berlin and will be shown.

Topics: water window microscopy, LPP collector, soft X-ray multilayer

Keywords: water window, soft X-ray collector optics, graded multilayer mirror

Preferred presentation: oral

[1] See, e.g., A. Sakdinawat and D. Attwood, *Nature Phot.* **4**, 840-848 (2010).