Trends on thin film X-ray optics and pinholes for synchrotron beamlines

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Introduction
Here, we give an overview on current developments in the coating of large total reflection X-ray optics up to 1500 mm in length, multi-layer coatings up to 500 mm, multi-stripe multilayer optics for tomography beamlines, Montel optics (nested KB) for Synchrotron applications and on our scatterless pinholes SCATEX as beam defining elements.

Total Reflection Optics for Synchrotron Beamlines
Total reflection optics for synchrotron beamlines are needed for beam guidance and beam alignment. This type of X-ray optics is used at grazing incidence angles, therefore more and more optics with lengths of 1000 mm and longer are needed.

Multi-stripe Multilayer Optics
Multi-stripe multilayer optics are often used as double crystal multilayer monochromators (DCMM). For example, tomography needs a homogeneous and stable beam profile, in order to perform optimal background corrections. Because of the high coherence of radiation, the optical components must be designed with particular care in order to avoid a deterioration of the beam quality. Multi-layer coatings with up to 5 stripes were produced with films homogeneities < 0.2% as well as with lateral gradients.

Montel Optics for Synchrotron Applications in Different Sizes
First optics, with slope errors < 0.2 arcsec, were sold to NSLS and Diamond for scattering experiments.

SCATEX Pinholes for Synchrotrons
Comparison of Tungsten Slits and SCATEX-Ta Pinholes
The measurements were performed at 1.3 keV at the NanoFocus Endstation P03 beamline at PETRA III with typical photon fluxes of 10^12-10^13 ph/s by C. Kryvko.

References
In closed cooperation with HZG, Incoatec has produced total reflection optics consisting of highly-stable carbon, silicon carbide, tungsten or ruthenium and also multilayer coating up to 500 mm as well as multi-stripe optics. First Montel optics with low slope errors are used at beamlines. Many research centers worldwide are using our know-how and our optics, e.g. Advanced Photon Source - Bessy - Canadian Light Source - Carl Zeiss - Diamond - Elettra -_HASylab at DESY - Helibas-Jobin-Yvon - Jenoptik AG - Lyncean Tech. Inc. - NSLS - PAL - Sesia - Swiss Light Source

Conclusion
High precision coatings up to 150 cm in length
Multi-layer coatings up to 50 cm
Montel optics for Synchrotron applications
Multi-stripe multilayer optics as monochromators
Ultra stable carbon coatings for FEL
New generation SCATEX with less parasitic aperture scattering.
The high quality and flexibility of the complete production process enable us to offer customized solutions for all kind of synchrotron applications.

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