

State-of-the-art X-ray Optics for in-house Crystallography and Synchrotrons

Jörg Wiesmann, Carsten Michaelsen, Jürgen Graf, Alexandra Oehr, Christian Hoffmann *Incoatec GmbH, Geesthacht, Germany*. E-mail: info@incoatec.de

This talk gives an overview on the large variety of different X-ray optics based on single- and multi-layer coatings. We present recent developments in (1) one-dimensionally beam conditioning optics for X-ray diffractometry, (2) two-dimensionally focussing optics for single crystal diffraction and small angle X-ray scattering and in (3) total reflection optics guiding the X-rays of free electron lasers (FEL) as well as conventional synchrotron sources.

Selected aspects on the simulation, preparation and characterization of the optics will be discussed. By calculating the optical properties of the coating the best multilayer material can be found. By simulating the complete beam path X-ray optics can be tailored for the requirements of a special application. Sophisticated improvements in deposition technology allow the precise realisation of the specified parameters during the manufacturing of the X-ray optics. An intense characterization by state-of-the-art optical profilometry and X-ray diffraction ensures the quality of the X-ray optics. The profilometry measures the quality of the shape of the optics substrate and X-ray reflectometry measures both accurate film thicknesses and their lateral gradient. Energy scans at a fixed angle of incidence demonstrate the quality of optics for synchrotron applications.

The impact of modern X-ray optics on up-to-date X-ray analysis will be demonstrated on selected applications of single crystal and high resolution diffraction.

Keywords: x-ray optics, multilayer, instrumentation