NEW TRENDS ON MULTILAYER OPTICS FOR X-RAY DIFFRACTOMETRY IN THE LAB

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In this contribution, we give an overview on current developments of multilayer optics for diffractometry in the lab. We explain the manufacturing process of the optics, summarize the different types of optics and give some examples of typical applications which benefit from the new possibilities, especially in combination with modern microfocus X-ray sources.

The optics consist of bent substrates with shape tolerances below 100 nm, upon which multilayers are deposited with single layer thicknesses in the nanometer range and up to several hundreds of layer pairs. The multilayers were designed with lateral thickness gradients within ± 1% deviation of the ideal shape. We use sputtering technology for deposition, optical profilometry in order to characterize the shape and X-ray reflectometry in order to characterize the multilayer thickness distribution both laterally and as in-depth. A scanning sample stage allows XRR at a lot of sample positions in a batch mode. Advantages and drawbacks of this new instrument will be discussed.

We will be presenting actual results with our IμS, which is a combination of a 30W microfocus source with our special 2-dimensional beam shaping multilayer optics. The IμS is now available for Cu, Mo, Ag and Cr. The optics focuses or collimates the beam in order to get a very high flux density as well as an adequate divergence directly at the sample position. Optics are also available, which focuses in one dimension and collimates in the other. This delivers a line-shaped beam profile. Some applications realized with an IμS are (GI)SAXS, texture, stress analysis, μ-diffraction, single crystal diffraction to name but a few.