

X-ray optics, state of the art and current issues

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Tremendous progress has been achieved on X-ray sources in the last decade and even more is promised in the coming one. X-ray optics technology by contrast may seem somewhat static or slow in its development. Actually the bases all x-ray optical elements we may think of have been established long ago, yet they are in most cases far from ultimate expectations due to various manufacturing difficulties. We will review several of these technical issues such as ultra-precise and aspherical surface polishing, grating ruling and etching, very small period multilayer deposition, evaluating the progress made in the last ten years and improvement prospects.

Among technological locks, metrology is not the most obvious but not the least. Visible light metrology is crucial for applying reliable local finishing corrections to optical surface. The present precision target or measuring instruments is about 0.05 μ rad in slope and 0.1 nm in height, but improvement are still needed to achieve the diffraction limit required by so-called diffraction limited storage rings (DLSR). Characterization at working wavelength is another strong demand. Several methods are available. Ideally they could lead to dynamic global corrections by means of an active element, but this scheme is hard to implement in practice. Other practical issues, such as difficulty to perform zooming functions or to achieve out-of-focus field uniformity, will be also analyzed.