X-Ray Optical Correction Plate

Self-aligned phase plate

Reference No. P 145

BACKGROUND

A problem of focusing of hard x-rays has been solved by the invention of refractive lenses. A single refractive lens has a large focal distance - in order to decrease the focal distance to practical dimensions many lenses are typically stacked behind each other in a so-called compound refractive lens (CRL). By characterizing the focal spot with ptychographic methods aberrations can be measured and later compensated with a "phase plate", an aspherical lens element made to correct the induced phase errors by the CRL. The use of a phase plate is coupled with a problem of proper alignment of it against the CRL, which means that a proper alignment at the x-ray instrument has to be done every time before the start of the experiment, which is very work and time consuming.

SOLUTION

The CRL itself is aligned at the instrument and can be used again without realignment due to a kinematic mount. The difference from existing techniques of manufacturing and alignment is the integration of the phase plate within the CRL by an order of manufacturing steps: Alignment of phase plate takes place before manufacturing and not afterwards. The key point of the invention is the marking of the exact location for manufacturing of the correction plate on the substrate. A photo-resist coating on the substrate is exposed by the x-ray beam simultaneously with the CRL that needs to be corrected. The precision positioning of the phase plate relative to the CRL is defined by precise machining of the lens box and the spatial resolution provided by the photo resist.

ADVANTAGES

- Repeatable and almost error-free usability of a fixed lens system
- Cost- as well as time-saving lens systems

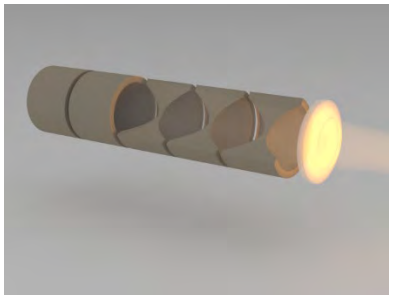

Fig. 1: Concept with illuminated phase plate (Credit: Frank Seiboth).

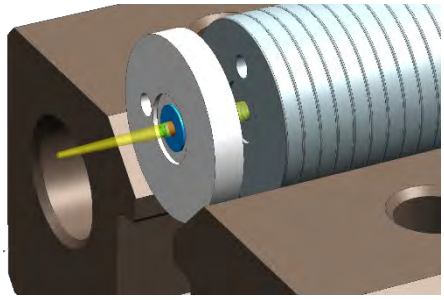

Fig. 2: Mechanical design (Credit: Ralph Döhrmann).

APPLICATION FIELDS

- X-ray microscopes
- Semiconductor industry

PROPERTY RIGHTS

EP 3540743 A1

POSSIBILITIES OF COOPERATION

- Licensing
- R&D Cooperation

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