

Montel Optics

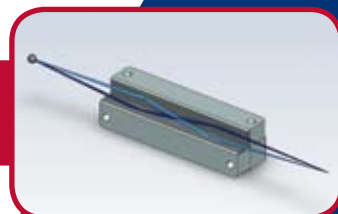
2D Multilayer Mirrors for X-ray Diffractometry

XRD



- 2D focusing, collimating and hybrid beam shaping
- For Cr, Fe, Co, Cu, Mo and Ag radiation
- Double bounce monochromatization, excellent K_{β} suppression
- More than 20 types of standard mirror designs
- Optics of various focal distances, magnification ratios and divergences
- Applications: Powder and High-Resolution XRD, Materials Characterization, Time Resolved Diffractometry, Small Angle Scattering, Protein and Small Molecule Crystallography, ...

2D Beam Shaping



Montel Optics: Multilayer Mirrors for 2D Beam Shaping

In the fifties, M. Montel first introduced an optical scheme for 2D X-ray focusing or collimating with two mirrors mounted side by side and mutually perpendicular. Incoatec's Montel optics consists of two optical surfaces that are coated with laterally graded multilayers. The mirrors either have an elliptical shape for 2D focusing or a parabolic shape for 2D collimating. In a hybrid Montel optic an elliptical and a parabolic mirror are combined in the Montel scheme resulting in a rectangular beam shape.



Advantages of Montel Optics

- high brightness
- symmetrical beam properties (size, divergence) in 2D
- very clean spectrum due to twofold monochromatization (double-bounce optics)
- easy to align

Montel Optics - made by Incoatec

Incoatec's portfolio of X-ray optics includes the **Montel-200** and **Montel-p** optics as the „classics“. The **Helios** optics are the ultimate optics optimized for rotating anode systems and are implemented in X-ray instruments made by Bruker AXS. They can easily be attached to any rotating anode system as an upgrade. The **Quazar™** optics are the newest kind of Incoatec's high brilliance Montel optics optimized for the Incoatec Micro-focus Source ($I\mu S^{\text{TM}}$). Besides our standard types, we offer **customized optics** for nearly all kinds of applications. Advanced analytical and ray-tracing methods are used to optimize the design of customized optics.

Beam shaping	2D focusing	2D collimating	hybrid coll. + foc.
Length (mm)	60 - 150	60 - 100	60 - 100
Typical magnification	1 - 20	-	5 - 10
Typical divergence (mrad)	20- 0.5	1-0.3	10 - 2

Tab. 1: Summary of parameters of manufactured Montel optics, each optimized to the needs of the application

Montel Optics for Powder Diffractometry

Powder samples and polycrystalline materials are often characterized by powder diffraction. Our focusing Quazar™ optics which has a spot of a few 100 μm can be applied for measurements in transmission geometry using a two-dimensional detector. When focused to the detector a larger number of grains is illuminated and the resolution of the pattern then only depends on the point spread function of the detector (Fig. 1). When focused to the sample measurements can be carried out in transmission or reflection geometry with high spatial resolution; in this way stress profiles can be recorded.

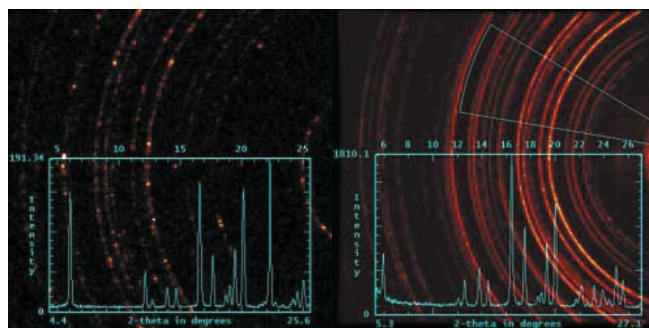


Fig. 1: Ibuprofen measured in transmission geometry. Left: sealed tube with Göbel mirror, 120 s exposure time, right: Incoatec Micro-focus Source $I\mu S^{\text{TM}}$ with focusing optics, 15 s exposure time.

The hybrid Montel can be used when investigating thin films and powders in transmission geometry. The optics delivers plenty of flux in a line shaped spot on the sample. The collimating optics is suitable for SAXS measurements due to its very low divergence.

Montel optics can be integrated into all types of X-ray sources including laser plasma sources and synchrotron beamlines.