

# μFOCUS 195

10 μm HIGH FLUX X-RAY MONOCHROMATOR SOURCE  
FOR SMALL SPOT X-RAY PHOTOELECTRON SPECTROSCOPY

## KEY FEATURES

- Al  $K_{\alpha}$  monochromator for XPS and NAP-XPS
- Small Spot Mode (10 μm): Flux  $1.4 \cdot 10^9$  photons/s
- High Flux Mode (150 μm): Flux  $3.3 \cdot 10^{10}$  photons/s
- Pressure Range: UHV to >100 mbar
- Bolt-on component design



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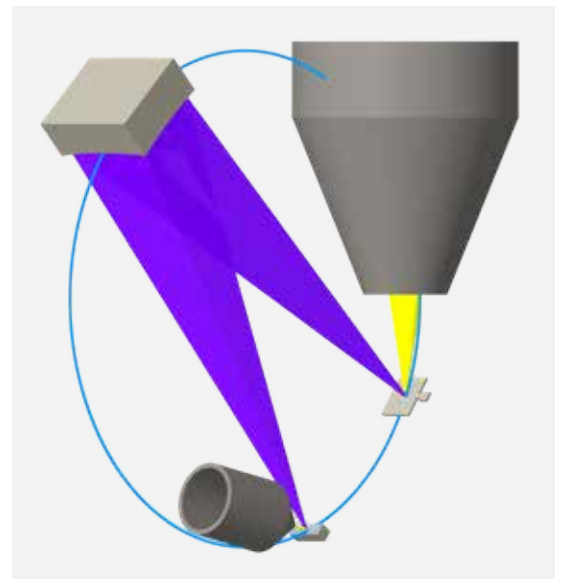
**X-ray photoelectron spectroscopy in UHV and under near ambient pressure conditions are important routine methods in surface analysis. The new  $\mu$ FOCUS 195 provides smallest spot sizes in a compact bolt-on design.**

### Monochromated Small Spot XPS

X-ray photoelectron spectroscopy (XPS) is the most important surface sensitive analytical method and can be applied to a plethora of solid state materials challenges. Since the development of XPS in elevated pressures up to >100 mbar (Near Ambient Pressure XPS or NAP-XPS), the fields of application extended into liquids, solid-liquid interfaces, solid-liquid-gas interactions and operando studies of materials under functional device conditions.

Often the materials are consisting of small structures and particles or the samples and processes are inhomogeneous. While analyses over large sample areas (several hundreds of  $\mu\text{m}$  to mm range) provide valuable information about the average properties of materials, sometimes the local materials specifications are important. For this small spot XPS at several  $10\mu\text{m}$  analysis area is a proven tool. Using such a source along with scanning across the sample surface also allows for fast surface chemical maps. High flux sources are needed to guarantee excellent images with good data statistics. So far such sources with Al  $k_{\alpha}$  only existed in stand-alone system designs and for classical UHV-XPS.

The new  $\mu$ FOCUS 195 source is a bolt-on component with spot sizes ranging between  $150\mu\text{m}$  to  $10\mu\text{m}$ , that can be operated in UHV, as well as under Near Ambient Pressure conditions up to 100 mbar or higher.



### X-ray source design of $\mu$ FOCUS 195

The  $\mu$ FOCUS 195 small spot X-ray monochromator consists of a small spot electron source, that can be focussed and defocussed to reach spot sizes between  $150\mu\text{m}$  and  $<10\mu\text{m}$  at electron energies of 15 keV. The electrons are focussed onto a special high thermal conductance anode, that is coated by high purity aluminum. The X-rays emitted from the anode are then impinging on a ultimate precision monochromator crystal manufactured from Quartz in (10-10) orientation. Due to its double bent geometry, the monochromated Al  $k_{\alpha}$  X-rays are focussed onto the sample located on a manipulator in the focus of the electron analyzer. The setup of anode, crystal and sample is following the classical Rowland geometry with a small Rowland circle diameter of 195 mm for small spot size stability and flux optimization reasons. This geometry allows for a narrow spectral linewidth of  $<250\text{meV}$ .

## Bolt-on design of $\mu$ FOCUS 195

The complete  $\mu$ FOCUS 195 with all its parts, like small spot electron source, anode assembly with cooling, crystal manipulator with monochromator crystal, all cable connections and cooling pipes are mounted on one DN 275 CF flange. This allows for a precise pre-adjustment of the monochromator with minimal degrees of freedom for adjustment. This makes the electron source, anode and crystal adjustment extremely easy and reliable for maximum uptime of the source and reliable day-to-day performance. It also minimizes the complexity in integration into a system concept. The space requirements inside the chamber are minimum at easiest serviceability. The rigid mechanics also guarantee long term stable energy, spectral line width and lateral resolution specifications.

The complete internal assembly is housed in a vacuum-tight housing with an external pumping port. Together with an easily exchangeable X-ray transparent window close to the sample position, this allows the source to operate under its individual vacuum conditions. This is helpful in UHV, especially, when performing sputter depth profiling or sample preparation steps in the analysis position.

Furthermore this perfectly suits the monochromator source for Near Ambient Pressure operation. The small spot size allows for analysis of smallest structures under elevated pressures. But because smaller analyzer entrance apertures can be used, analyses at higher pressures, than the usual 50-100 mbar can be performed by using its own pumping system.

## System Integration

Using the special analysis chamber, the  $\mu$ FOCUS 195 can be combined with every PHOIBOS analyzer model for UHV or NAP-XPS. The optimized chamber geometry also allows for additional Ion, Electron, UV and X-ray sources, as well as all UHV or NAP sample manipulators. Contact us for your system integration requests.

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## Technical Data

### Specifications

$\mu$ FOCUS 195	Value
Photonen Energie	Al_Ka
Beam Voltage	Up to 15 kV
Flux in Small spot mode (10 $\mu$ m)	$1.4 \cdot 10^9$ photons/s
Flux in High flux mode (150 $\mu$ m)	$3.3 \cdot 10^{10}$ photons/s
Rowland circle diameter	195 mm
Crystal mirror	Quartz (10-10) in double bent geometry
Pressure range	UHV to > 100 mbar
Bolt-on flange	DN 275 CF

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