

# A compact and calibratable von Hamos X-Ray Spectrometer based on two full-cylinder HAPG mosaic crystals for high-resolution XES

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In high-resolution X-ray Emission Spectroscopy (XES) crystal-based Wavelength-Dispersive Spectrometers (WDS) are being applied for characterization of nano- and microscaled materials. Thereby the so called von Hamos geometry provides high detection efficiency due to sagittal focusing using cylindrically bent crystals. To maximize the detection efficiency a full-cylinder optic can be applied.

A novel calibratable von Hamos X-ray spectrometer based on up to two full-cylinder optics was developed at the PTB. To realize the full-cylinder geometry Highly Annealed Pyrolytic Graphite (HAPG) [1] was used. Besides its good bending properties this mosaic crystal shows highly integrated reflectivity while offering low mosaicity ensuring high resolving power [2]. The spectrometer enables chemical speciation of elements in an energy range from 2.4 keV up to 18 keV. The design and commissioning of the spectrometer will be presented together with first results using synchrotron radiation as excitation source. The spectrometer combines high efficiency with high spectral resolution (ten times better than in commercial WDS systems) in a compact arrangement also suitable for laboratory arrangements.

## Summary

A calibratable wavelength-dispersive spectrometer that can detect X-ray radiation in the photon energy range between 2.3 keV and 18 keV will be presented. By using two dispersive full-cylindrical optics in the beam path, the sensitivity and efficiency of the spectrometer has been increased, and so access to high-resolution X-Ray Emission Spectrometry (XES) in nanoscaled materials, consisting of light elements and transition metals was enabled. Furthermore, due to both integrated optics, a compact design and four different operation modes have been realized.

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