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P65 - a workhorse beamline for in-situ and operando XAFS spectroscopy at the PETRA III storage ring

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X-ray absorption fine structure spectroscopy (XAFS) is among the most useful analytical methods for the investigation of structure/function relations in all fields of catalytic chemistry and energy storage techniques like batteries, fuel cells, H₂ storage etc. The beamline was build as part of the PETRA III extension project and is in regular user operation since Summer 2016. The beamline was designed to provide stable and reliable operating conditions for XAFS in bulk samples to employ XAFS as analytical method in applied science.

A short undulator provides a monochromatic photon flux of up to 10^{12} s⁻¹, more than enough for all kinds of XAFS experiments. The radiation from the undulator is monochromatised with a water cooled double crystal monochromator. A pair of plane mirrors is employed to reduce the contamination of the monochromatic beam by higher harmonics radiation and to reduce the heat load on the first DCM crystal. A typical EXAFS scan in transmission mode takes 60 s – 180 s. The spot size on the sample is 0.5×1 mm², a size that fits very well to catalytic in-situ/operando samples.

The experiment is equipped with supply and safety infrastructure for all kinds of gases that are used in in-situ experiments. A small sample preparation lab is available directly beneath the beamline. We will present the beamline design and demonstrate the performance and versatility of the beamline using selected examples from experiments done during the first 2 years of operation.

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