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Hard X-ray Spectroscopy and Imaging at the BAMline and µSpot beamlines @BESSY II (Berlin, Germany)

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The BAMline and the µSpot beamlines are hard X-ray multipurpose stations. The common X-ray source is a 7 Tesla wavelength shifter (WLS) installed at the Berlin Electron Storage Ring for Synchrotron Radiation (BESSY II). Such source enables a continuous broad energetic spectrum up to 100 keV, which is optimal for implementing various analytical methods. The BAMline was the first hard X-ray beamline being installed at BESSY II in 2001 [1] followed by the µSpot beamline in 2004 [2].
Both beamlines are versatile but somewhat different regarding their optical elements. The main difference is the existence of a toroidal mirror at the µSpot beamline placed at 13 m after the source. The beam is sagittal focused down to a 300 µm diameter 20 m thereafter. The mirror allows performing several experiments at the micrometer scale but, due to its reflectivity, in the energy range between 2-25 keV 'only'. A total flux of 1013 photons/s/100mA @ 8 keV is achieved [2]. The µSpot beamline possesses three different monochromators with distinct energy resolutions: B4C/Mo (2x10-3), Si 111(2x10-4) and Si 311 (4x10-5). The BAMline has the possibility to experiment at energies between 4 to 100 keV but with one order of magnitude lower in photon flux. The optical elements are two monochromators with different energy resolutions, depending on the desired experiment: W/Si (1.6x10-2) and Si 111 (2x10-4).
At the BAMline the available analytical methods fall into the three main groups: X-ray fluorescence spectroscopy (XRF), X-ray absorption spectroscopy (XAS) and X-ray computed tomography (CT). At the µSpot the same spectroscopic methods are available with the possibility of performing microanalysis, as the name suggests. Besides spectroscopy, diffraction techniques are also available at the µSpot beamline: X-ray diffraction (XRD) and X-ray scattering in both small-angle (SAXS) and wide-angle (WAXS) configurations. Presently, several variations of these methods are accessible to the (scientific) community. The aim is to optimize the fields of application of materials by means of different analytical methods. Actual pertinent fields of investigation are catalysis, 'green chemistry', material, biology, medicine and environment. Several examples will be presented.

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