

Laboratory X-ray spectroscopy and imaging as a preliminary step towards synchrotron experiments

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X-ray spectroscopy experiments often require high-brilliance sources of X-ray radiation, provided by synchrotron or X-ray free electron laser (XFEL) facilities. However, acquiring access to such facilities is a complex procedure, which involves proposal application, long wait for the beamtime and travel expenses. Recent advances in the compact X-ray sources allowed for development of laboratory X-ray spectroscopy setups. While being orders of magnitude less brilliant compared to large facility sources, modern X-ray tubes with built-in focusing optics enable measurements of X-ray absorption (XAS) and X-ray emission (XES) spectra in the laboratory environment. Despite the significant drawbacks (i.e. long acquisition times, limited energy range and noisy data), laboratory X-ray setups are a valuable research tool due to relatively low cost and practically unrestricted accessibility.

Herein, we report on development of laboratory setup for simultaneous acquisition of XAS, XES and X-ray fluorescence (XRF) data. Double von Hamos geometry-based spectrometer configuration allows for simultaneous XAS/XES measurements. On the other hand, the three-axis positioning stage enables XRF imaging and aids sample positioning. The setup is routinely used for the studies of electronic and structural properties of metal complexes, nanoformulation and biological samples.

Type of presence

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