

Laboratory X-ray instruments for biological applications

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Recent progress in development of laboratory X-ray sources, detectors and, most importantly, efficient X-ray optical systems made possible to implement X-ray techniques in laboratories and showed its potential wide application. A permanent laboratory-based setup offers the advantages of low costs and easy accessibility and, therefore, more flexibility in preparation and scheduling of the measurements.

Herein we present X-ray laboratory setups for biological applications that are newly developed at the Institute of Nuclear Physics PAN in Krakow, Poland. X-ray laboratory is characterized by unique combination of various X-ray techniques with biological laboratory that enables to design *in situ* and *in vitro* experiments performed on different biological material, including such complex systems as cells. Offered X-ray techniques include micro tomography and micro imaging, elemental analysis combined with X-ray absorption and X-ray emission spectroscopy at high energy resolution employing wavelength-dispersive spectrometers. Available analysis enables studies of sample morphology at microscale as well as sample structure at atomic and molecular level. Thanks to the proposed technical developments, it is possible to do the measurements in the conditions mimicking physiological ones.

Examples of biological applications of the setups include mostly studies of the electronic structure of metal complexes and their interaction with biocompounds such as DNA and proteins are presented as well as imaging of biological systems and structural analysis of biomaterials.

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