

X-ray Fluorescence Imaging and Spectroscopy with High Spatial Resolution at NSLS-II

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NSLS-II is a source of synchrotron radiation ideally suited for experiments in need of coherent radiation. With a very low emittance of horizontally 0.6 nm-rad, vertically 8 pm-rad, a position stability of less than 10% of the source size in vertical and horizontal, and a design goal of 500 mA ring current, it provides an ideal platform for micro- and nanoprobe instruments. Beamline 5-ID, the Sub-micron Resolution X-ray Spectroscopy (SRX) beamline has been designed, installed and commissioned as an X-ray fluorescence analytical probe dedicated to spectroscopy experiments with sub- μm and sub-100nm spatial resolution. XRF mapping and XANES spectroscopy experiments to investigate the elemental composition and the chemical state of a sample are the core capabilities of this beamline. The scientific emphasis is the study of complex systems with chemical heterogeneity at sub- micrometer and sub-100nm length scales. The photon flux of 10^{13} phot/sec that SRX delivers in a sub- μm spot, ultimately combined with the use of new energy dispersive detectors like 384-element Maia, opens up new possibilities for compositional and spectroscopic analysis of major and trace elements in natural and synthetic materials. The accessible energy range of 4-25 keV allows for X-ray absorption spectroscopy experiments across the periodic table from titanium up to plutonium.

The main focus of this presentation will be the SRX beamline, presenting its setup and using applications in environmental and geosciences, material and energy research, and cultural heritage to highlight its capabilities. NSLS-II is as an excellent source for a whole suite of high resolution X-ray microscopy and spectroscopy instruments, which will be introduced as well.