

SCIENTIFIC SCOPE

Hard x-ray nanoprobe (HXN) is an undulator beamline at sector 3-ID providing x-ray imaging capabilities with a world-leading spatial resolution. It will offer a suite of x-ray analytical tools for structural, elemental and chemical imaging, with an initial resolution of 10 nm and an ultimate goal of 1 nm. The combination of unique detection capabilities of x-rays and the unprecedented resolution will enable noninvasive material characterizations at nanometer scale, critical for studies in many areas of science and technology.

BEAMLINE CHARACTERISTICS

TECHNIQUES:

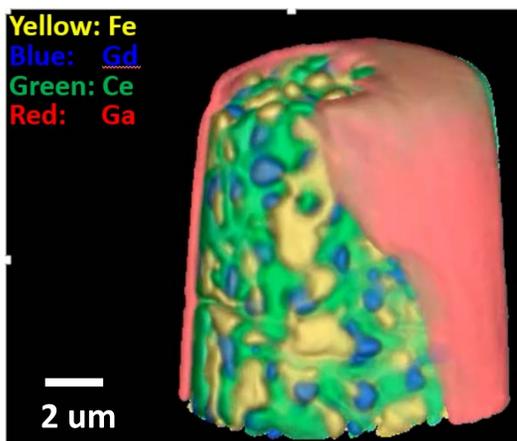
- 2D/3D scanning microscopy including fluorescence absorption, phase and diffraction, spectroscopy, and ptychography

HXN at NSLS-II:

- Imaging material heterogeneity using multiple contrasts to analyze elemental composition, structure, oxidation states, crystalline phase, orientation, and strain.

CURRENT ENDSTATION DETAILS :

- In-vacuum or in-air operation
- Sample temperature regulation
- MLL (multilayer Laue lens) module for 11 x 13 nm resolution
- ZP (zoneplate) module for 30 nm resolution
- Fast imaging using a flyscan.
- Exceptional vibration and thermal stability



3D elemental distribution of a ceramic membrane sample. The ZP module was used. Courtesy of Wilson Chiu (U of CT)

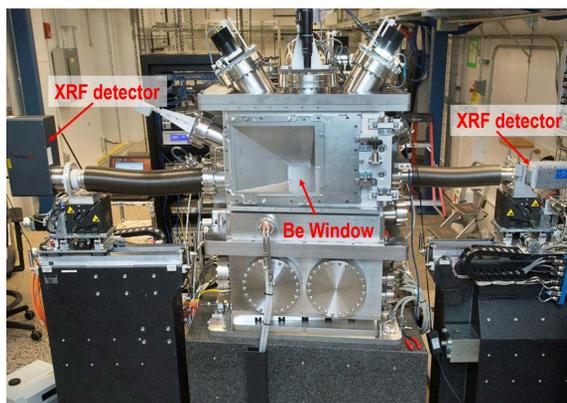


Photo of the HXN x-ray microscope. MLL and ZP microscope modules are within the vacuum enclosure. The Be window allows transmission, diffraction and ptychography measurements

Overview

PORT: 3-ID

SOURCE: undulator (IVU20)

ENERGY RANGE: 6 – 25 keV

ENERGY RESOLUTION: $\Delta E/E = 10^{-4}$

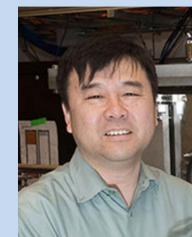
SPATIAL RESOLUTION: 10 nm (MLL),
30 nm (zone plate)

BEAMLINE PHONE: 631.344.1603

BEAMLINE WEBSITE:

www.bnl.gov/nsls2/beamline/3-ID

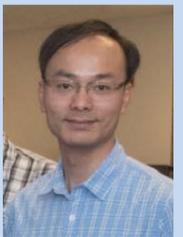
Beamline Staff



Yong Chu
Lead Beamline Scientist



Hanfei Yan
Beamline Scientist



Xiaojing Huang
Beamline Scientist

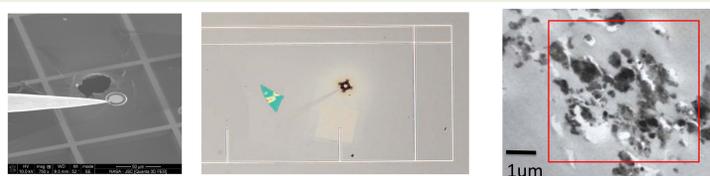
Apply for Beam Time

Beamlines at NSLS-II are available to all scientific researchers through a peer-review proposal process. For more information, see the NSLS-II Users' Guide at:

www.bnl.gov/ps/userguide/

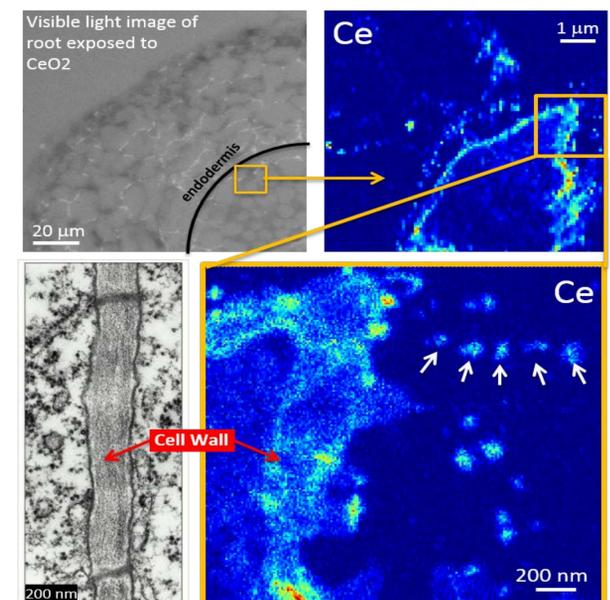
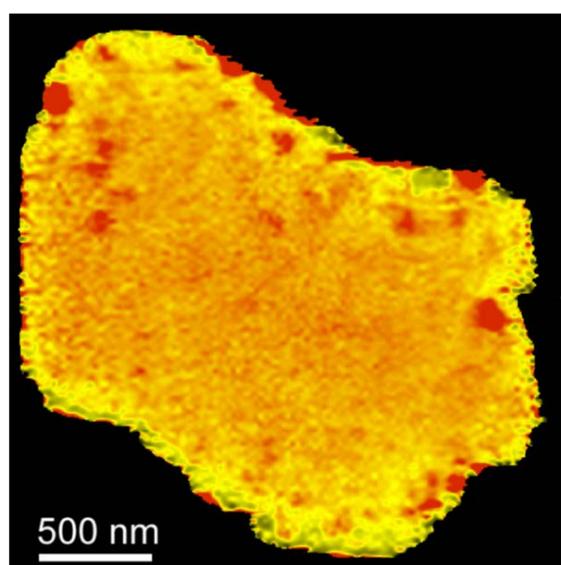
Analysis of Interplanetary Dust Particles (IDPs)

IDPs collected from the upper atmosphere of the earth are studied to test current models on formation of the solar system. A 70 nm-thick sample, pre-screened by TEM, is transferred to a fiducialized sample holder using FIB. XRF images are collected from a ROI indicated by a red box. Data are taken using fly-scans with 0.2 s dwell time. George Flynn (SUNY Plattsburgh)



Battery Electrode Transformation

Initial stage of Ag nucleation in a $Ag_2PO_2VO_4$ anode upon partial discharging. The image below was obtained by normalizing the Ag XRF signals to the V XRF signal. Esther Takeuchi (Stony Brook University)



Ecotoxicity of Diesel Fuel Nano-catalysis- CeO_2 Nanoparticle cerium oxide (CeO_2) is diesel fuel additive used in EU. Little is known about impact of CeO_2 on human health and environment or potential for transfer into food web. Uptake of CeO_2 nanoparticles in tomato roots are studied. Ryan Tappero (Brookhaven National Lab).

