xradia™

UltraXRM-S200/S220

Tomography X-ray Microscope for Synchrotron Facilities

UltraXRM-S200:
Non-destructive 3D X-ray imaging in the multi-keV range

UltraXRM-S220:
High contrast 3D imaging of unstained organic materials with soft x-rays

Key Benefits

User-friendly turn-key solution

Ultra-high spatial resolution to 30 nm

Spectro-microscopy and elemental contrast

4D imaging and in situ experiments: characterizing specimens over time and under varying conditions

Cryogenic sample handling to minimize the effects of radiation damage for organic specimens

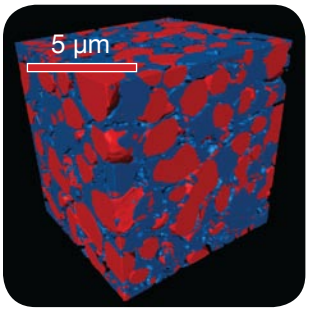
Ultra high resolution, energy-tunable 3D Imaging at the Synchrotron

3D tomographic imaging with X-rays provides detailed volumetric data of internal structures without the need for cutting or sectioning at the region of interest. The UltraXRM-S series combines Xradia X-ray optics with the powerful X-ray beams produced by synchrotron radiation facilities for 3D X-ray microscopy with resolution down to 30 nm. From soft X-rays to the multi-keV range, Xradia proven technology delivers a sophisticated turnkey solution with the UltraXRM-S series, ideal for any synchrotron facility developing high-resolution X-ray imaging capability.

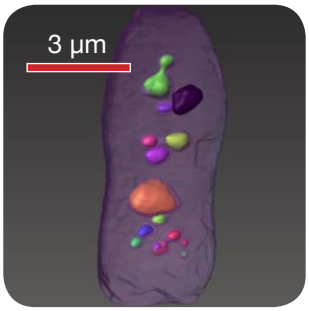
Application Examples

- **Materials Science**
  Characterization of composite and functional materials to understand properties such as porosity, tortuosity, cracks and phase distribution at the nanoscale
- **Life Science**
  Structural imaging of fine- and nano-structure in hard tissue for bone research (osteocyte lacunae and canalicular networks), and high contrast imaging of soft tissue (stained and unstained organelles)
- **Geosciences and Environmental**
  Measurements of porous rock microstructure for flow modeling in virtual core analysis, or heavy metal uptake in plants
- **Semiconductor**
  Process optimization and defect characterization for wafer-level packaging such as through silicon vias (TSV), or reverse engineering of malicious circuits

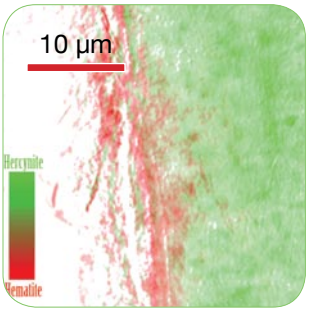
The tunability of X-ray photon energies at synchrotron sources enables spectroscopic imaging for elemental contrast and chemical state mapping. Integrated Zernike phase contrast imaging enhances the visibility of internal edges and interfaces when absorption contrast is low. Incorporating multiple switchable configurations of X-ray optics, the UltraXRM-S series enables access to a wide range of photon energies from typically 5 to 11 keV (S200), or from 200 to 2700 eV (S220).



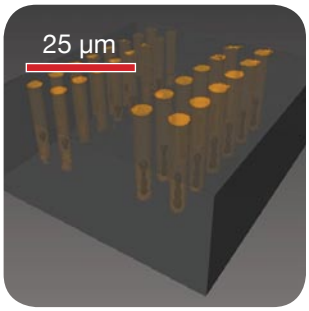
Multi-phase imaging
of a Solid Oxide Fuel Cell (SOFC) electrode



Yeast Cell
with segmented organelles imaged under cryogenic conditions



Mineralogical Phase Map
(spectroscopic imaging) of an ancient pottery sample.
Image courtesy of Y. Liu et al., SSRL



Through Silicon Vias
Process characterization and failure analysis

Image samples in background (from top to right): carbonate, concrete, network of cerebral vasculature, semiconductor packaging.

UltraXRM-S200/S220 Tomography X-ray Microscope for Synchrotron Facilities

Features

Automated image alignment for tomographic reconstruction

Multiple optics configurations for different magnifications and contrast modes

Integrated visible light microscope for easy sample alignment

Absorption and Zernike phase contrast

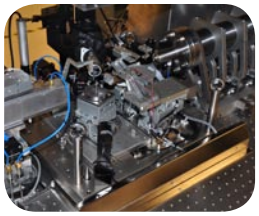
Automated spectroscopic imaging (XANES)

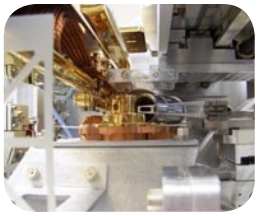
Cryogenic sample handling with automated sample exchange robot available

Flexibility for integration of in-situ devices and fluorescence detectors (UltraXRM-S200)

Proprietary reflective condensers and Fresnel zone plate optics for short acquisition times and superior image quality with 2nd and 3rd generation synchrotron sources

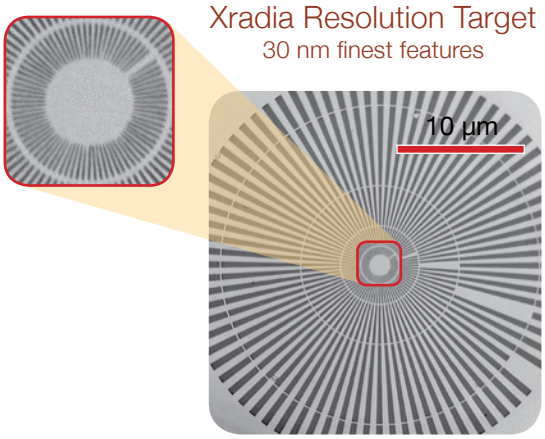
Large working distance ideal for in situ experiments





Key Specifications

Systems	UltraXRM-S200	UltraXRM-S220
Energy range	5 to 11 keV	200 to 2700 keV
Spatial Resolution	30-60 nm	30 nm
Field of View	20-40 µm	15 µm
Sample environment	Air (vacuum optional)	Vacuum
Exposure times	Beamline and application dependent	



Xradia Resolution Target
30 nm finest features

The UltraXRM-S200 / S220 works with both bending magnet sources and insertion devices. Please consult Xradia for beamline recommendations.

All specifications subject to change. Please consult Xradia for current specifications.

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The VersaXRM family of X-ray microscopes includes the VersaXRM-500, MicroXCT-200 and MicroXCT-400 for 3D X-ray computed tomography.
The UltraXRM family of 3D X-ray microscopes includes the UltraXRM-L200 and UltraXRM-S for laboratory and synchrotron facilities, respectively.

PO-UX2-0411