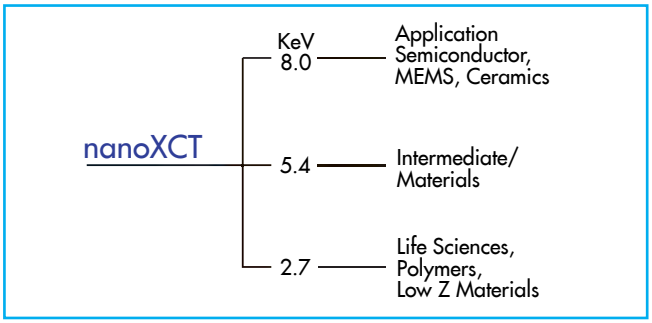
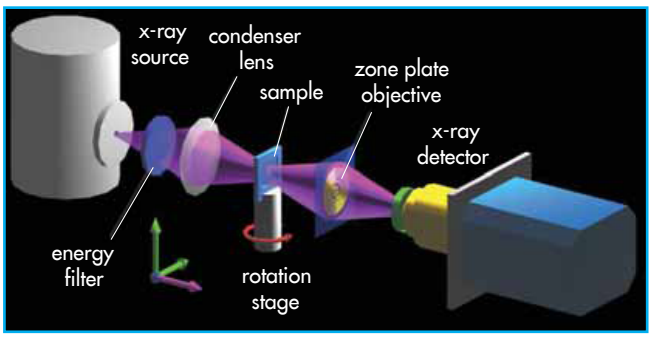
nanoXCT

An innovative approach at the center of nanoscale imaging

Extending 3D x-ray vision to the nanoscale

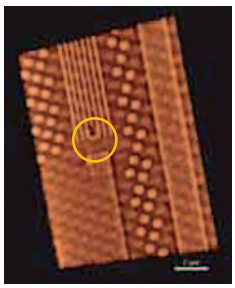
Xradia's nanoXCT is the world's first turnkey x-ray computed tomography (CT) system that enables the non-invasive, nondestructive visualization of buried, internal structures at the nanoscale. At the heart of the nanoXCT are unique x-ray optics including lenses, condensers and a high aspect ratio Zone Plate. The use of Xradia's proprietary X-POSE technology (x-ray phase optimized sample evaluation) and multi-keV x-rays provides deep penetration, as well as high contrast and resolution down to 30 nanometers. Samples can cover a wide range including advanced materials, semiconductor/ microelectronics and the life sciences. With little or no sample preparation, the nanoXCT system provides the advanced imaging capability to "see inside" your sample to view critical internal structures in a 2D/3D CT format.



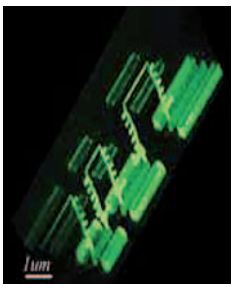


Semiconductor. Microelectronics and MEMS

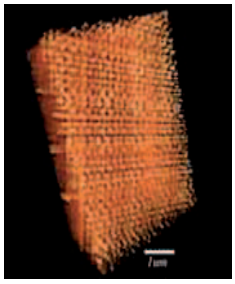
With non-destruct, 3D imaging offering resolution down to 30 nm, the nanoXCT provides new insight into applications relating to micro and nanoelectronic structures, specifically in the visualization of voids, shorts, die cracks, substrates via defects and residuals in metal interconnects as well as electromigration, all without the time, expense and uncertainty of physical de-processing. The nanoXCT is the logical tool to address current and future demands of MEMS, multi layer metallization, multi-core processors, System on a Chip, (SOC) as well as the decreasing dimensions of advanced interconnect technology.



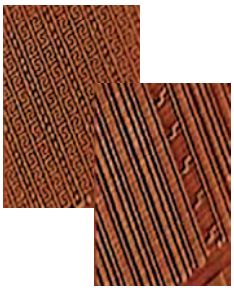
Cu IC showing missing via



IC showing 3D interconnects



Volume rendering of
Pentium 4 chip



Pentium 4 die
virtual delayering

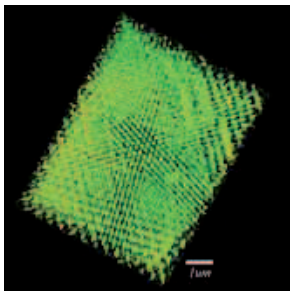
Features of the nanoXCT x-ray microscope:

- Spatial resolution down to 30 nm with fully automated data acquisition.
- High penetration through dense and optically opaque materials, such as silicon and ceramics.
- Versatility of sample selection, such as non-conducting, hydrated, powdered, porous, radiation-sensitive materials
- X-POSE technology using Zernike E phase imaging for dramatically improved contrast.
- Highly efficient condenser and zone plate optics for optimal utilization of x-ray source.
- Intuitive user interface with integrated 3D data acquisition, hardware accelerated reconstruction, and image analysis software
- Little or no sample preparation or deprocessing.
- In-situ time-lapsed non-invasive imaging of functional devices and sample reactions.

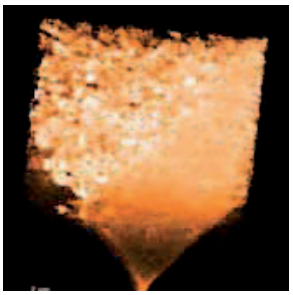
nanoXCT

An innovative approach at the center of nanoscale imaging

Advanced materials R&D and commercialization

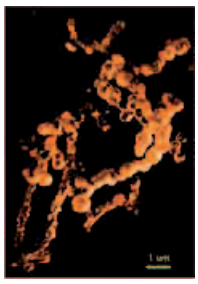


Volume rendering of photonic crystal



Solid oxide fuel cell (SOFC)

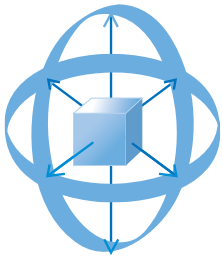
With the increased demand for polymer composites, structured ceramics and advanced metal alloys, the detailed knowledge of 3D structures is becoming more of a necessity every day. The ability of the nanoXCT using *X-Pose* technology allows for imaging of extremely difficult, low Z materials having little or no contrast. Additional capabilities include pore size and continuity calculations, density measurements and standard metrology surface evaluations. Using the 3D Volume Data Set, the opportunity to "see inside" through virtual cross section and de-layering of these difficult materials is increasing valuable. Again, there is no de-processing and little or no sample preparation.



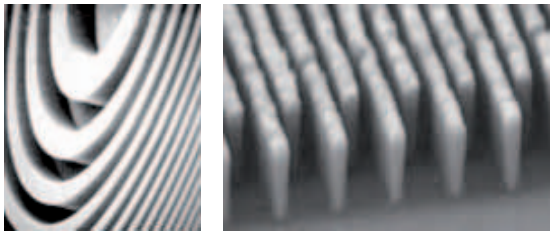
Self Assembling Magnetic Particles

3D volume data set

The 3D image contains virtually all the structural information of the object, up to 1.000 physical cross sections down to 17nm intervals. The reconstructed cross sections form a 3D virtual image that can then be manipulated and viewed in practically any manner or angle allowing you to „see inside" your sample and view internal structure by virtual cross-sectioning or de-layering.



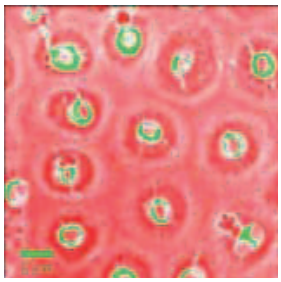
X-POSE technology



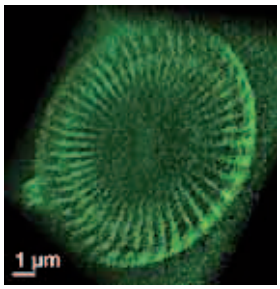
Key x-ray optical elements

Life sciences and biomaterials

The nanoXCT provides the ability to image thick sections of low Z materials without the addition of contrast enhancing agents. Using non-invasive virtual cross-sectioning essentially eliminates the need for complex and time consuming conventional histology. Imaging of samples containing both low and high Z materials such as soft tissue and bio-composite/metal interfaces, is dramatically demonstrated by using the X-POSE high contrast optics. In the rapidly emerging markets relating to the Life Science Research, Pharmaceuticals and Advanced Biomaterials, the demand for critical imaging, regardless of hydration state is a growing requirement.



Dentin tublets



Diatome volume rendering

Technical specifications	
Hardware	
X-ray source	Copper or chromium target rotating anode
Detector	1024 x 1024 thermoelectrically cooled, 16 bit
Field of view	~20 µm
Resolution	<60 nm
Pixel size	<20 nm
Magnification	~800x (total)
Sample Stage	4 axis:XYZ/ rotation
Travel	24 mm x 24 mm x 12 mm, 360° in full rotation
Computer	PC workstation with Windows XP Hardware accelerated graphics processing unit. 21" flat panel monitor.
Other	Prealignment microscope (optical)
Electrical	208VAC, 3-phase, 50 A, 50/60 Hz
Chilled water	20 °C, 1 l/min
Footprint	1.5 x 2,4 m², 1.300 kg
Sample requirements	
Maximum size	25 mm x 25 mm
Software	
	nanoXCT image acquisition, 3D tomographic reconstructor (hardware accelerated), 3DViewer image analysis (hardware accelerated)
Safety standards	SEMI S2-2000, SEMI S8, NFPA 79