

# High-Resolution 3D X-ray Microscopy Systems

Enabling innovation with CT Scanning at the micro and nano scale

## Enabling innovation and productivity for research and industry

Innovation is the cornerstone of today's leading industries—from life science research to advanced material development, to semiconductor technology and consumer electronics, to oil and gas drilling feasibility modeling, new materials and structures are constantly being explored to improve the way we live, work, and play. This surge in innovation requires timely and efficient analysis of internal structures to address barriers to progress, yield improvement, and failure analysis.

Xradia designs and manufactures a complete family of high-resolution 3D X-ray microscope systems for non-destructive imaging of internal structures. This new class of X-ray technology enables higher levels of innovation through 3D insight for diverse industrial and research applications such as:

- 3D imaging of biomedical devices and life sciences specimens
- 3D imaging of oil and gas reservoir rocks
- Process development and failure analysis for semiconductor packaging and MEMS
- Structural visualization and time-lapse imaging of advanced materials
- Nondestructive 3D imaging of nanotechnology devices and materials

## A new view in 3D

- High-resolution 3D X-ray visualization
- High-contrast; phase enhanced imaging
- Broad sample size and type
- 3D volume data processing & analysis
- Fast time to analysis of internal structural complexity



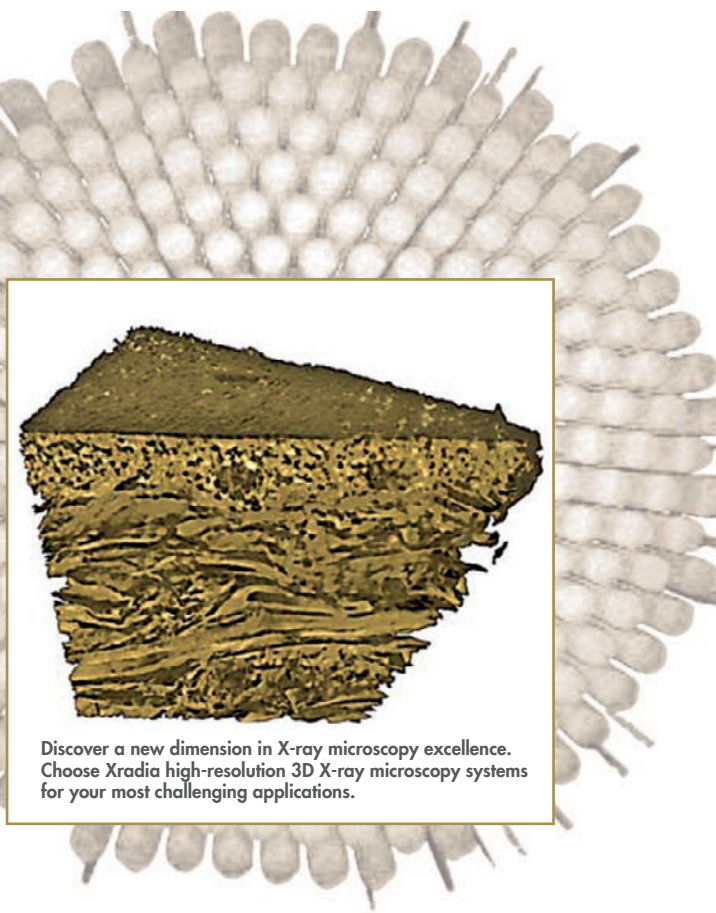
Traditional approaches to the analysis of internal structures—such as destructive sample preparation

and two-dimensional imaging—have a variety of drawbacks, including: high cost and lengthy sample preparation, sample preparation-induced artifacts, and complex 3D reconstruction.

These shortcomings ultimately impede information gathering, analysis and delay decision-making.

Xradia addresses these issues with a new class of nondestructive high-resolution and high-contrast 3D imaging solutions for industry, research, and academia. The company's advanced solutions feature the unique ability to visualize full volume data for very small features without destroying the sample. This makes them a compelling alternative for imaging in many fields of research, characterization, and in the inspection and failure analysis of manufactured products. Xradia imaging produces easy-to-analyze and intuitive 3D data for very complex structures. This enables scientists and engineers to assess complete internal structural information with unprecedented resolution and throughput. They can now make quicker decisions for rapid progress in product development and troubleshooting.

Based upon proprietary X-ray optics and detector technology, Xradia products offer resolution ranging from the nanometer level to several hundred microns at superior contrast. And unlike traditional techniques, the samples require little to no preparation. Image data integrity is completely preserved with no artifacts introduced into the process.



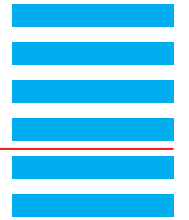
Discover a new dimension in X-ray microscopy excellence. Choose Xradia high-resolution 3D X-ray microscopy systems for your most challenging applications.



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## Multi-Length Scale Solutions

Xradia X-ray microscopy solutions are developed on two platforms, designed for use in academia, research labs and industry.

### nanoXCT™

*Ideal for molecular imaging, advanced materials, and nanotechnology development*

This high-resolution transmission X-ray provides structural information with 50 nm resolution and can use either a synchrotron or standalone laboratory X-ray source. The synchrotron-based nano system can also be customized for sub-30 nm resolution.



### MicroXCT™

*True micrometer resolution with the best sample size flexibility available*

This industrial family of systems is a new class of 3D X-ray microscopy solutions for non-destructive imaging of complex internal structures. It offers full 3D resolution of sub-micron voxel features, making it a compelling alternative for research and manufacturing process inspection.



	50 mm	20 µm	1 µm	150 nm	50 nm
<b>Oil &amp; Gas</b>	Whole animal	Trabecular bone & organ vasculature	Cortical bone vasculature, Haversian canals, alveoli	Neuron bodies	Canaliculi osteocytes
<b>Semiconductors</b>	High absorption dispersion cores	Tar sands & sandstones	Carbonate	Oil shale	Gas shale
<b>Advanced Materials</b>	Board level	Missing solder balls	Solder bump cracks	TSV	
<b>Life Sciences</b>	Composite	Carbon composite cracks	Fuel cell membranes		Nano fibers/particles

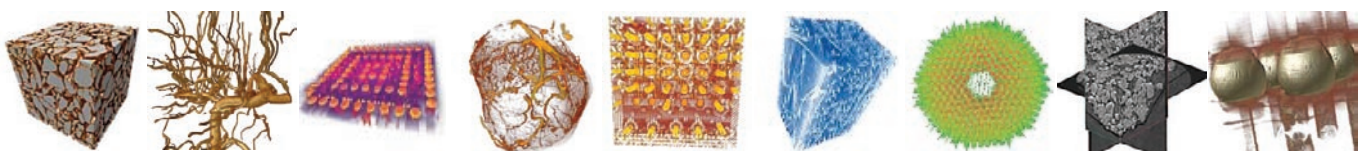
**Xradia technology and solutions have been used successfully for applications in four major markets:**

**Life Sciences** - Xradia solutions are capable of imaging complex samples for physical, pharmacological, and biological studies. These systems provide the highest-contrast images of bone, cartilage, soft tissue, micro-vasculature, neural networks and medical devices. Complete, full-volume 3D data creates a virtual histology view, eliminating the need for time-consuming sample preparation that can also introduce preparation induced artifacts. Sample orientation and margin analysis are supported in easy to understand 3D models.

**Semiconductor** – Xradia offers device/package imaging and failure analysis that improve packaging process development and control, package substrate quality, 3D package interconnect characterization (such as through silicon vias), and MEMs device inspection.

**Oil & Gas** – The high demand and the high cost of drilling for oil require rock cuttings and core analysis to provide nano and micro-models for porosity, permeability, and connectivity. This is used for drilling feasibility analysis and decision-support computational modeling. Xradia provides in-the-field, real-time data to support microstructure modeling that optimizes drilling efficiency and cost-effectiveness.

**Advanced Materials** – The ability to visualize internal structures in 3D without destroying the sample and with nano- or micro-meter resolution is essential to function and form related studies of new materials. The efficacy of many advanced materials, such as high strength composites and photonic crystals, is determined by their unique 3D structure. Xradia's high resolution and high contrast imaging of internal properties of such materials aids in research and are useful for failure analysis and production process monitoring.



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