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CT Lab HX

Compact X-ray microtomography

High-performance in a small package

Rigaku
Leading With Innovation

CT Lab HX

Computed tomography for materials and life science

Large sample stage with smartphone and view of flat panel detector

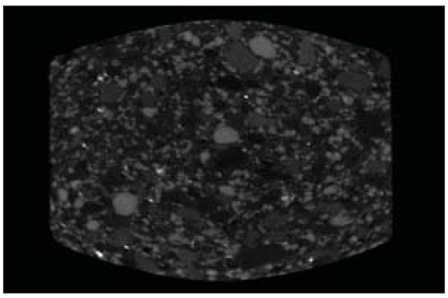
Small sample stage with shark tooth and view of X-ray source

3D X-ray computed tomography measurements, like 2D X-ray radiographic measurements, allow us to look inside an object and image features important in the analysis of a wide variety of materials and life science samples. In a 2D radiograph, all the features of a sample's 3D volume are projected, displayed, and analyzed on a 2D plane orthogonal to the incident X-ray beam. The resulting 2D image is complex; display and analysis suffers from the shadowing of certain features that are "behind" others with respect to the direction of the beam. The benefit of computed tomography compared to 2D radiography is that the entire three-dimensional volume of the sample can be imaged, displayed and analyzed fully in three dimensions. This is achieved by rotating the sample 360° with respect to the incident beam and collecting a set of two-dimensional radiographs at different angles. This set of radiographs, or "projections," can be "reconstructed" to obtain a three-dimensional volume rendering rather than the single 2D projection of the radiograph. The number of projections required depends on the sample size and the size of the sample features the analyst is interested in viewing. Also as with 2D radiography, by coupling varying source-to-sample and sample-to-detector distances with a diverging X-ray beam, CT systems can magnify observable features and vary the field of view of the imaging. This is critical for the optimal measurement of many complex samples in both materials and life science applications.

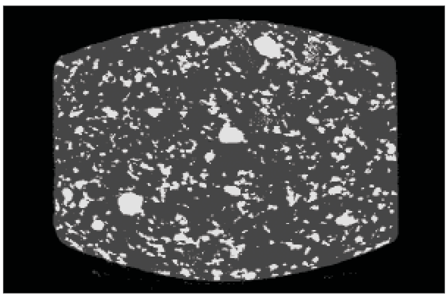
CT Lab HX

The CT Lab HX is a compact, versatile computed tomography system suitable for a wide range of sample types and required measurement conditions. It offers a high-powered, variable focus size X-ray source with excitation energies up to 130 kV. Variable filters enable energy settings suitable for organic materials, inorganic materials, and metals. Its small voxel size, large field of view, and large sample capability make it ideal for applications in materials and life science research, product development, failure analysis, and manufacturing quality control. The high-speed flat panel detector offers both high-speed 3D data collection and millisecond scale live 2D imaging for dynamic studies. The CT Lab HX comes bundled with ORS Dragonfly 3D visualization and analysis software with machine learning for the most advanced analysis capabilities in materials and life science applications.

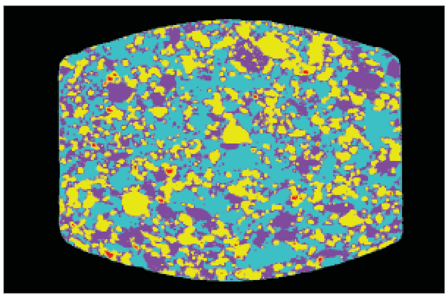
Sample: multivitamin tablet



Original tomographic cross section



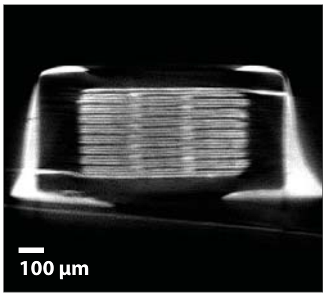
Segmentation by traditional thresholding (Shanbhag)



Segmentation by machine learning

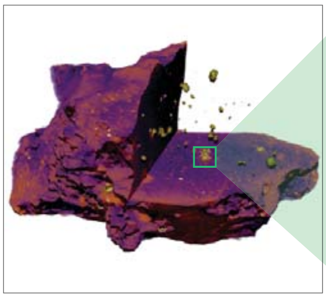
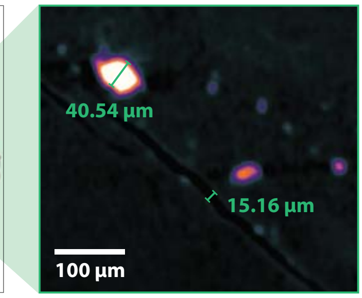
Applications and examples

Electronics

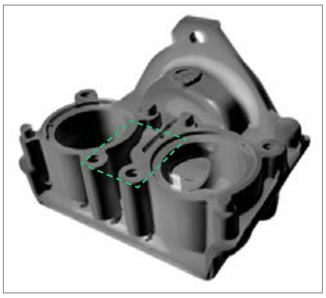
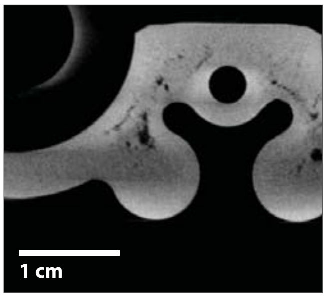
A flexible FOV allows scanning of full circuit boards as well as their individual components. In this example, an entire smartphone and a single component (condenser) are shown. The full scan shows the device layout, while the smaller FOV shows a higher-resolution scan of an isolated condensor coil wire thickness and spacing.

Geology

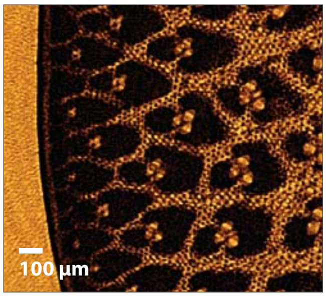
High-resolution CT scans let researchers look inside rocks to explore both mineralogy and morphological features. This example shows a 3D rendering of a rock from the Hirose River in Japan. The bulk material has been removed from one section of the rock showing inclusions within. The close-up view shows inclusions down to 5 microns in size.

Metals

High-energy scans are required for dense materials such as metals. A low-resolution full rendering of an aluminum die cast part shows macroscopic structure and dimension suitable for quality control and failure analysis. A higher-resolution scan is able to look into the Al material itself, showing voids and cracks.

Life Science

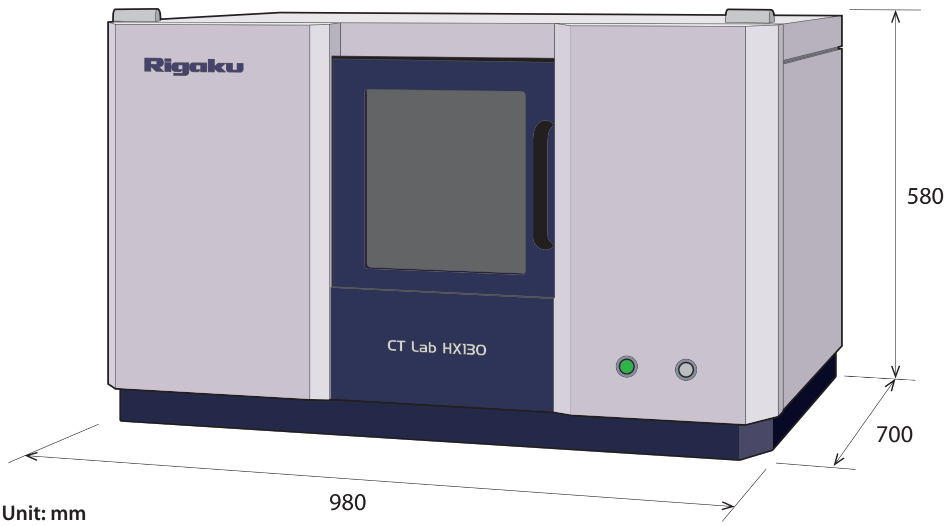
Lower-energy scans provide high contrast for organic materials fundamental to life science research. Flexibility in scan energy, FOV, and resolution allows users to optimize images for plants, insects, and animal tissues. This example shows a rendering of a section of a bamboo toothpick revealing the external grain pattern and surface roughness associated with the manufacturing, and the internal structure of the bamboo. A close-up view of the internal structure shows the sieve tubes, water vessels, and vascular bundles making up the bamboo microstructure.

CT Lab HX

Compact X-ray microtomography

X-ray source	Applied voltage	30 – 130 kV
	Filament current	20 – 300 µA
	Maximum power	39 W
Detector	Type	Flat panel detector
	Size	2352 x 2944 pixels
	Frame rate	60 fps
Geometry	Type	Cone beam geometry with sample rotation
	Source to detector distance	Selectable, 224 – 430 mm
	Field of view	200 mmØ (Max.)
	Voxel size	2.2 µm (MIn.)
	Reconstructed image size	512^3 – $3K^3$
Data collection speed	Computed tomography 3D image	18 sec / scan (top speed)
	Live 2D image and movie	16.7 msec / frame (top speed)
CPU	OS	Windows® 10
	Memory	128 GB
	HDD	512 GB SSD + 8 TB HDD
	GPU	NVIDIA Quadro + GeForce series
Installation condition	Power supply	100 – 120 VAC, 1-phase, 15 A 200 – 240 VAC, 1-phase, 8 A
	Dimensions	980 W x 700 D x 580 H mm (PC not included) Approximately 380 kg

Specifications and appearance are subject to change without notice.



Unit: mm

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