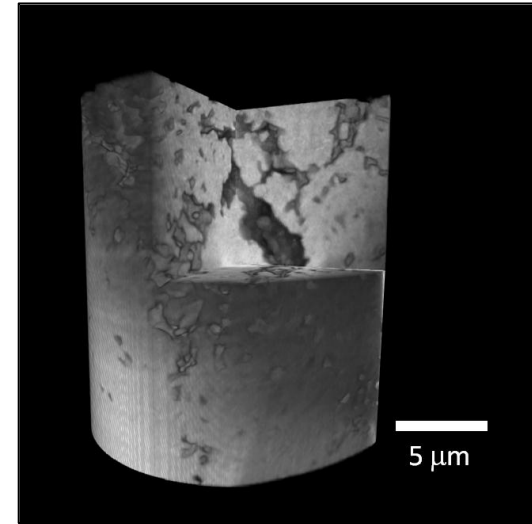


# Microscope Captures Nanoscale Structures in Dazzling 3D

*Transmission Electron Microscope automatically corrects micrometer wobbles*

- A new full field transmission hard x-ray microscope (TXM) on beamline X8C at the National Synchrotron Light Source (NSLS) produces 3D images with sub-50 nanometer resolution at unprecedented speeds, thanks to its unique markerless automated tomography.
- Three sensitive sensors measure inevitable nanometer shifts as the material rotates and the microscope takes pictures. The computer recording the images, after calibration with a gold sphere, can automatically compensate for wobbles and then assemble thousands of 2D images into the final three-dimensional construct. Other devices are limited by markers or lattices to provide guidelines, requiring more time and producing lower-resolution output.
- Experiments are also under way demonstrating this TXM's high-res spectroscopic capabilities.
- The direct observation of nanometer structures will offer fundamental advances in many fields, including energy research, environmental sciences, biology, and national defense. IBM, UOP, and DARPA have already scheduled time at NSLS to use the device.



This 3D reconstruction of a 20-micrometer lithium-ion battery electrode, composed of 1,441 individual images captured and aligned by the TXM, reveals structural details as small as 25 nanometers to help understand its function and guide future energy research. The markerless, sensor-based TXM produced the above rendering in 4 hours, a radical jump in efficiency. When used on the under-construction National Synchrotron Light Source II, it will operate 1,000 times faster and capture 3D structures at video speeds.