Your mineral identification ambitions realized non-destructively

ZEISS Mineralogic 3D for Geoscience

The game has changed

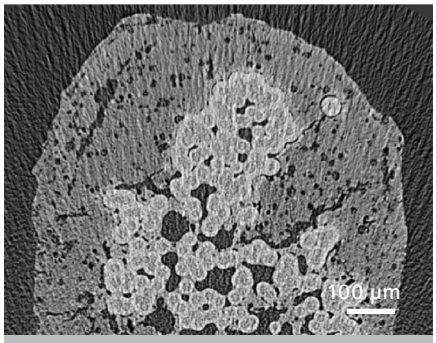
The phrase "automated mineralogy" has been synonymous with the use of scanning electron microscopes (SEM) for decades. The classification of minerals using SEM-based energy dispersive spectroscopy (EDS) chemical measurements has been the only method for rapid, automated phase ID in microscopy.

Now, ZEISS Mineralogic 3D applies non-destructive X-ray-microscopy techniques and deep learning algorithms to execute automated mineralogy in 3D. Mineral classification and particle identification are performed alongside customizable data outputs including true grain size/shape and mineral association measurements.

Three immediate benefits:

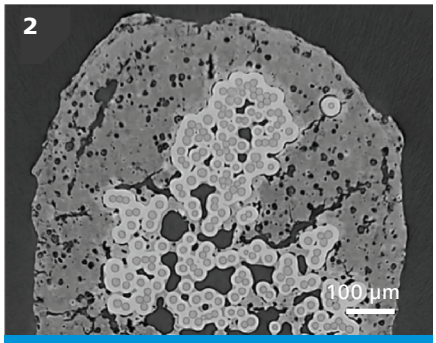
1. Streamlined sample preparation with no polished mounts
2. Reduce sample runs by eliminating stereological assumptions
3. Non-destructive to allow for precious samples or correlative workflows

Standard Recontruction



301 projections
Scan time: 53 minutes

DeepRecon Pro



301 projections
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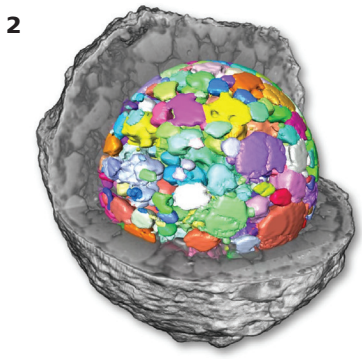
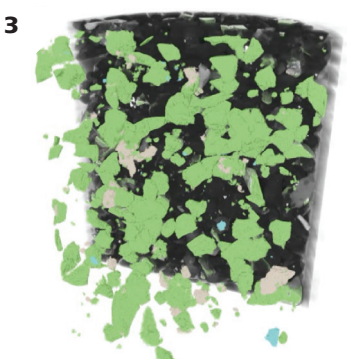




Recent advances in 3D X-ray analysis include (1) DeepRecon Pro deep learning image processing, (2) non-destructive crystal orientation analysis, and now (3) automated quantitative mineralogy

Maximize outputs from non-destructive techniques

The capabilities of ZEISS Xradia X-ray microscopy (XRM) and computed tomography (µCT) are at the forefront of lab-based, non-destructive imaging. These 3D microscopy capabilities now feature three key enhancements enabling quantitative analytical applications.

1. DeepRecon Pro – Advanced deep learning for noise reduction and speed
2. LabDCT/CrystalCT – Diffraction contrast tomography for crystal orientation analysis
3. Mineralogic 3D – Calibrated phase identification for automated mineralogy

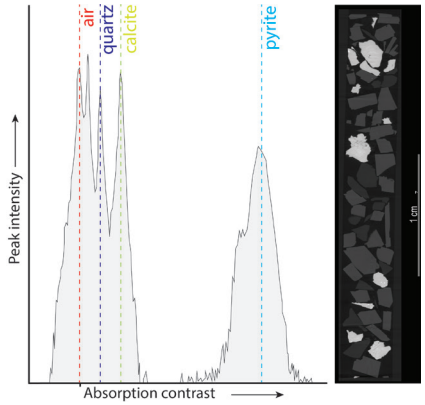
ZEISS

Seeing beyond

Introducing Mineralogic 3D

Mineralogic 3D automatically classifies the mineralogy of the sample based on attenuation measurements. This unique capability can be combined with morphological measurements to create a full description of the sample with none of the stereological restrictions of SEM-based analyses.

Mineralogic 3D is capable of analyzing whole rock samples, loose particle fractions, or intricate structures in full with no sample damage and minimal preparation. Maximizing the quantitative outputs from non-destructive X-ray techniques is ideal for precious samples such as meteorites and sample-return missions, museum specimens, and fossil samples – particularly those still embedded in host rock.



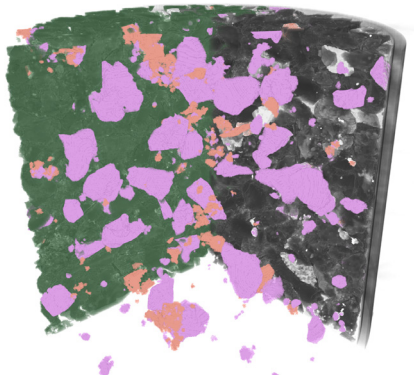
Measured attenuation peak positions shown match the predicted/simulated positions (dashed lines) for each mineral, allowing for mineral species to be easily classified. Image on the right shows a single 2D projection of the analyzed test sample.

Prepare your research workflows like never before

Mineralogic 3D creates a new opportunity to understand your samples in as much detail as possible, either as standalone datasets, or prior to further sample preparation and analysis. Automated mineralogy in 3D paves the way for targeted, correlative workflows to light microscopy, SEM, FIB-SEM, and beyond.

Characterize mineral deposits in meteorites with quantitative grain size/shape analysis and mineral associations for key minerals *in situ*. Or create streamlined 3D-to-2D workflows. E.g., Mineralogic 3D identifies mineral crystal systems as inputs for 3D crystal orientation, highlighting the perfect targets for high resolution EBSD or TOF-SIMS.

Investigate your sample in its true form, without mechanical alteration, and see 100% of it. ZEISS Mineralogic 3D offers an unparalleled ability to understand composition, mineral relationships, and fabric of the geological materials under scrutiny, including minor phases and mineral inclusions. No longer are assumptions on the representativity of the exposed sample relevant, nor are there issues with stereology.



Automated mineral segmentation from X-ray data allows for non-destructive analysis of mineral textures and abundance. These data provide the most robust and representative 3D analysis of your rock sample and can guide correlative workflows.

Simple preparation, advanced analysis

Analyze your sample intact and dispense with the requirement to make epoxy mounts or hope for the perfect thin section to be cut. New helical raster scanning techniques allow larger volumes than ever before to be imaged in high resolution, or analyzed for crystal orientation.

Take advantage of the ZEISS Xradia flat panel detector to obtain a larger field of view and enjoy the high throughput of deep learning image processing improvements provided by ZEISS DeepRecon Pro. Mineralogic 3D offers unrivaled resolution, mineral classification, and measurement of samples in their natural state with simple sample handling.

ZEISS Xradia Versa XRM
with primary workstation
Standard FDK Reconstruction

ZEISS Xradia Context microCT or CrystalCT
with primary workstation
Standard FDK Reconstruction

Mineralogic 3D

Deep Recon Pro Software
XRM High Performance Workstation
FPX Flat Panel Extension
ZEISS Scout-and-Scan
ZEN Analyzer
ZEN Module Macro Environment
ZEN Intellesis

Optional Extras:
ORS Dragonfly Pro, Autoloader

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