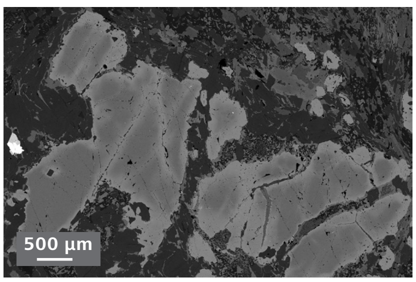
Boost and Automate Analysis with AI

ZEISS Phase Identifier AI

Raw Materials Industry and Academia

AI enhanced phase segmentation and classification algorithm

- Data driven segmentation utilising deep learning neural networks
- Enabling unbiased materials analysis in a fully automated workflow
- No pre-knowledge of sample required – adaptive classification and labelling for single or multi-sample workflows
- Fully quantified image analysis and chemistry led characterisation



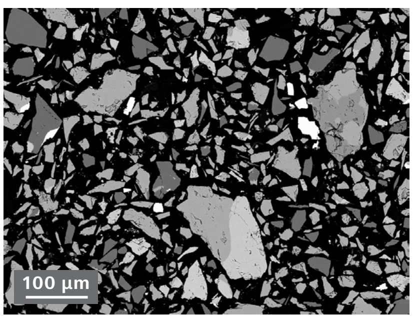
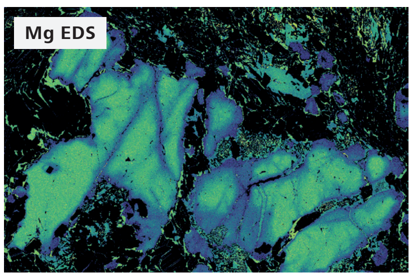
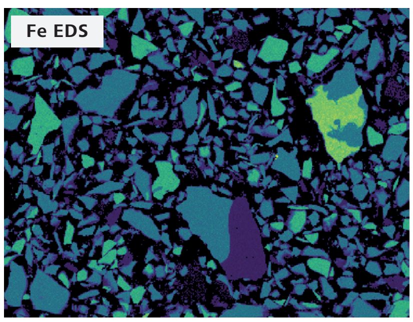
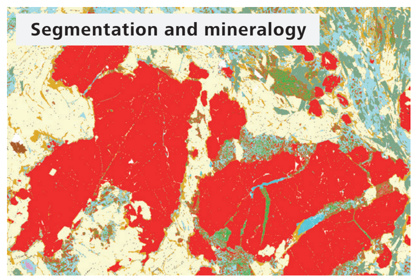


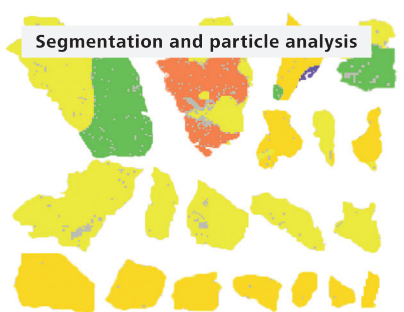
IMAGE: *Scanning Electron Microscope (SEM) images are the preliminary stage in understanding our sample, and may form the basis of initial image analysis, or be the foundation for deeper understanding using microanalytical detectors. Imaging is key for both solid rock samples (top) as thin sections or core, or crushed material (bottom) for particle and grain analysis.*





EXPLORE: *Microanalytical information in the form of chemical or structural data provide key insights to our sample, but working with large datasets is prone to misinterpretations and personal bias. Phase Identifier AI allows automated, unbiased sample segmentation, mineral classification, and measurement alongside real-time, interactive feedback during data exploration.*





DISCOVER: *The microscopy workflow finishes with the extraction of functional data providing key insights into our samples. Automated image segmentation based on the underlying data leads to robust, consistent image analysis with measurements and outputs essential for holistic rock characterisation.*

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Seeing beyond

Your mineral identification ambitions realized non-destructively

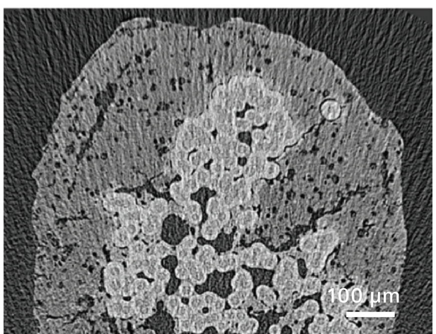
ZEISS Phase Identifier 3D

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.

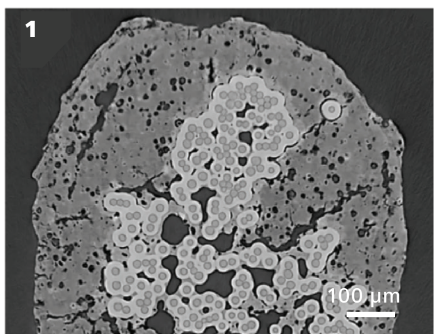
Now, ZEISS Phase Identifier 3D applies non-destructive X-ray-microscopy techniques and deep learning algorithms to execute automated mineralogy in 3D. Mineral classification and particle identification are performed alongside customizable data outputs including true grain size/shape and mineral association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

Standard Recontruction



301 projections
Scan time: 53 minutes

DeepRecon Pro



301 projections
Scan time: 53 minutes

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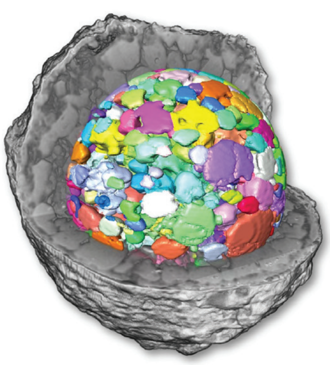

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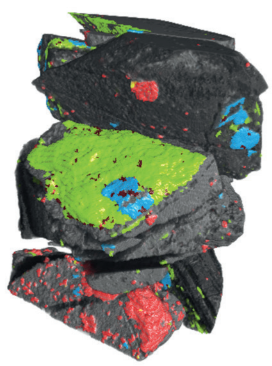


Recent advances in 3D X-ray analysis include (1) DeepRecon Pro deep learning image processing, (2) non-destructive crystal orientation analysis, and now (3) automated quantitative mineralogy

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

Maximize Outputs from Non-destructive Techniques

The capabilities of ZEISS 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. Phase Identifier 3D – Calibrated phase identification for automated mineralogy

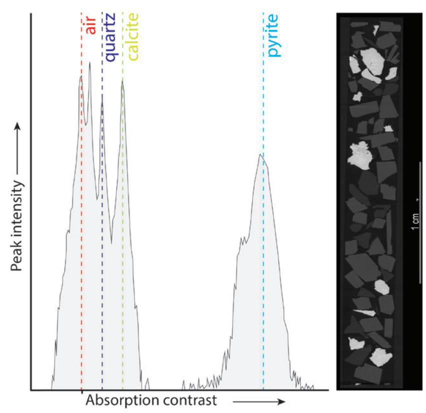
ZEISS

Seeing beyond

Introducing Phase Identifier 3D

Phase Identifier 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.

Phase Identifier 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.



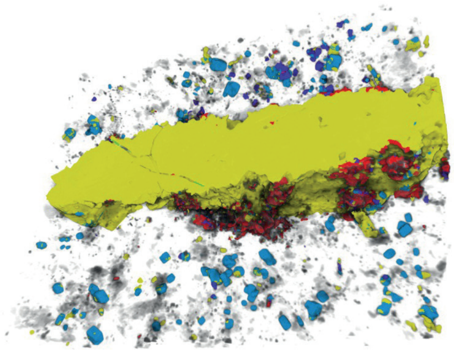
Measured attenuation peak positions shown match the predicted/simulated positions (dashed lines) for each mineral, allowing for mineral species to be easily classified. Image on the right shows a single 2D projection of the analyzed test sample.

Prepare Your Research Workflows Like Never Before

Phase Identifier 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 and meteorites with quantitative grain size/shape analysis and mineral associations for key minerals *in situ*. Or create streamlined 3D-to-2D workflows. E.g., Phase Identifier 3D identifies minerals, 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. Phase Identifier 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. Pyrite vein (yellow) with molybdenite (red), galena (green), magnetite (blue), and sphalerite (purple).

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.

Take advantage of the ZEISS 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. Phase Identifier 3D offers unrivaled resolution, mineral classification, and measurement of samples in their natural state with simple sample handling.

ZEISS Versa XRM
with primary workstation
Standard FDK Reconstruction

ZEISS Context microCT
with primary workstation
Standard FDK Reconstruction

Phase Identifier 3D

XRM with:
- Flat Panel Extension
- ZEN navx or Scout-and-Scan

XRM High Performance Workstation with:
- ART
- Deep Recon Pro

Optional Extras:
Dragonfly 3D World ZEISS Edition

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