

Product Information
Version 1.0

ZEISS Mineralogic Mining

Your Solution for Automated Mineral Analysis



We make it visible.

Maximize Your Recovery of Natural Resources

- › In Brief

- › The Advantages

- › The Applications

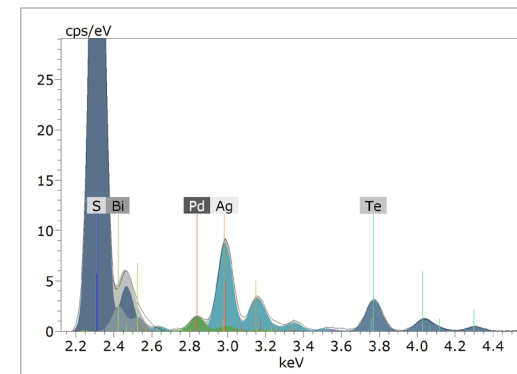
- › The System

- › Service

Characterize and achieve maximum recovery of resources: with Mineralogic Mining you use automated mineral analysis to identify and quantify minerals in real-time.

Mineralogic Mining is your geological investigation tool, answering a wide range of questions of your sample. From dedicated high throughput mineral liberation workflows to in-depth fundamental geoscientific investigations, the combination of image processing, quantitative EDS and image analysis toolkits can be configured to interrogate even the most challenging samples.

Mineralogic Mining combines a scanning electron microscope with one or more EDS detectors, a mineral analysis engine and the Mining software plug-in. Simply choose the ZEISS SEM platform that best suits your applications from conventional or field emission systems.



Quantitative EDS analysis of a mineral spectrum including peak deconvolution. Courtesy of Bruker Nano GmbH

Simpler. More Intelligent. More Integrated.

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Tailor Your System to Analyze Any Mineral

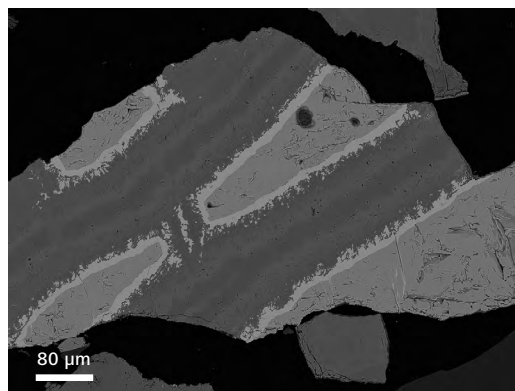
Match mineral classification methods to your sample texture. For maximum accuracy, use the highly sensitive technique of fully quantitative EDS. For the fastest analysis speeds, choose BSD grayscale. Combine both techniques with morphology-based mineral classification to achieve highest flexibility. Include element ratio rules to get ultimate mineral discrimination. A full suite of image processing functions gives you a powerful edge when analyzing samples with low atomic number such as coal.

Simple Ore Body Characterization

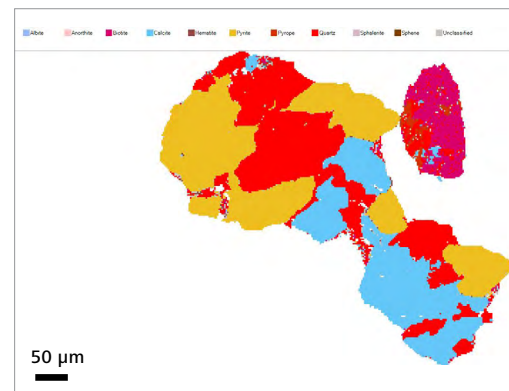
Unknown ore bodies are now simple to characterize thanks to quantitative EDS. The stoichiometry of all unclassified minerals is measured and can be used to quickly classify unknown minerals. Creating a mineral library to classify an unknown ore body now takes hours instead of weeks and significantly reduces the need to use XRD or microprobe data. Furthermore, mineral libraries can be copied to new instruments to avoid a significant overhead recreating instrument specific libraries.

Count on High Productivity

Mineralogic Mining lets you measure and classify minerals in real-time. Once the sample run is complete, there's no need for post processing. You can also re-analyze data sets retrospectively using modified mineral classification rules. Use its workflow orientated wizard to set up sample runs quickly. You'll achieve maximum automation and productivity with a 16-stub sample holder and a range of ZEISS SEMs. Choose between one and four Energy Dispersive Spectrometers (EDS). Producing dedicated reports has never been easier.



African copper gold ore; BSD image showing subtle mineralogy changes



Detailed mineral particles of a base metal sulphide tailings



16-stub sample holder for maximum throughput

Your Insight into the Technology Behind It

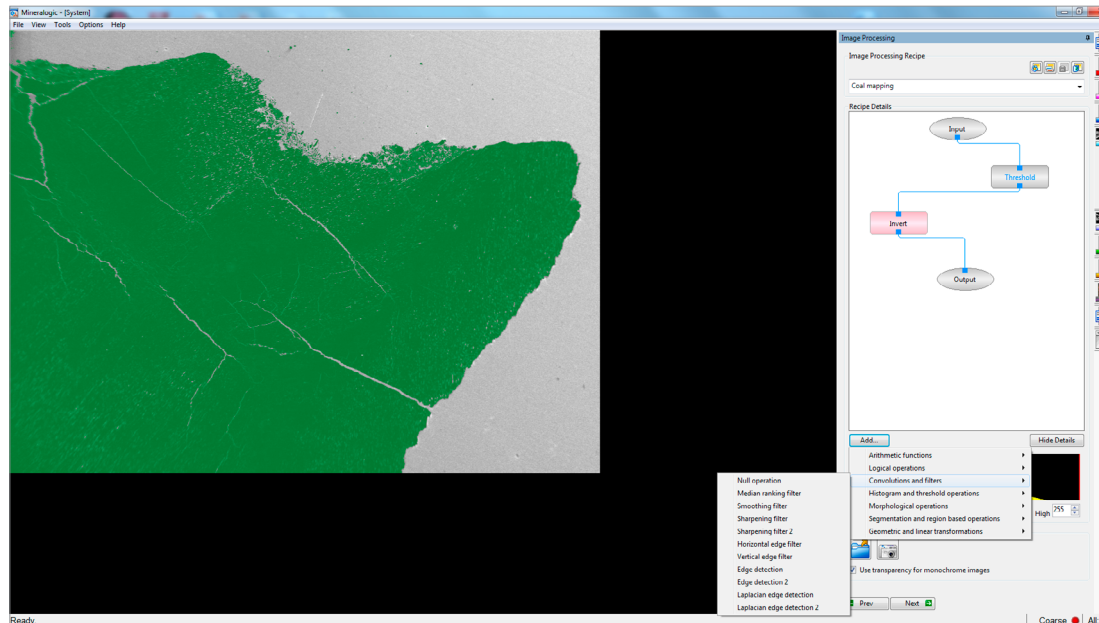
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Image Processing

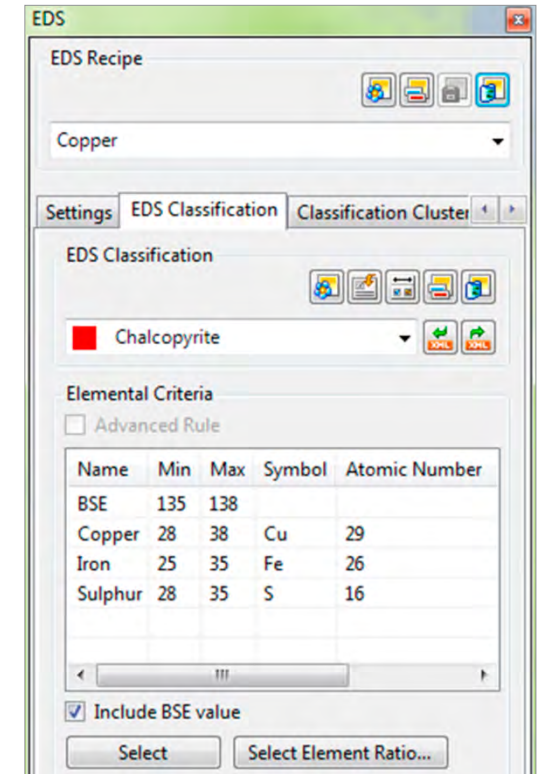
With Mineralogic Mining you benefit from a unique suite of algorithms for customized image processing. This gives you a particular advantage when analyzing low Z materials such as carbon: you can modify the image to improve contrast. Set multiple BSD grayscale thresholds and windows to exclude potting media and analyze only high value target minerals. Avoiding unwanted regions and edge artifacts makes your analysis very efficient.

Classifications

Tailor your analysis to each sample's specific properties with a choice of five different analysis methods and more than 20 image processing options. Mineral classifications are independent of SEM conditions and can be assigned using actual stoichiometry, which makes it easy to generate new classifications and libraries. Use quantitative EDS to measure trace elements in minerals and you will observe subtle changes in mineralogy. Combine your EDS data with grain shape classifications for ultimate precision in mineral identification.



Processed image of coal sample embedded in resin. Materials contrast is achieved using the cathodoluminescence image as the input for the mineralogical analysis.



Mineralogic mineral classification window showing stoichiometric, element ratio and BSE greyscale mineral classification options.

Your Insight into the Technology Behind It

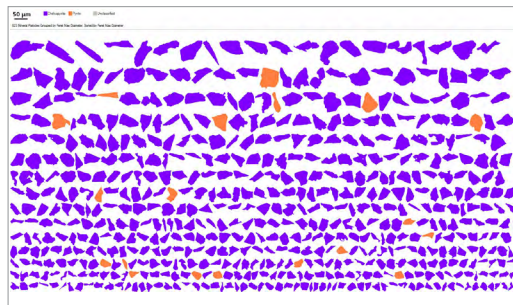
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View and Manage Your Results

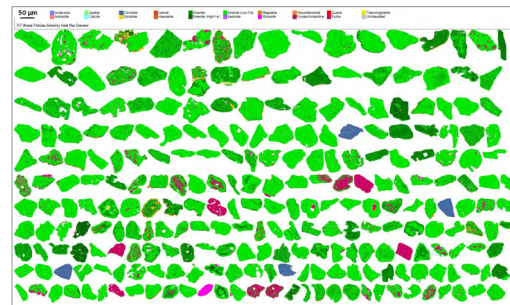
Use Mineralogic's Explorer application to browse results of mineralogy, mineral associations, mineral partial exposed perimeter, elemental assay and mineral liberation. Sort particles and grains, and view individual particles, grains, pores or fields of view. You can automatically separate touching particles. Create large mineral maps and BSD grayscale montages. Enjoy the convenience of modifying mineral classifications. Retrospectively reanalyze data offline increasing productivity. Quickly export data for further handling.

Create Reports Effortlessly

Save time with Mineralogic's built-in reporter tool: predefined reports can be filled automatically, while the SEM is still acquiring data. Alternatively you can generate reports from previously acquired data at your convenience. Use drag and drop functionality to produce new report templates, that are ready for export to Microsoft® applications.



Mineral particles images of heavy mineral sand feed, sorted by Feret max diameter



Mineral particle images of copper concentrate, sorted by Feret max diameter

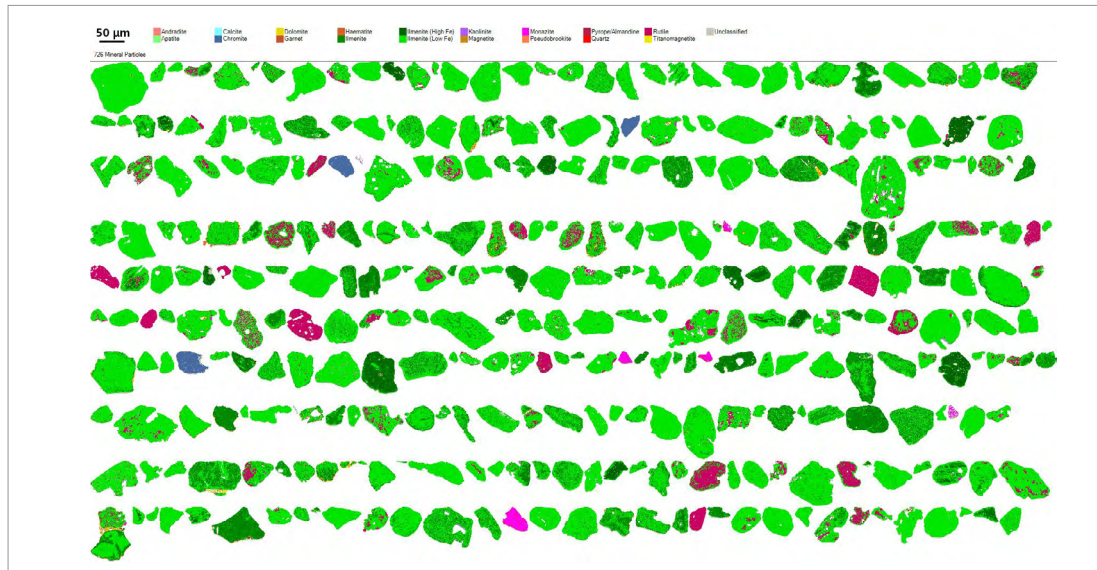
Tailored Precisely to Your Applications

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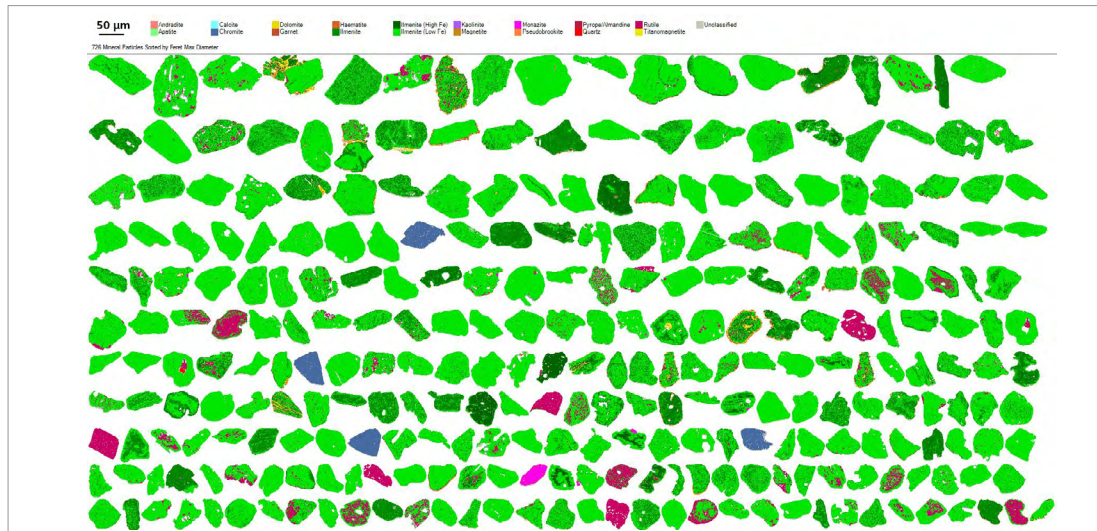
Typical Applications, Typical Samples	Task	ZEISS Mineralogic Mining Offers
Ore	Ore evaluation	<ul style="list-style-type: none"> ■ Modal analysis ■ Assay ■ Chemical distribution
Concentrate	Optimization of grinding and beneficiation processes	<ul style="list-style-type: none"> ■ Modal analysis ■ Assay ■ Chemical distribution ■ Liberation ■ Mineral associations ■ Other industry-specific calculations
Tailings	Environmental control	<ul style="list-style-type: none"> ■ Efflorescence
	Quality assurance and control	<ul style="list-style-type: none"> ■ Bulk mineralogy ■ Elemental assay
	Process optimization	<ul style="list-style-type: none"> ■ Mineral reactive area

ZEISS Mineralogic at Work

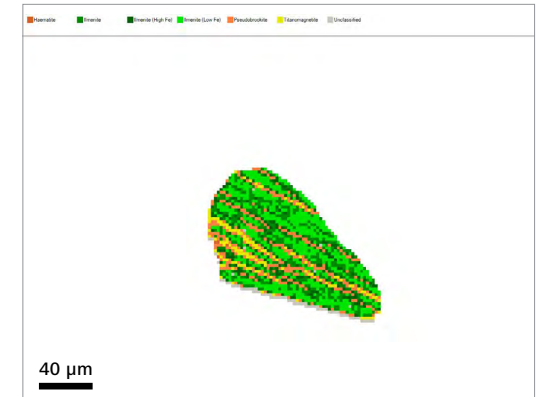
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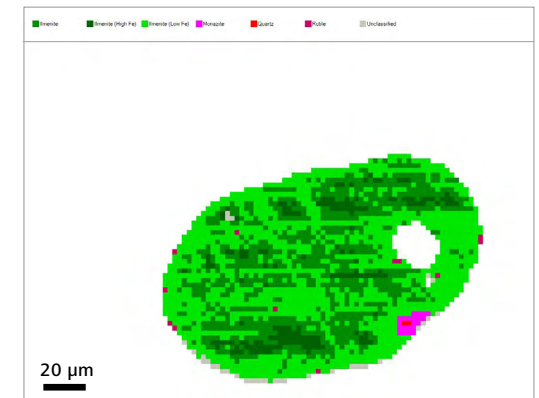
Randomly sorted heavy mineral sand mineral particles



Heavy mineral sand mineral particles sorted by Feret max diameter



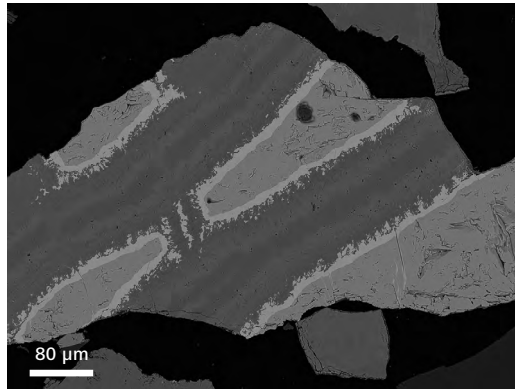
Detailed high resolution mineral map of a heavy mineral sand particle



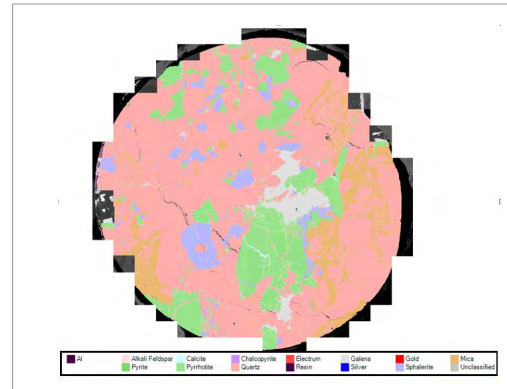
Detailed high resolution mineral map of a heavy mineral sand particle

ZEISS Mineralogic at Work

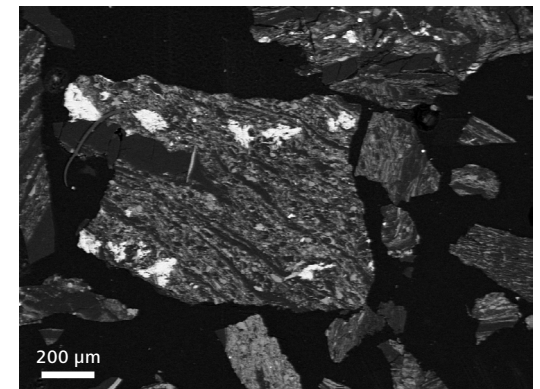
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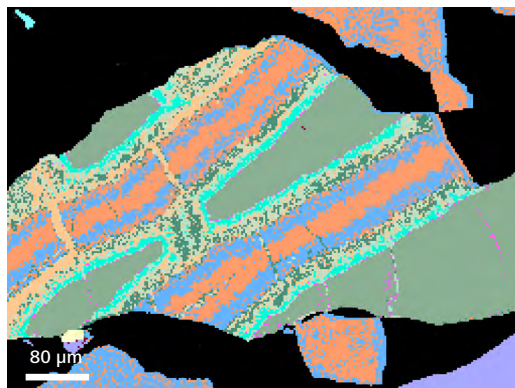
Copper-gold ore; BSD image



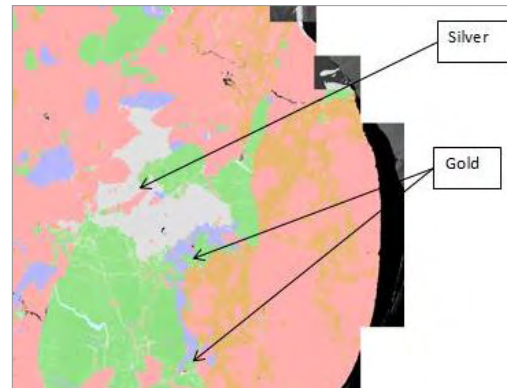
Montage image of Mineralogic Mining analysis of a gold-silver hosting base metal sulphide vein. Courtesy of Dr Simon Dominy from Snowden and the Natural History Museum



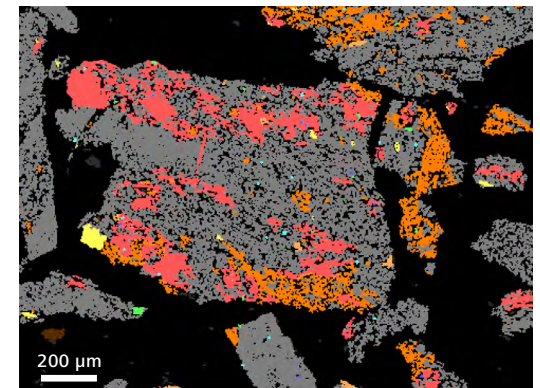
BSD image showing southern hemisphere coal mounted in carnauba wax.



Copper-gold ore; BSD image; mineral classification showing each mineral type by color: hematite (orange) and magnetite (blue)



Gold and silver located in base metal sulphide vein; Courtesy of Dr Simon Dominy from Snowden and the Natural History Museum



Mineral map of southern hemisphere coal mounted in carnauba wax showing variations in sulfur content using Mineralogic's element ratio rules mineral classification.

Your Flexible Choice of Components

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Mineralogic Mining combines a scanning electron microscope with one or more EDS detectors, a mineral analysis engine and the Mining software plug-in – all controlled and operated from a single user interface. You can use all standard sample types, including stubs, geological slides and core cuttings. Choose the ZEISS SEM platform which best suits your applications: conventional or field emission systems.

ZEISS EVO for 24/7 Ore Process Control

EVO is the industry standard platform for automated mineralogy and is in operation worldwide in mineral processing laboratories. EVO's column isolation valve allows fast sample transfer and chamber pump down, making it the ideal SEM for 24/7 ore processing. Choose between three chamber sizes – 10, 15 or 25 – to get the right system for your application. Use EVO in variable pressure mode for easy analysis of uncoated samples, shortening your time to result.



ZEISS SIGMA for Research into Ore Processing

SIGMA is a Schottky thermal emitter which combines a high brightness source with high stability improving your time to result. By exploiting SIGMA's exceptional imaging capabilities, you can distinguish minerals of similar average atomic weight by grayscale alone (0.07 atomic mass unit resolution). The multi-purpose nature of SIGMA allows it to perform a range of complementary analytical techniques for maximum flexibility.



ZEISS SIGMA HD for High Resolution Mineral Mapping

SIGMA HD is equipped with two dedicated diametrically opposite EDS ports for high speed mineral mapping. An optional third port provides you the highest detector solid angle on the market. Combined with the high definition BSD, you achieve both unrivalled materials contrast and high count rate X-ray detection for ultimate productivity during mapping. SIGMA HD is available in both high vacuum and variable pressure configurations.

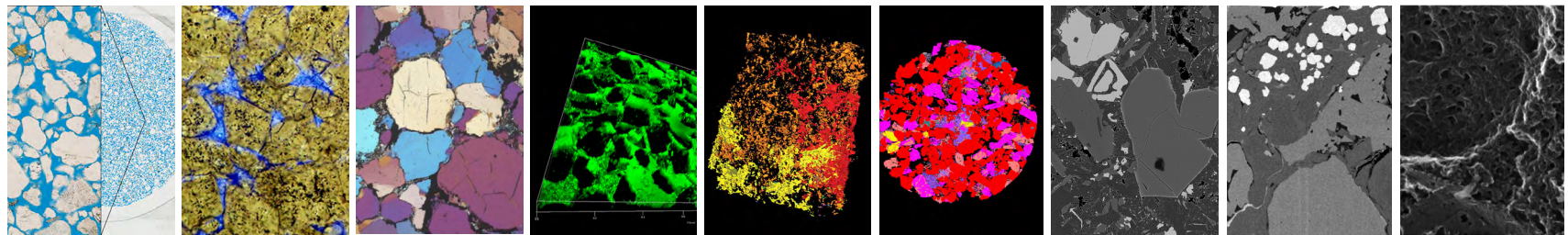


Expand Your Possibilities

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Microscopy Solutions for Natural Resources

ZEISS offers you the industry's widest range of imaging solutions for natural resources. Choose from light, electron and ion microscopes with an imaging range from 1 μm to 0.5 nm resolution. Use multiple technologies for imaging and correlate your data to gain a deeper understanding of your samples. Choose between focused ion beam and X-ray microscopy for imaging of volumes with voxel resolution as small as 5 nm.



**Stereo
Microscopes**

**Light
Microscopes**

**Polarized Light
Microscopes**

**Confocal
Microscopes**

**X-ray
Microscopes**

**Scanning
Electron
Microscopes**

**Field Emission
Scanning
Electron
Microscopes**

**Focused Ion
Beam Scanning
Electron
Microscopes**

**Helium
Ion Beam
Microscopes**

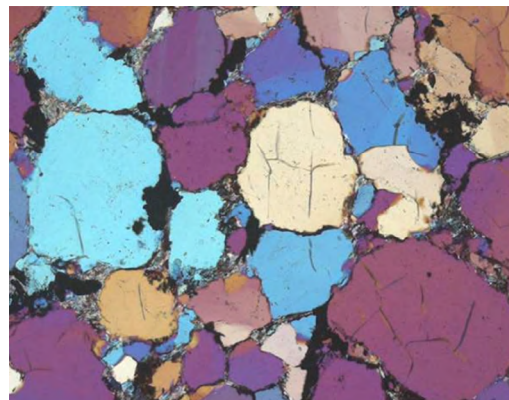
Expand Your Possibilities

Correlative Image Viewing with ZEISS SmartBrowse

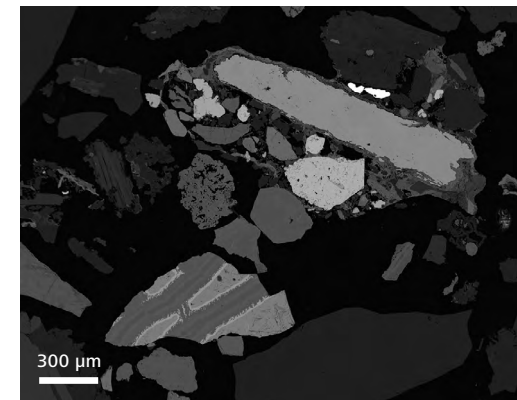
With SmartBrowse you can compare and correlate data from multiple ZEISS instruments. Combine images from the same region of interest, acquired with optical, electron, ion and X-ray microscopes. SmartBrowse is available on all SEMs to set images in context to one another, at the correct magnification.

Correlate the Following Image Types:

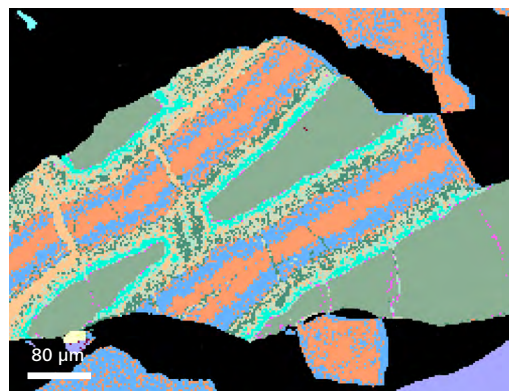
- Polarized images from a light microscope such as Axio Imager 2
- Secondary electron, backscatter and cathodoluminescence images from a scanning electron microscope such as EVO, SIGMA and MERLIN
- Mineral maps from a petrological analyzer such as Mineralogic
- Virtual 2D data slices from an X-ray microscope such as Xradia Versa and Xradia Ultra



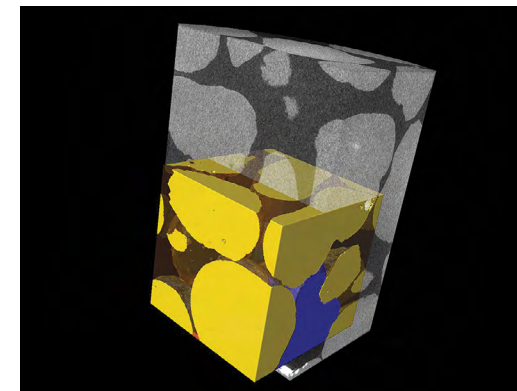
Sandstone, transmitted light, polarization contrast with λ -plate



Copper-gold ore, BSD image; monazite, electrum and native copper



Mineral map of copper-gold ore; BSD image; mineral classification showing each mineral type by color: hematite (orange) and magnetite (blue)



Contrast for in-situ fluid imaging; sand (yellow), brine (blue), and air (clear, brown) imaged in a 12.5 mm diameter aluminum tube with Xradia Versa

Count on Service in the True Sense of the Word

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Because the ZEISS microscope system is one of your most important tools, we make sure it is always ready to perform. What's more, we'll see to it that you are employing all the options that get the best from your microscope. You can choose from a range of service products, each delivered by highly qualified ZEISS specialists who will support you long beyond the purchase of your system. Our aim is to enable you to experience those special moments that inspire your work.

Repair. Maintain. Optimize.

Attain maximum uptime with your microscope. A ZEISS Protect Service Agreement lets you budget for operating costs, all the while reducing costly downtime and achieving the best results through the improved performance of your system. Choose from service agreements designed to give you a range of options and control levels. We'll work with you to select the service program that addresses your system needs and usage requirements, in line with your organization's standard practices.

Our service on-demand also brings you distinct advantages. ZEISS service staff will analyze issues at hand and resolve them – whether using remote maintenance software or working on site.

Enhance Your Microscope System.

Your ZEISS microscope system is designed for a variety of updates: open interfaces allow you to maintain a high technological level at all times. As a result you'll work more efficiently now, while extending the productive lifetime of your microscope as new update possibilities come on stream.

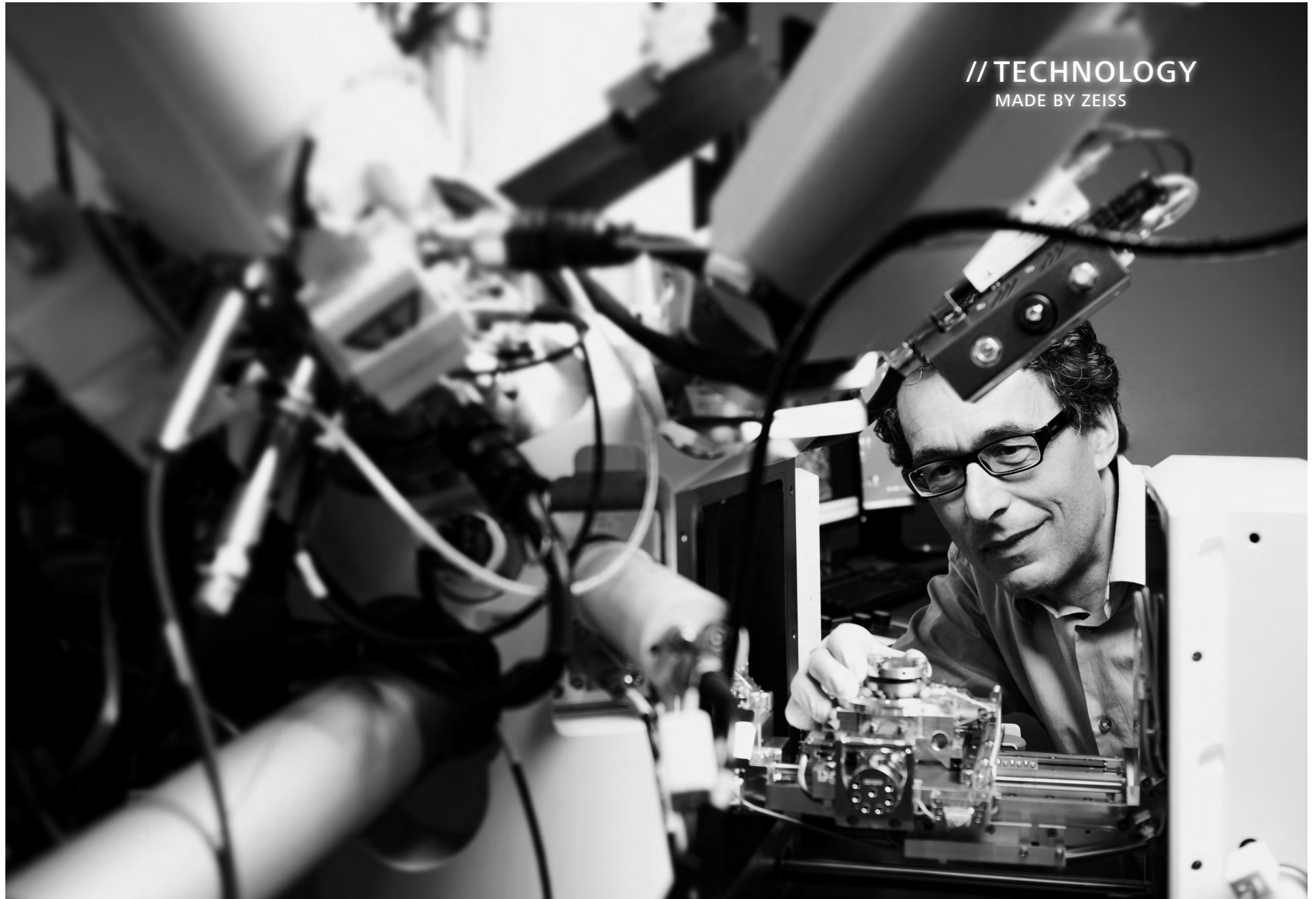


Profit from the optimized performance of your microscope system with services from ZEISS – now and for years to come.

>> www.zeiss.com/microservice

The moment "I think" becomes "I know".
This is the moment we work for.

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