



A single vision for SEM imaging and EDS analysis

ChemiSEM Technology

PUTTING YOUR CHALLENGES INTO FOCUS

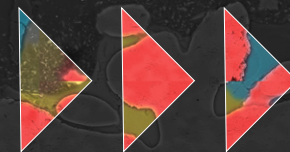
Today's industrial laboratories face increasing pressure to achieve accurate, reliable, and consistently high-quality material compositional analysis at speed and on budget.

For laboratory and quality assurance managers, results often need to be delivered with fewer skilled staff and limited budget and equipment. Until very recently, the standard industry response to this challenge was to combine the scanning electron microscopes (SEM) used to acquire structural information with energy dispersive X-ray spectroscopy (EDS) detectors and software that are capable of providing elemental analysis and chemical characterization of a sample at scales ranging from tens of centimeters to less than a micrometer.

EDS adds critical information that can guide analysis in directions that would not be possible using SEM images alone. However, when manually bridging SEM and EDS technologies, interpreting data can be difficult and take a long time, often due to difficulty in finding the correct area to analyze based on limited information in backscattered electron images.

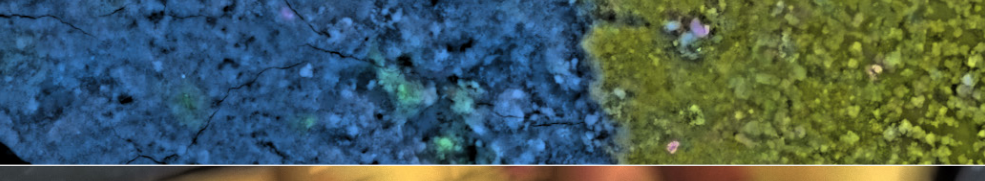
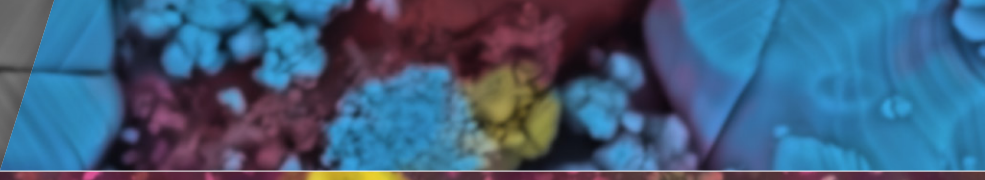
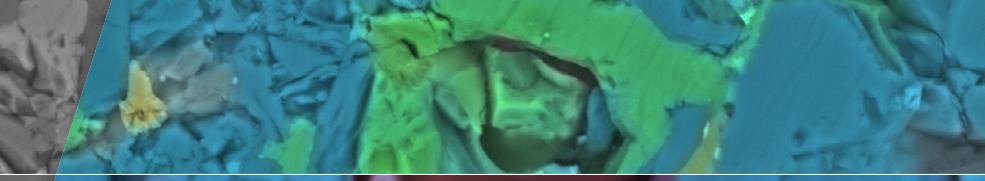
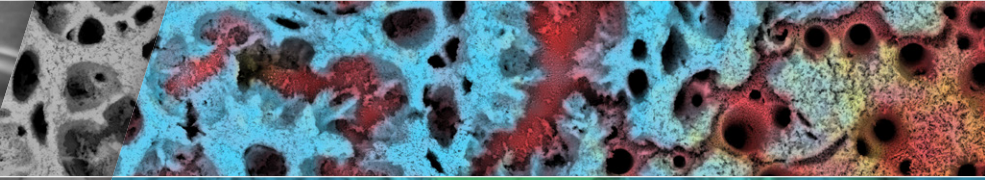
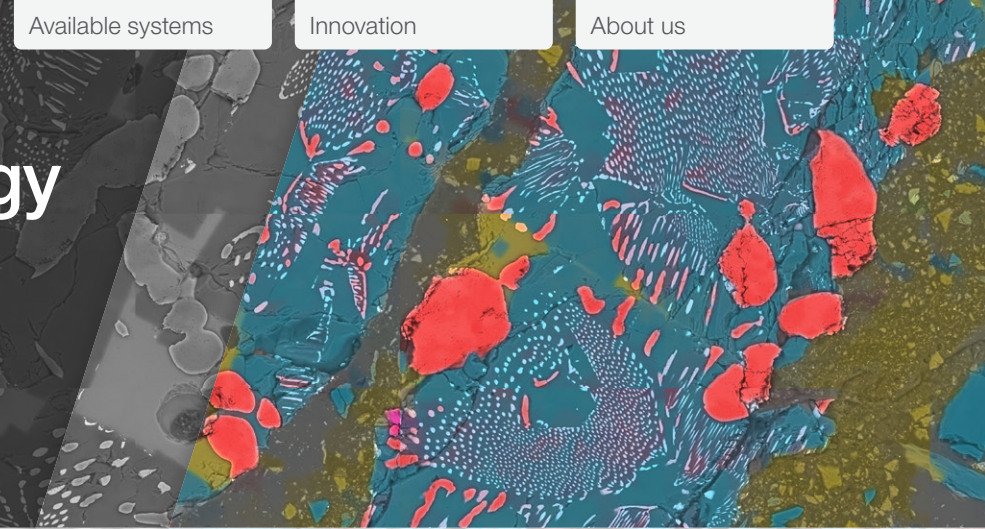
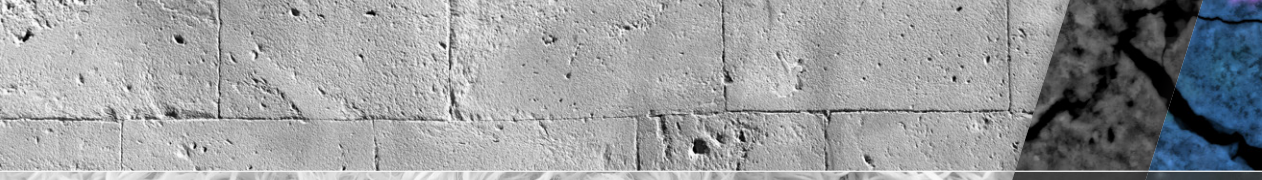
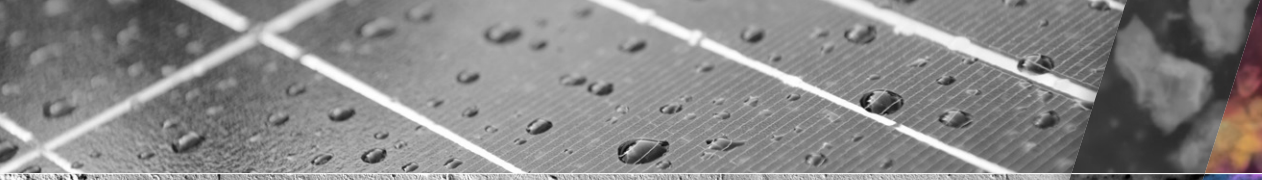
But now there's a better way:

Thermo Scientific™ ChemiSEM™ Technology.



Introducing ChemiSEM Technology

ChemiSEM Technology combines SEM and EDS to streamline complex analysis of many materials, including metals, ceramics, batteries, coatings, cements, and soft materials.



For your lab team,

it provides a single, foolproof solution that is easy to install and use, always live, and able to deliver reliable results with minimal preparation and training.

For your organization,

it reduces downtime and increases throughput to enhance both the quality and quantity of material analysis you can perform.

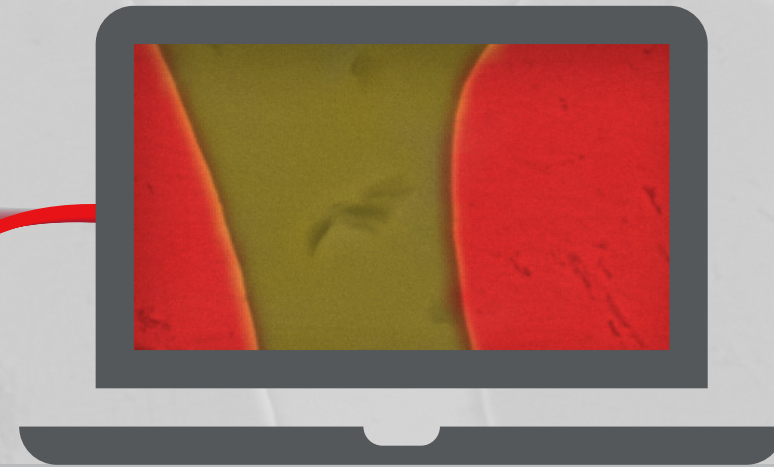
While **conventional wisdom** states that boosting **efficiency** can often lead to compromises on **quality**, this is not true with ChemiSEM Technology. It's unique in its ability to **achieve both objectives** while also lowering the **cost per sample** and providing an **early warning system** for quality control issues.

One user, one sample, one system

One of the greatest challenges facing industrial R&D operations is the practical need to test a greater number of samples each day without compromising analytical quality.

To address this challenge, ChemiSEM Technology fully integrates the EDS software needed to provide elemental analysis into the SEM microscope itself. The result is a single, seamless experience based on a simple and intuitive user interface that puts you in the best possible position to succeed.

You no longer need to learn and manage two separate software systems when conducting material analysis. ChemiSEM Technology is always on, quietly collecting chemical information in the background before you even need it to provide live data that can help your laboratory process larger data volumes and create experimental datasets with higher statistical precision.



It's time for increased uptime

With ChemiSEM Technology, lab managers no longer need to spend valuable time and resources training staff on specialized EDS systems. The versatile solution delivers higher-throughput analyses and provides the best of both worlds: a wide range of features that appeal to experienced users and simpler configurations for those newer to the technique.

ChemiSEM Technology offers a variety of features to help you make the most of your time, including:

- ⌚ Built-in reporting capabilities allow you to save and export each session for offline post processing from anywhere
- ⌚ After importing each data cube, a wide range of options and features help reanalyze data, adjust colors, extract spectra from smaller areas, or cross-check analyses with previously acquired data
- ⌚ Experiment setup, image processing, and spectral analysis functions are intuitively grouped, making data management straightforward
- ⌚ The quadrant format and project tree highlight the most important data
- ⌚ A reporting function enables selected data to be easily saved and presented in a customized report

Live analysis for deeper insights

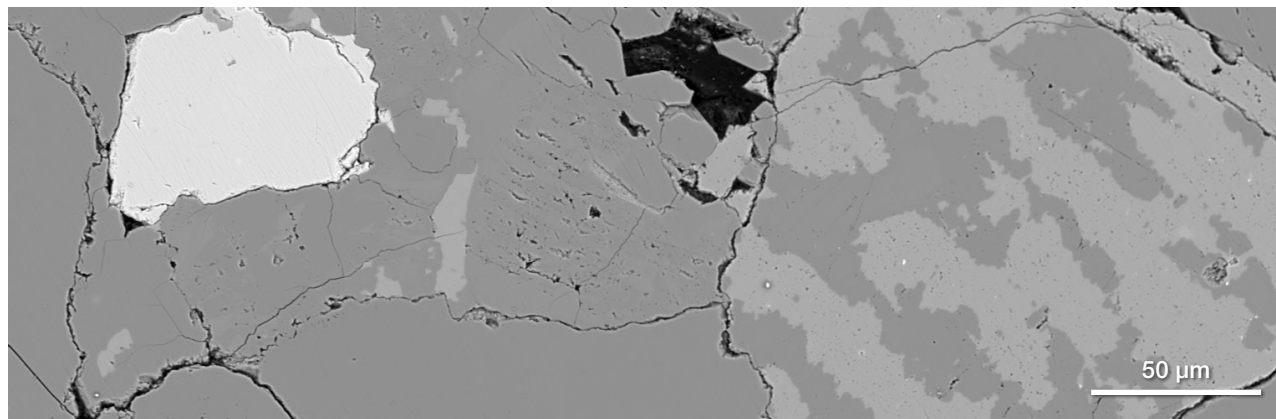
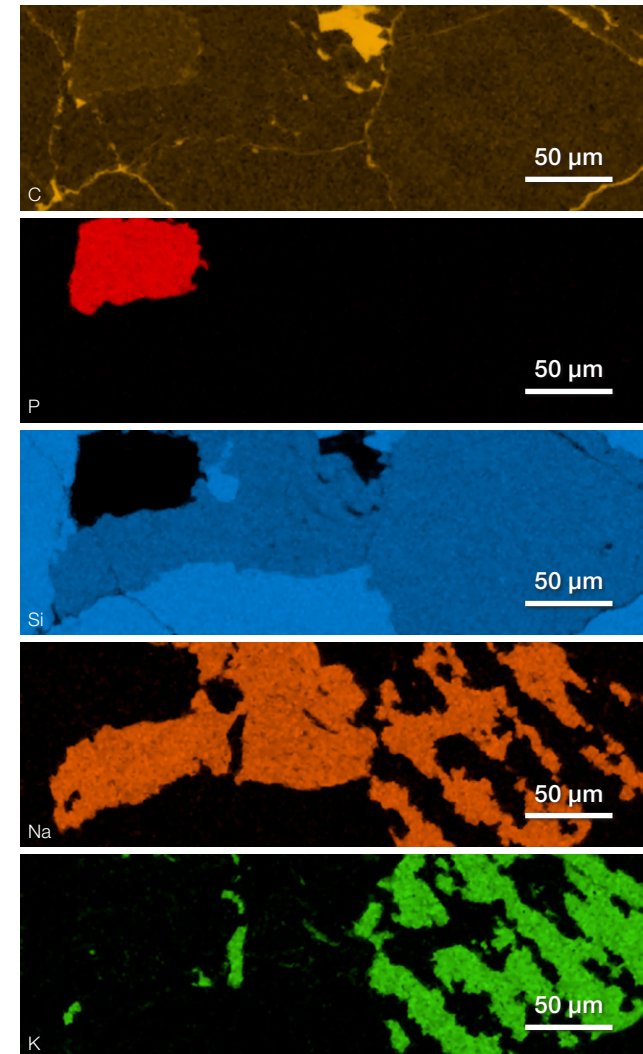
All SEM-EDS analysis is, by definition, complex. This is especially true for applications like product failure investigation and contaminant identification, in which the R&D function needs to continually improve the QC and FA process to gain a better understanding of the issues that emerge.

This is where ChemiSEM Technology's live analysis provides unique benefits in both quality and productivity. By automatically delivering instant and constant access to quantitative elemental information, it gradually builds a deeper and more detailed analysis of the sample in the background, helping you identify key quality issues faster than ever before.

Live quantitative mapping: no more mixed signals

Unfortunately, conventional mapping of elements and phases in complex samples is not an exact science. For example, the signal from one peak can sometimes be assigned to two elements, generating an error that slows identification of QC issues in the sample.

ChemiSEM Technology, on the other hand, automatically deconvolves these peak overlaps and correctly assigns them to the correct elements. This is achieved with quantitative X-ray mapping that can be accessed both live during the acquisition and offline after the acquisition. ChemiSEM Technology stores a spectrum at every pixel, yielding data that can be analyzed repeatedly without the need to reacquire it or recreate acquisition parameters.



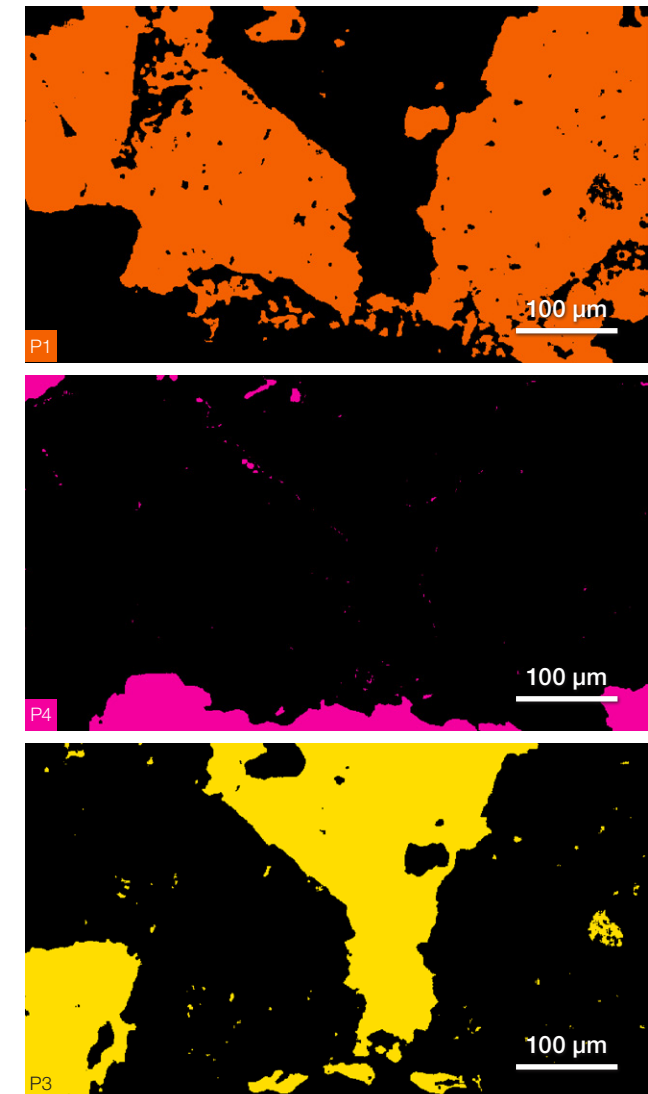
Example of quantitative mapping. ChemiSEM Technology automatically processes the raw signal, generating quantitative maps. The data is deconvolved, avoiding the presence of summed and overlapping peaks, and the background is subtracted.

Unbiased phase analysis

Traditional phase analysis is highly dependent on assumptions made about the sample, which can be a problem if unexpected elements are missed, for example, due to overlapping peaks or insufficient intensities.

With ChemiPhase—a new feature within ChemiSEM Technology—this cannot happen. Interpretation of complex samples is completely unbiased and based on the systematic identification of every unique phase using all statistically significant spectra within the data cube.

Subsequently, your lab team can run the fully automated process with no prior identification of elements, locate minor and trace elements without extensive experience, definitively identify major and minor components down to a single pixel, and ultimately complete a deeper, more comprehensive analysis.



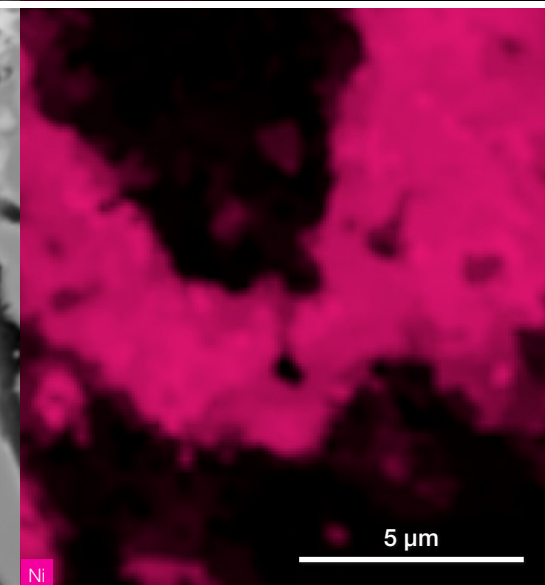
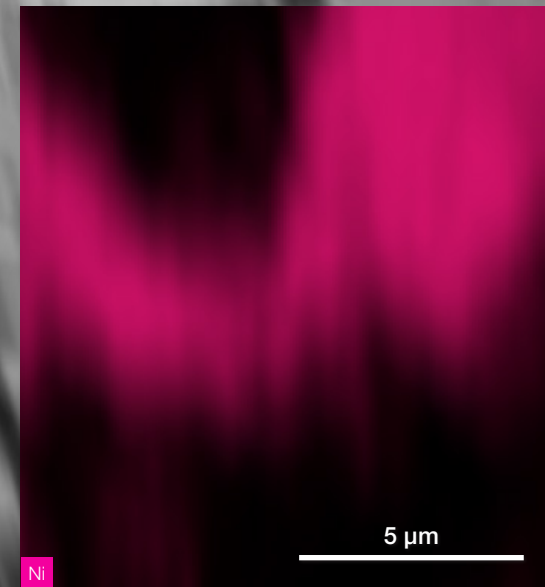
ChemiPhase analysis of a geological section, with different minerals assigned to the different phases. Spectra and composition are automatically calculated and extracted for each phase.

An automatic choice for drift correction

Above all, accurate and efficient quantification requires a sample that is—and remains—correctly positioned.

Often, in the case of image drift, you would either have to re-acquire the analysis multiple times or wait for the sample to stop drifting and then reacquire the analysis. Both cases reduce productivity.

By constantly monitoring the sample position, ChemiSEM Software provides automatic sample drift correction, enabling higher magnification operation and longer acquisition times. It's yet another feature of this integrated SEM-EDS solution that helps you save valuable time and effort by focusing on what's important: acquiring the highest-quality data as quickly as possible.



Comparison of uncorrected (top) and drift-corrected (bottom) SEM/ChemiSEM images of oxides and nitrides in a Ni-based superalloy. Thanks to drift correction, high quality images and EDS data can be easily acquired, even when the samples are not stable.

Reliable data for consistent analysis

Consistent, high-quality quantitative analysis cannot be achieved without reliable data. That is why ChemiSEM Technology has a range of built-in tools that accelerate data acquisition and increase production quality.

Hitting your peak in quantitative analysis

With innovative algorithmic approaches and smart spectral fitting, ChemiSEM Technology can help your lab team achieve accurate and precise elemental identification and quantification—even when dealing with multiple overlapping elements.

For example, in other systems, it can be challenging to achieve good peak identification and elemental identification because the operator must correctly navigate through a large parameter space. ChemiSEM Technology, on the other hand, offers smart, automated optimization of auto ID, digital peak fitting, and matrix correction routines that make it possible for all users to achieve reliable results. As more data arrives, results are continually and automatically modelled and refined using a range of statistical validation routines, providing complete peace of mind.

Ensuring the quality of quantitative information

Quite simply, ChemiSEM Technology delivers high-quality analytical results.

It is optimized over a wide range of operating parameters, providing reliable results even in the presence of multiple overlapping peaks. Spectrum simulation automatically validates elemental identification and quantification based on the exact microscope settings, providing assurance in the results obtained.

Get more from your microscope

ChemiSEM Technology already integrates with the Thermo Scientific™ Phenom™, Axia™, Apreo™ 2, and Quattro™ Scanning Electron Microscopes



The **Phenom Desktop SEM** line redefines speed, ease of use, and performance thanks to its innovative, user-friendly design and software, which allow even novice users to obtain an SEM image in minutes.

- Easy-to-use desktop SEMs
- Automated quality control
- Minimal training required

[Learn more](#)

The **Axia ChemiSEM System** can provide actionable data up to twice as fast as conventional SEM-EDS. Alignment and other functions are automated, which simplifies the workflow and reduces the amount of training needed to conduct analyses.

- Includes a large, flexible chamber that can easily accommodate large samples like tubular heating elements
- Requires minimal sample prep
- Non-destructive

[Learn more](#)

The **Apreo™ 2 ChemiSEM System** acquires EDS data at higher resolution and precision with a wide range of detectors available.

- Delivers high image quality and performance
- Offers outstanding versatility for a wide range of samples

[Learn more](#)

The **Quattro ESEM™ System** combines all-around performance in imaging and analytics with a unique environmental mode that allows samples to be studied in their natural state.

- Performs analysis at temperatures ranging from -165°C to $+1,400^{\circ}\text{C}$ with a range of cryo, Peltier, and heating stages
- Offers high- and low-vacuum modes in addition to ESEM

[Learn more](#)

An invitation for innovation

Choosing a single, integrated SEM-EDS solution simplifies training, increases efficiency, and reduces costs.

ChemiSEM Technology was specifically designed to be a light-touch technology that delivers fast, accurate, and high-quality analysis of complex samples with minimal intervention, maintenance, and staff training.

Ultimately, we want your lab team to spend their time on what really counts for your organization. That means supporting you at every stage with advice and demonstrations—both on site and remote—that are tailored to your unique needs. This also includes instrument maintenance and technical support services as well as training to help maximize the value of your investment.

At Thermo Fisher Scientific, we understand the complex business challenges you face when investing in mission-critical equipment and technology. That's why we've spent decades working closely with a wide range of industrial and academic customers to provide flexible financing options that support their success.

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Silver nitrate analyzed with ChemiSEM Technology.

About Thermo Fisher Scientific

We are the world leader in serving science. Our Mission is to enable our customers to make the world healthier, cleaner and safer.



Step ahead. Step beyond. Duration 1.33

Our innovative solutions for electron microscopy, surface analysis, and microanalysis help materials science researchers advance their sample characterization to gain deeper insight into the physical and chemical properties of materials from the macroscale to the nanoscale. Our multiscale, multimodal solutions cover a broad range of applications across dozens of industries and research fields, serving customers in academia, government, and industry. Our TEMs, DualBeam™ FIB-SEMs, comprehensive portfolio of SEMs, XPS, and microanalysis solutions, combined with software suites, take customers from questions to usable data by combining high-resolution imaging with physical, chemical, elemental, mechanical, and electrical analysis across scales and modes.

Financial and Leasing Services

At Thermo Fisher Scientific, we will not let budgetary constraints stand between you and your next great discovery.

We are your one-stop partner for the best laboratory products and analytical technologies available, plus the unique financing options you need to accelerate success in science or industry.

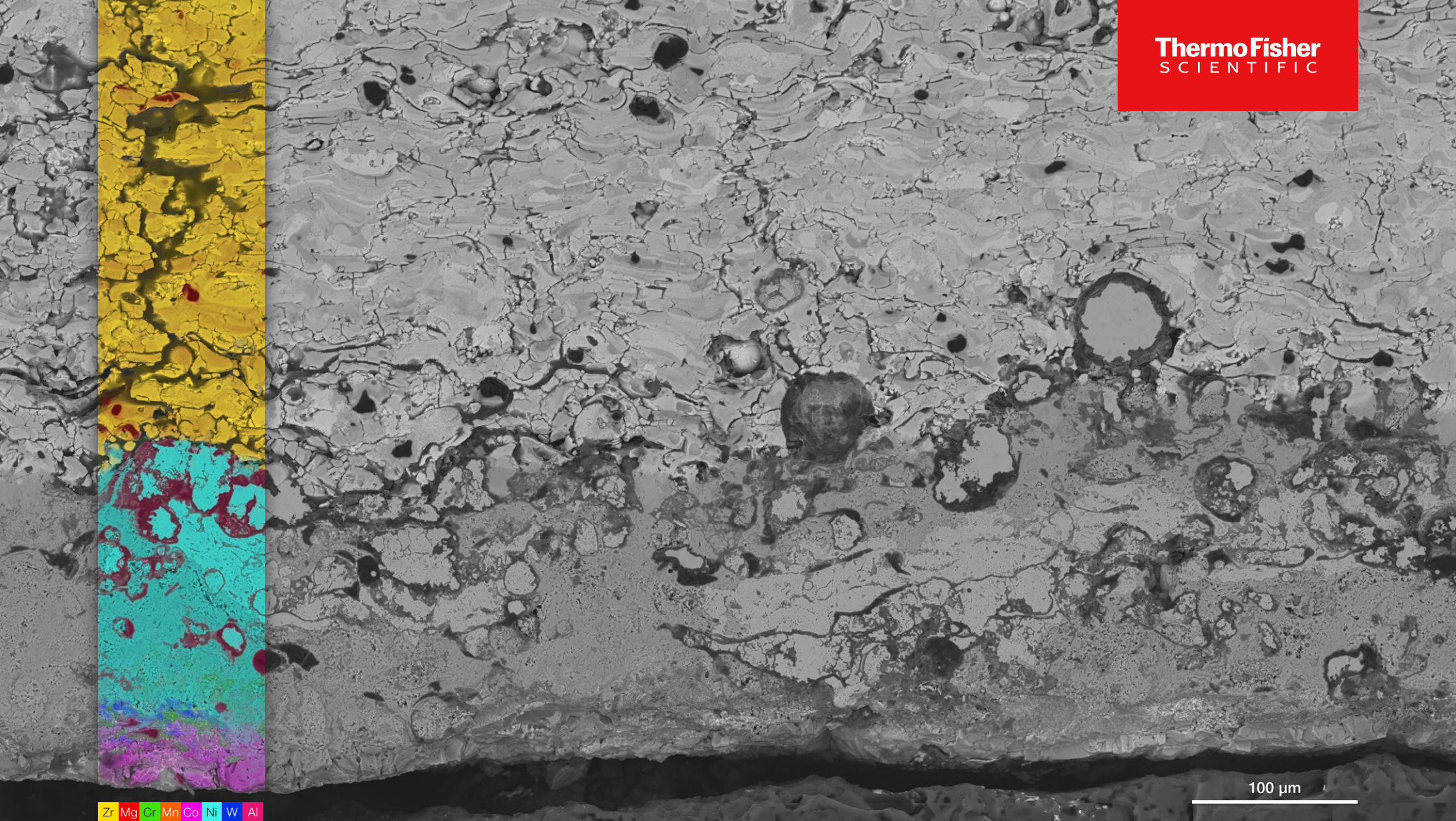
Cost-effective financing designed for each individual customer is key to any successful capital equipment solution.

We understand not just your advanced technology and application requirements, but the business challenges you face when financing your critical equipment assets. For decades, we have worked closely with businesses, hospitals, universities, and municipalities to provide flexible financing terms to support their successful operations.

If you are looking for off-balance sheet financing, accelerated ROI, technology protection, or cash flow management, our innovative financing options can help meet your company's budgetary needs and bottom-line goals.

We also offer instrument maintenance and training services.

**Explore equipment
leasing and
financing options**



Cross section of a thermal barrier coating. ChemiSEM Technology provides clear compositional information that is otherwise absent from the SEM image.

Learn more at thermofisher.com/chemisem

thermo scientific

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