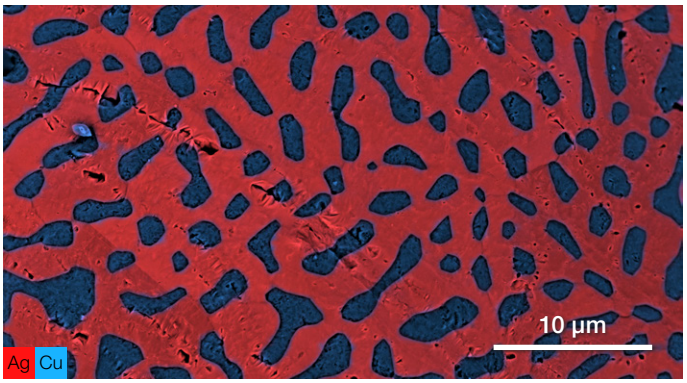
# ChemiSEM Technology

## SEM and EDS for materials characterization

Thermo Scientific™ ChemiSEM™ Technology revolutionizes EDS analysis, providing elemental information quickly and easily.

Built on live chemical imaging and decades of expertise in EDS analysis, it features a single user interface with integrated SEM-EDS functions and delivers live quantification. ChemiSEM Technology is always on, which dramatically shortens time to results and shows features that would have previously gone unnoticed, providing more complete information and more reliable results.

Choose between ChemiSEM and ChemiSEM Advanced packages to get the flexibility you need. And add complete offline analytical processing with ChemiView Technology to free up your electron microscope and increase productivity.




**ChemiSEM image of an electroplated bimetallic metal foam used as catalysts for the electrochemical reduction of $CO_2$ into carbon monoxide and alcohols.**

### Get high analytical confidence

ChemiSEM Technology incorporates innovative algorithmic approaches, smart spectral fitting, and optimized matrix correction routines to facilitate accurate and precise quantification, even in the presence of multiple overlapping elements.

Proprietary electron and X-ray data processing algorithms make ChemiSEM Technology incredibly fast, allowing you to view live compositional information during routine SEM navigation and imaging.

### Key benefits

**Always on**—Eliminate the need to move from SEM imaging to EDS analysis for each sample. ChemiSEM Technology is always on and continuously collects the EDS signal during SEM imaging to generate a so-called datacube, collecting a full EDS spectrum at every point in the image.

**Faster data acquisition**—Access elemental information much faster than conventional techniques with novel data segmentation approaches based on machine learning, ultrafast signal processing, and the tightest possible SEM EDS integration.

**Reliable results**—Get accurate qualification and quantification over the widest range of operating conditions, including beam energy, sample size, and working distance.

**Complete information**—See the big picture with comprehensive micro-scale elemental composition. Immediate color results reveal defects or imperfections you might have otherwise missed.

**Multi-spectral viewing**—See SED and elemental information in a single frame for complete characterization of your sample at a glance.

**Simplified operation**—Immediately view compositional results that make elemental information accessible to everyone and easily increase the number of scientists or engineers who can use your facilities.

It works on a statistical basis, assigning segments to the image that progressively shrink as data continues to arrive. This process ultimately converges on a pixel-precise EDS map, allowing you to perform both rapid sample navigation and detailed quantitative analysis without switching setup parameters.

To further support your quantitative analysis, ChemiSEM Technology can also:

- Remove sum and escape peak artifacts
- Remove background and resolve overlapping peaks
- Analyze compounds using stoichiometry

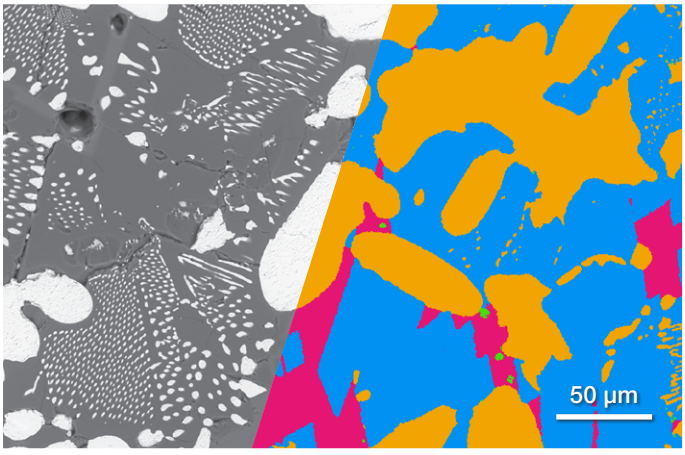
## Identify unique phases using advanced statistical analysis

ChemiSEM phase analysis uses a big data approach to detect all statistically significant spectra within the datacube. It provides a simple probability that each pixel belongs to each detected significant spectra. This makes interpretation of complex samples much more straightforward and intuitive because each pixel can only belong to a single phase.

This comprehensive, unbiased statistical engine avoids problems with traditional methods, which often yield erroneous results if unexpected elements are missed due to overlapping peaks or insufficient intensities.

ChemiSEM phase analysis delivers quick, easy, and comprehensive phase analysis:

- The fully automated process runs with no prior identification of elements
- Major and minor components are unambiguously identified down to a single pixel
- Most acquisitions are complete in less than a minute, even for complex phase maps
- All spectra are automatically optimized for a more confident analysis



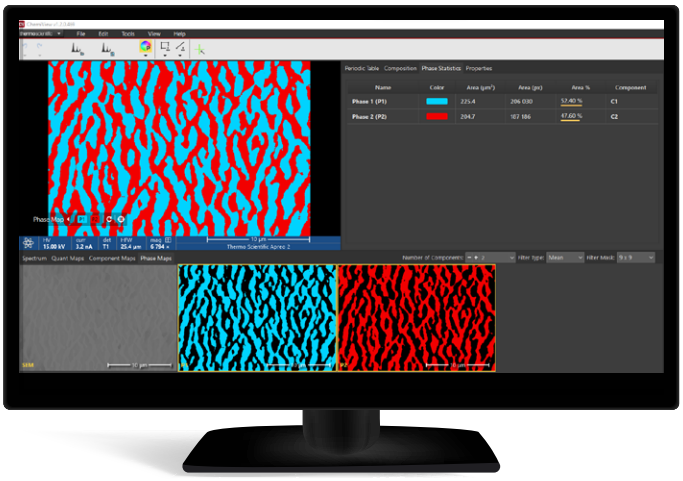

**Phase analysis on a zirconia mullite polished section showing the presence of the zirconia (light orange), of the mullite phase (blue) and highlighting the presence of a third unexpected silicate phase.**

## Boost productivity with complete and comprehensive offline analysis

ChemiView Software offers full offline data processing and reporting functionality to help you take—and analyze—your data anywhere.

Each session can be saved and exported for post processing on any device. After importing each datacube, a wide range of options and features help you re-elaborate data, adjust colors, extract spectra from smaller areas, or simply cross-check analyses with previously acquired data. The reporting function allows you to easily save selected data in a Microsoft Word file.

ChemiSEM, ChemiSEM Advanced, and ChemiView on Thermo Scientific™ Axia™ ChemiSEM and Apreo™ 2 SEMs are commercially available as a one-time purchase or may be included in your value-added service contract.



**View of the ChemiView user interface showing the phase analysis of the gamma and gamma prime phases in a Rene n5 polished cross section.**

## ChemiSEM features and packages

| Feature | ChemiSEM | ChemiSEM Advanced | ChemiView |
|---|---|---|---|
| Full integration of all SEM EDS functions in a single user interface | ● | ● | n.a. |
| Project-based data storage | ● | ● | ● |
| Project data tree for easy data management | ● | ● | ● |
| Industry-standard data formats | ● | ● | ● |
| Dedicated analytical mode with seamless data blending between point, line, and mapping modes | ● | ● | ● |
| Choice of any electron image type available in the xT SEM user interface | ● | ● | ● |
| Single-click reporting | ● | ● | ● |
| Sum peak removal | ● | ● | ● |
| Escape peak removal | ● | ● | ● |
| Spectral terminations based on time or statistics | ● | ● | ● |
| Automatic peak identification | ● | ● | ● |
| Synthetic and background spectral overlays | ● | ● | ● |
| Accurate quantification over a wide range of working distances, beam currents, and beam energies | ● | ● | ● |
| User-definable selections for included, excluded, or absent elements | ● | ● | ● |
| Automatic or user-defined KLM line selection for quantitative analysis | ● | ● | ● |
| Background removal by digital filtering | ● | ● | ● |
| Standardless quantitative analysis using filtered least squared fitting | ● | ● | ● |
| Quantification using PROZA matrix correction for superior light element performance | ● | ● | ● |
| Qualitative and quantitative linescans with termination by time or statistics | ● | ● | ● |
| ChemiSEM Technology using electron image processing for accelerated quant mapping* | ● | ● | ● |
| Always-on live quantitative mapping with fully deconvolved X-ray maps | ● | ● | ● |
| Gross count mapping with per-element line selection | ● | ● | ● |
| Optional quantitative mapping using square kernelization | ● | ● | ● |
| Overlay of all map types onto the electron image | ● | ● | ● |
| Map termination based on time or statistics | ● | ● | ● |
| User-definable or auto-generated elemental color selection | ● | ● | ● |
| Navigation montage to acquire and stitch multiple frames | ● | ● | ● |
| Spectral extractions using point and rectangle | ● | ● | ● |
| Linescan extract from X-ray maps with flexible line direction, width, and point selection | ● | ● | ● |
| Normalization for comparison of multiple spectra | | ● | ● |
| Display of individual quant maps | | ● | ● |
| Drift compensation mapping based on DCFI | | ● | n.a |
| Compound analysis of borides, carbides, oxides, and nitrides by stoichiometry | | | ● |
| ChemiSEM phase analysis | | | ● |

Patents pending (US 16/941,253; US 16/867,770; US 16/867,972; US 16/886,716); Patents granted (US 11,002,692 B1; US 8,748,816 B1; EP 2546638 B1 ; US 11,327,032 B1)

Learn more at **thermofisher.com/chemisem**