

# AZtecEnergy

## EDS Acquisition and Analysis

...the ultimate EDS System



**OXFORD  
INSTRUMENTS**

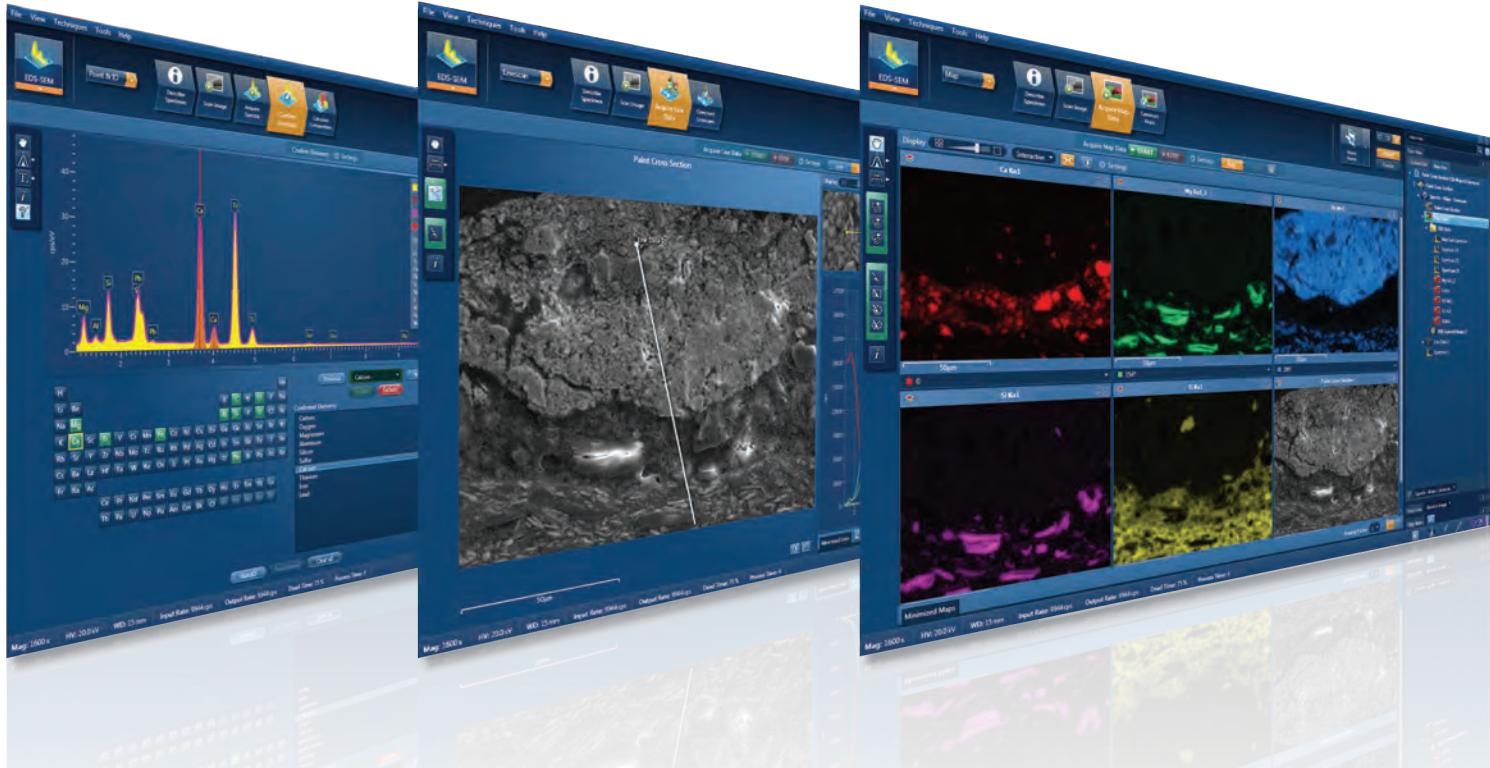
*The Business of Science®*



# AZtecEnergy

The most powerful, the most flexible EDS system you'll ever see

# EDS



**AZtec** integrates **AZtecEnergy** acquisition and analysis software with Oxford Instruments' **X-Max<sup>N</sup>** and **x-act** ranges of SDD detectors to create the ultimate materials characterisation system.

**AZtec** combines unrivalled speed and accuracy of results for routine analysis, with the flexibility and power required for applications that push the frontiers of the EDS technique.

Developed by the market leader with global customer support and over 40 years experience in nanoanalysis, **AZtec** meets the ever more challenging requirements of analysis at the nanoscale.

Acquire data and report results in seconds using  
**AZtec** and **X-Max<sup>N</sup>**

**A-Z technology for nanoanalysis**

# AZtecEnergy

## At a glance...



### Powerful

- **AZtec** has a host of new tools and technologies that will transform the way you get results and enable everyone to see 'The Real Picture'

### Flexible

- Whatever your level of expertise, **AZtec** will be there to guide you from start to finish or give you the tools to explore in your own way

### Fast

- Every feature of **AZtec** has been optimised with speed and productivity in mind, for consistently accurate real-time results

### Accurate

- New Tru-Q technology takes standardless analysis to the next level and ensures that **AZtec** gives you the best 'out of the box' results

### Innovative

- A host of brand new features and novel visualisations deliver useful information to help you make decisions

### Structured

- Whatever your level of expertise, **AZtec** will assist you from start to finish with Step Notes and editable Standard Operating Procedures (SOP)

# Point&ID

## Real-time analysis for high count rate (SDD) detectors

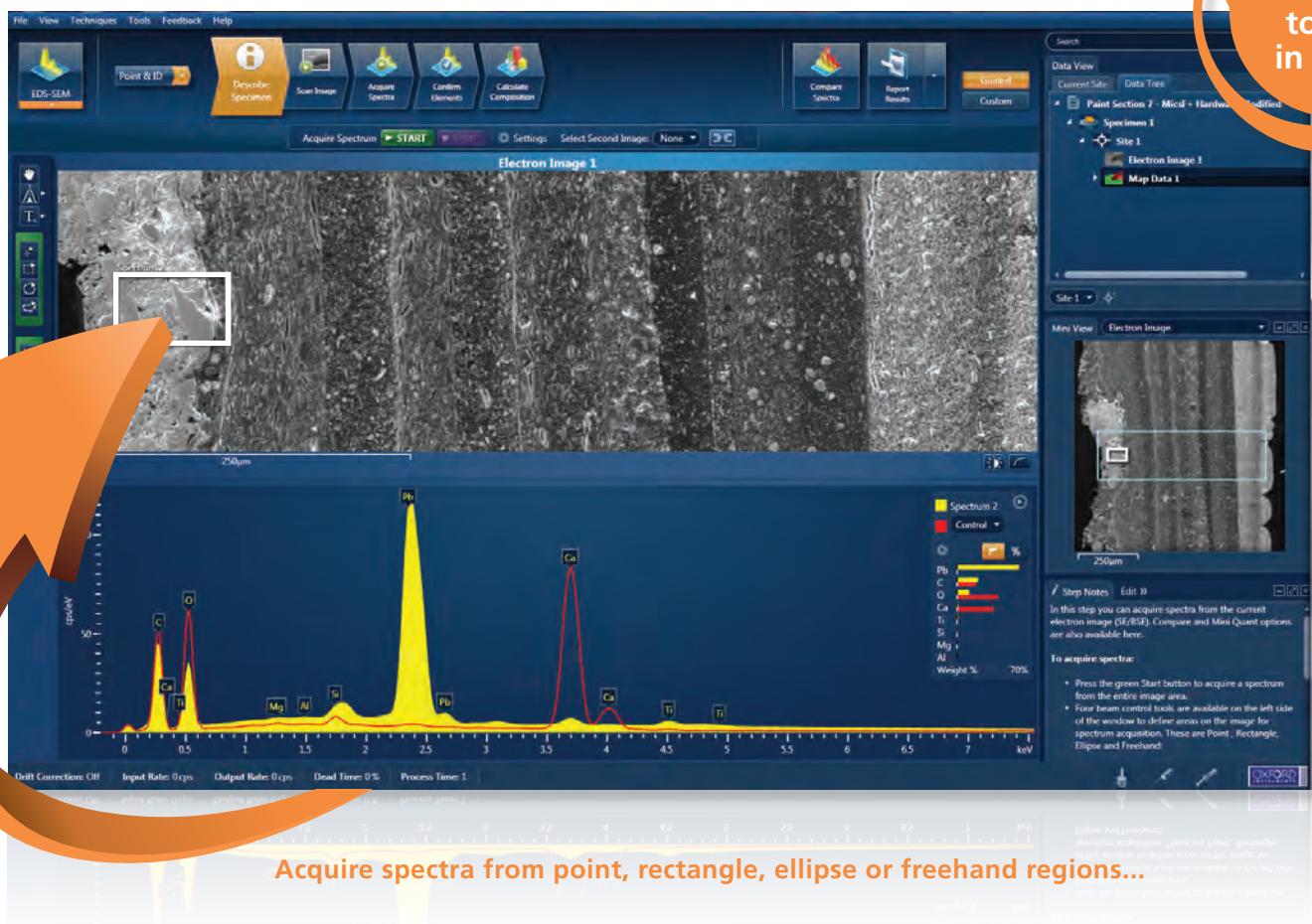
Point&ID has been designed to take advantage of the high count rates generated by the latest SDD detectors to deliver accurate specimen information in real-time.

### See the elements in a specimen and its composition instantly

- Simply select the area to analyse, then, in the few seconds required to acquire a spectrum:
  - Elements are identified using an improved version of our field-proven automatic PeakID routine
  - Composition is displayed in the unique MiniQuant using the accuracy of new Tru-Q technology
  - Annotate and e-mail results directly from the software

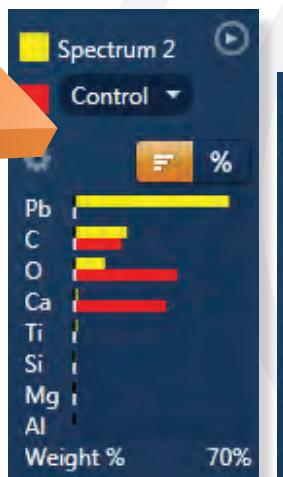
Acquisition starts, elements are automatically identified in real-time...

From 'Beam on' to report in seconds



# ACCURATE

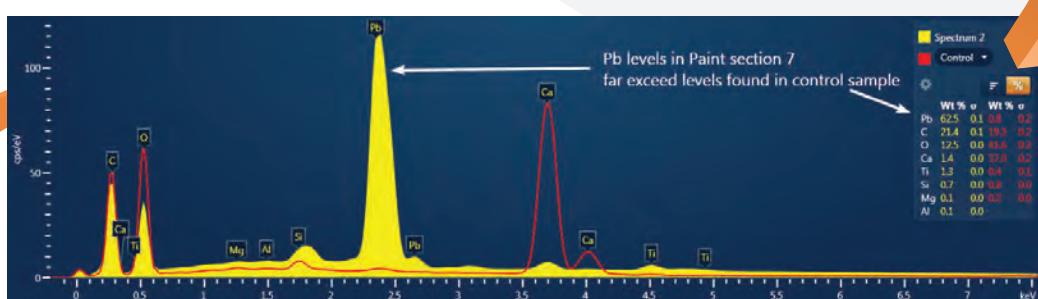
Review with  
MiniQuant...



MiniQuant shows comparison data in  
numerical and pictoral formats.

Everything  
in real-time

Annotate  
on screen...



...one click reporting  
to print or email direct  
from the interface.



# Tru-Q

## Providing the accuracy required for automatic real-time ElementID and Concentration Measurement

Tru-Q provides high accuracy AutoID and quantitative analysis using a unique combination of technologies.

**Only AZtec offers high quality results without the need to standardise using:**

### QCAL

- Complete detector and hardware characterisation for true standardless analysis

### FLS

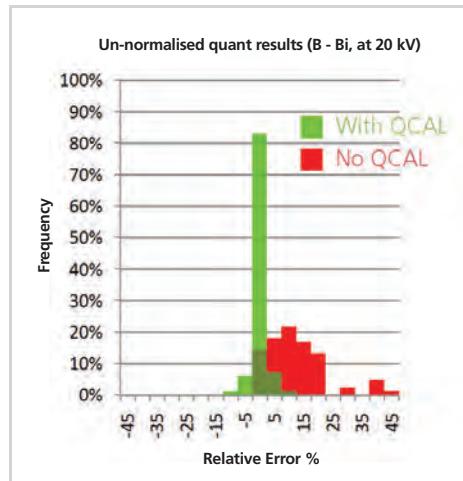
- Robust spectrum processing that works in all situations with no need for any background fitting adjustment

### XPP

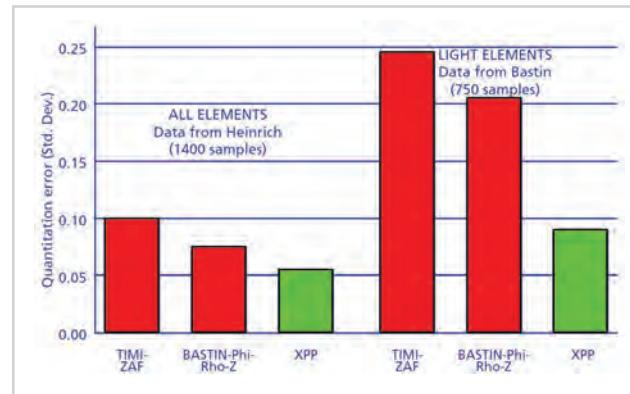
- Matrix correction with proven accuracy beyond that possible with ZAF or Phi-Rho-Z

### Pulse Pile-up Correction (PPC)

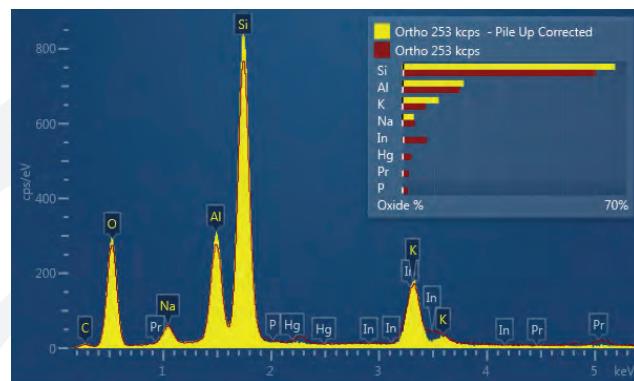
- Automatic correction for pulse pile-up at high count making accurate quant at 200,000 cps a reality



Tests of un-normalised quant shows that, with QCAL, errors are reduced to less than 5% relative...a level of accuracy only previously possible using standards-based analysis.



Tests on published data show that XPP results are more accurate than older methods, particularly for light elements.



Pulse pile-up corrected spectrum collected at 250,000 cps (in yellow) gives correct AutoID and composition. In comparison, the uncorrected spectrum (in red) shows misidentified peaks and quant errors.

# ElementID and Quantitative Analysis

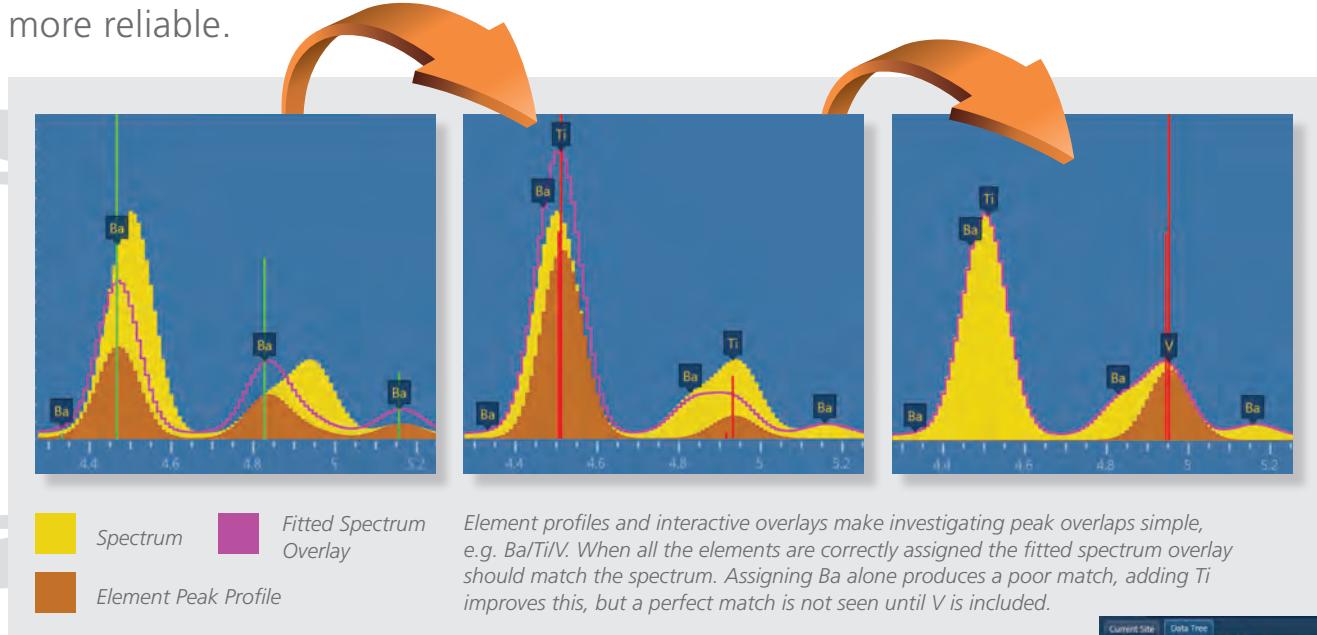
Providing clarity and flexibility for more detailed analysis

Now everyone can achieve reliable results

**AZtec** provides new tools to make the task of checking PeakID faster and more reliable.

Be confident, even where peaks overlap

- Element profiles give a much clearer picture than traditional markers
- Interactive overlays show when the element list is correct



Calculate quantitative results the way you want to

- Flexible processing options
- Batch output from multiple specimens
- Standardisation manager for easy optimisation for special samples or conditions

The best results... guaranteed.

Spectrum Label	Mg	Al	Si	Ti	Cr	Mn	Fe	Total	Project Path
Spectrum 19	24.72	47.33	0.36	0.29	25.93	0.00	1.37	100.00	Hi-Res Slag 20 kV/Specimen 1/Site 2/Map Data 1/EDS Data
Spectrum 6	26.00	52.90	0.67	0.21	18.50	0.27	1.45	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data
Spectrum 7	25.25	51.59	0.48	0.17	20.85	0.18	1.46	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data
Spectrum 8	25.28	51.13	0.98	0.19	20.63	0.17	1.60	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data
Spectrum 9	25.38	51.66	0.47	0.15	20.61	0.06	1.67	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data
Spectrum 18	20.88	22.60	0.37	0.35	52.73	0.54	2.54	100.00	Hi-Res Slag 20 kV/Specimen 1/Site 2/Map Data 1/EDS Data
Spectrum 10	19.90	19.43	0.38	0.59	51.48	0.56	7.67	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data
Spectrum 11	18.27	16.35	0.28	0.57	52.62	0.30	11.44	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data
Spectrum 14	18.01	14.54	0.20	0.55	49.04	0.54	17.12	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data
Spectrum 13	17.14	14.63	0.07	0.59	49.11	0.82	17.64	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data
Spectrum 12	17.90	14.58	0.21	0.56	48.05	0.53	18.18	100.00	Slag FLS 3/Specimen 1/Site 1/Map 1/EDS Data

Statistics

Statistic	Mg	Al	Si	Ti	Cr	Mn	Fe
Max	26.00	52.90	0.98	0.59	52.73	0.82	18.18
Min	17.14	14.54	0.07	0.15	18.50	0.00	1.37
Average	21.70	32.43	0.41	0.38	37.23	0.38	7.47
Standard Deviation	3.62	17.91	0.23	0.19	15.42	0.26	7.27

Clear All Spectra Remove Selected Spectra

Add Selected Spectra Site 1

Powerful visualisation specimens includes combining results from different samples and projects.

# FLEXIBLE SmartMap and AutoLayer

Brings new levels of certainty and detail to specimen investigation

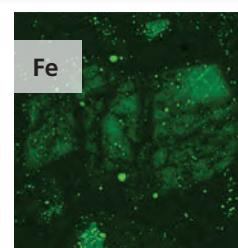
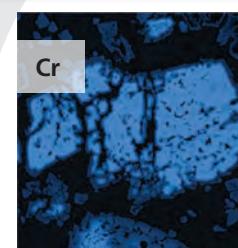
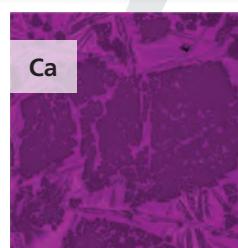
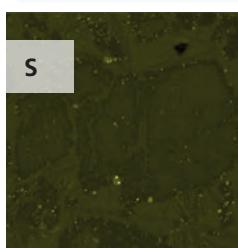
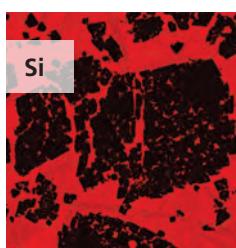
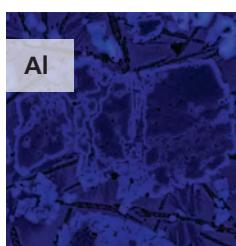
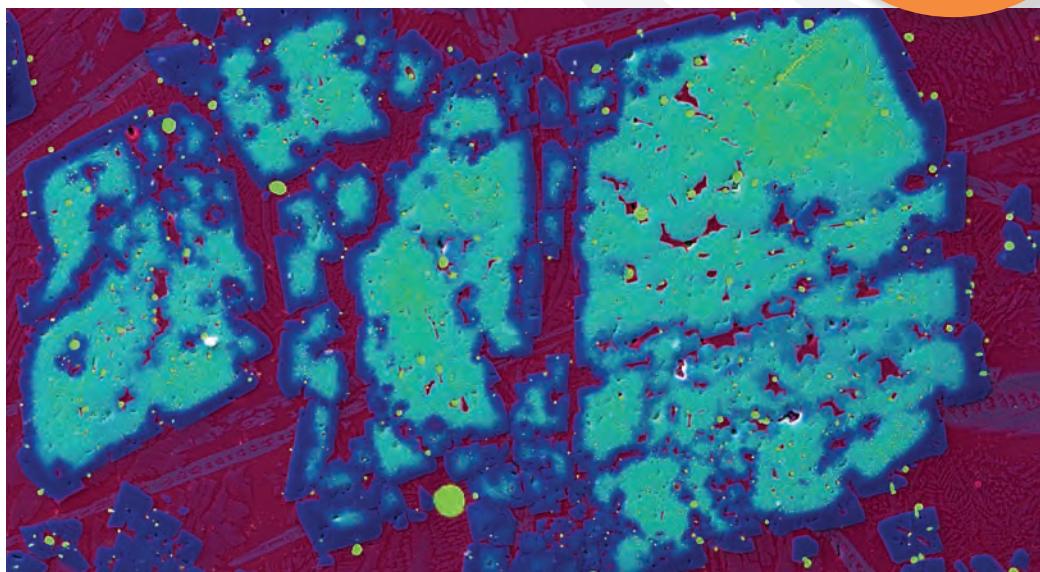
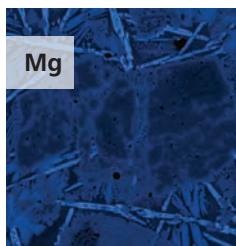
SmartMap spectral mapping brings the benefits of automatic qualitative analysis into two dimensions to identify elements and show their distributions.

## Now see how all elements are distributed in a specimen

- No specimen pre-knowledge required
- Maps for all elements identified and generated automatically
- Single Layered Image highlights chemistry and phase distribution in seconds
- Up to 4K SmartMap resolution to combine wide area and high resolution studies

Spectral Mapping should be a central tool of every EDS system, it is with AZtec

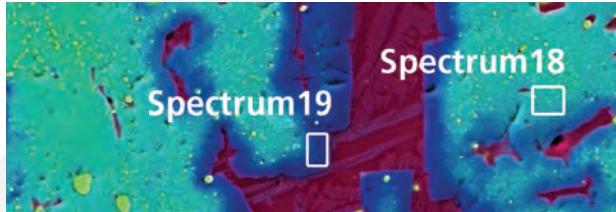
Layered Image of a slag sample, a 4K electron image is overlaid by 4K X-ray maps



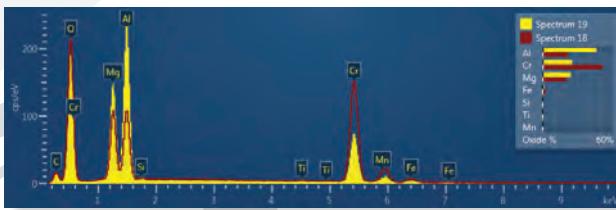
Layered Image gives complete picture of composition and phase distribution. Or view individual X-ray maps for more detailed information.

## Analyse the information in greater depth at any time

- Reconstruct any data from the SmartMap to the same accuracy provided by live spectrum acquisition



Reconstruct spectra from any area during or after acquisition.



Accurate ElementID and MiniQuant give instant result.

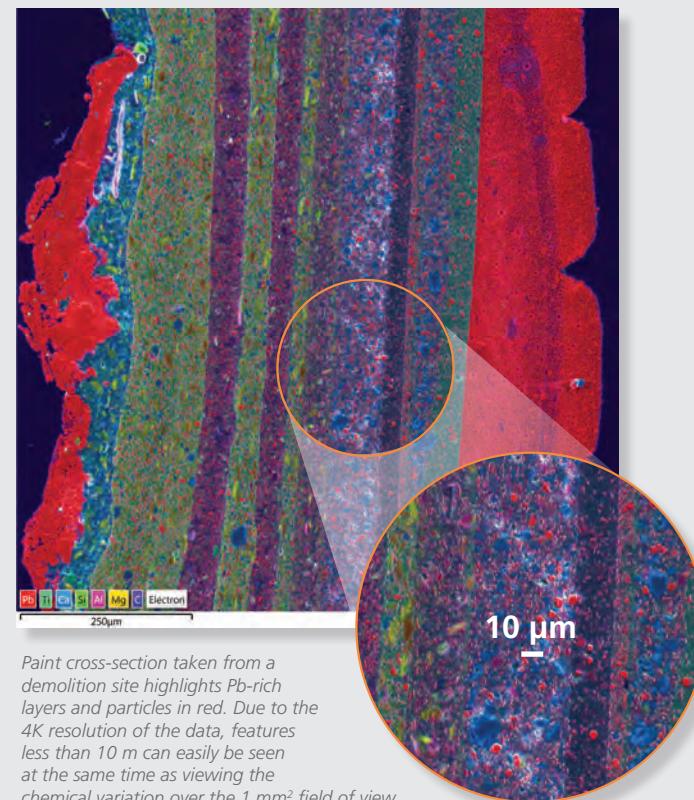


Data is of same high quality as live spectra acquisition for accurate quant analysis.

## AutoLayer: a complex story made simple.

At the click of a button, AutoLayer takes the often complex information contained in a set of X-ray maps, and turns it into a single image that helps you visualise both phase and element distribution in your specimen.

- Instantly and automatically interprets your specimen
- Highlights what's important in a single image
- Unravels the complexity of real specimens
- Colours on the Layered Image correlate to the X-ray map colours



# INNOVAT

## TruMap™

Makes a complex story... Accurate

TruMap: Unique Real-time Mapping solution takes advantage of the increased counts acquired by the latest SDD detectors.

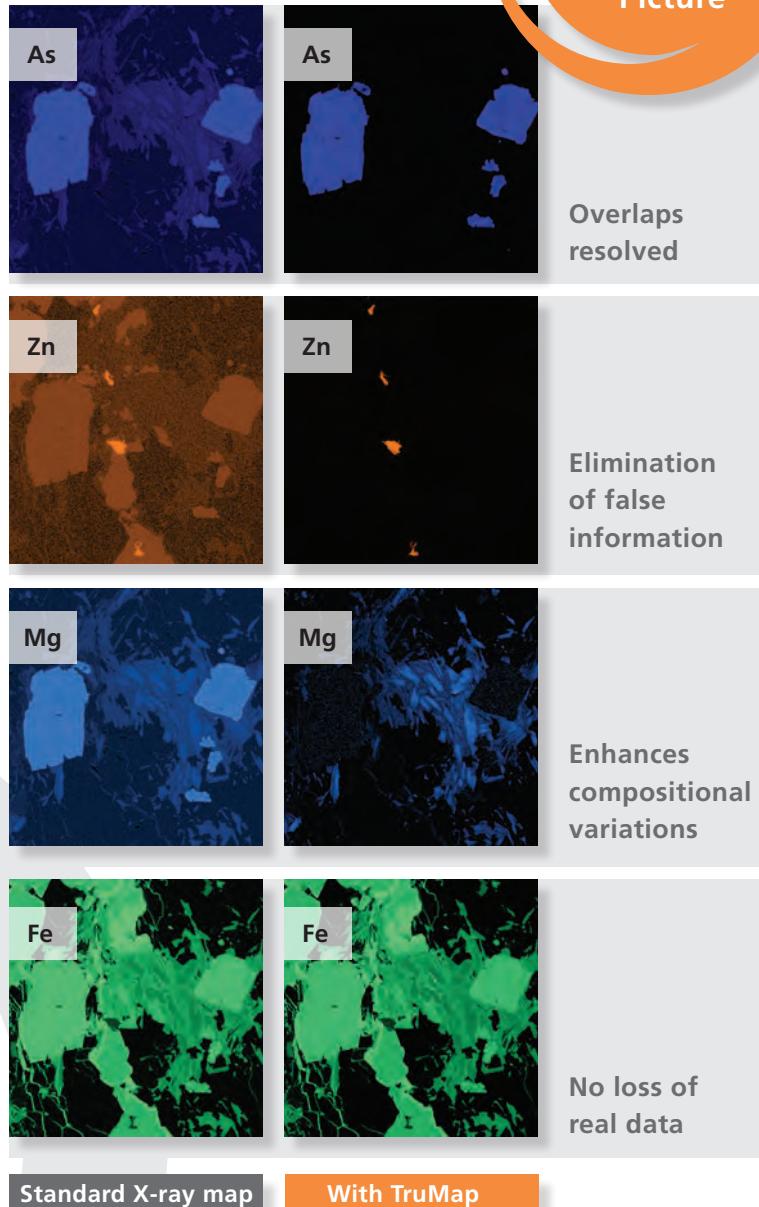
TruMap has been designed to really take advantage of high counts generated by latest SDD detectors offering a new level of data integrity

Now see the real element variation

- Eliminates artifacts
- Corrects element overlaps
- Removes false variations due to X-ray background
- Everything is in real-time

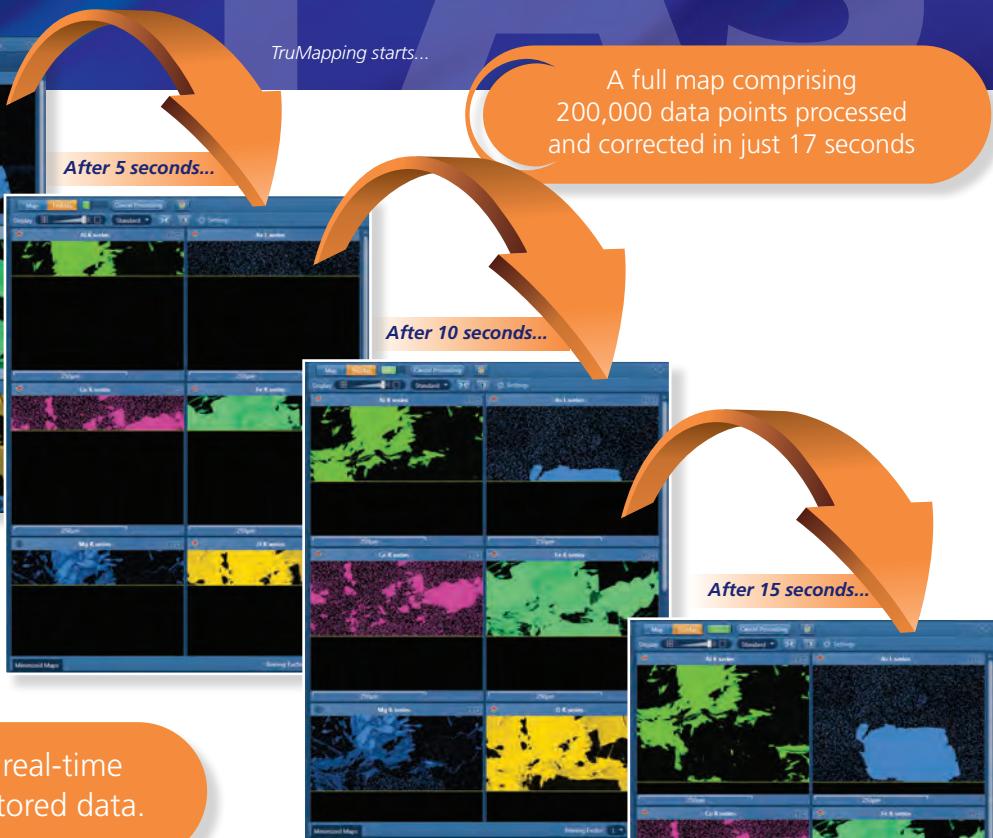
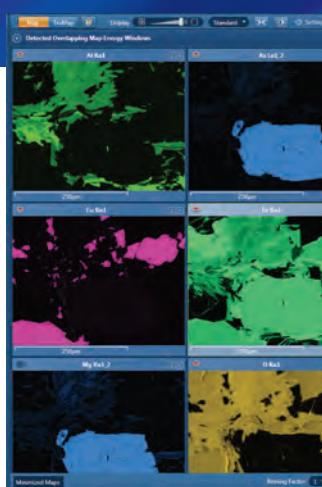
Why map any other way?

Choose the Right Picture  
NOT the Bright Picture



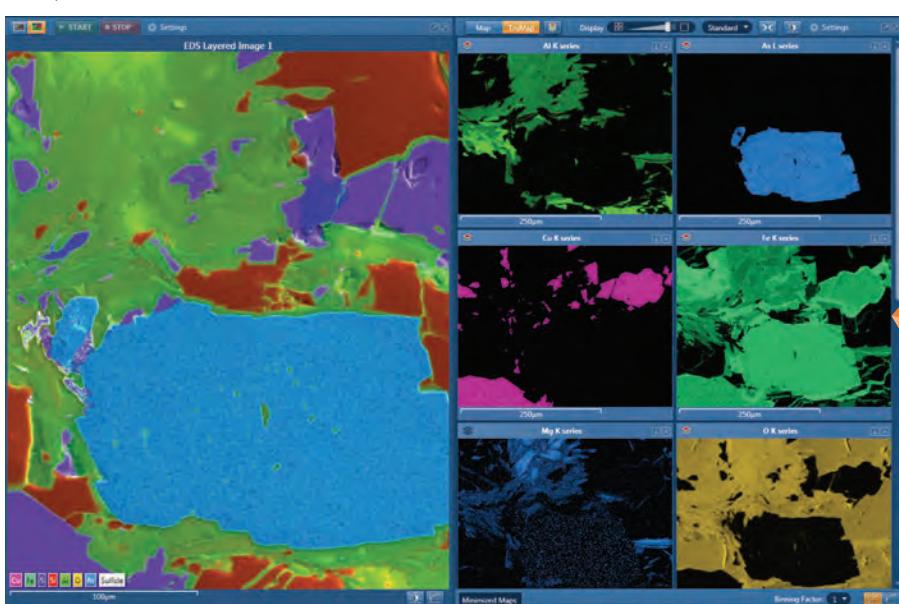
TruMap reveals real element variations in this ore specimen. Overlaps such as As/L/Mg/K are resolved, and variations in X-ray background seen in the Zn map are removed.

## Resolves a Complex Story... Quickly



TruMap works in real-time or can re-process stored data.

TruMap now shows the correct distribution.



Finished after 17 seconds, overlaps resolved

# POWERFUL

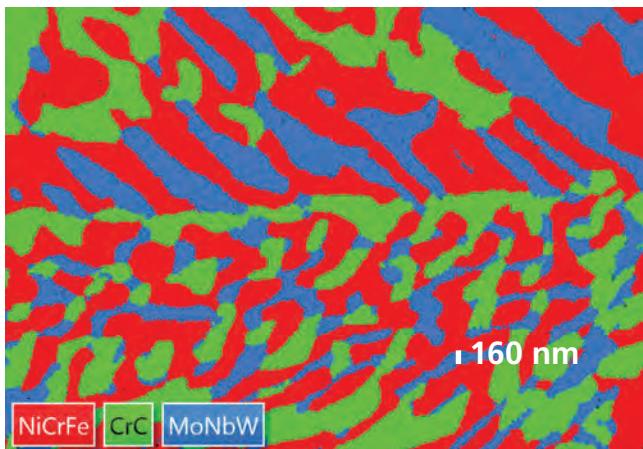
## AutoPhaseMap

### Makes a Complex Story... Complete

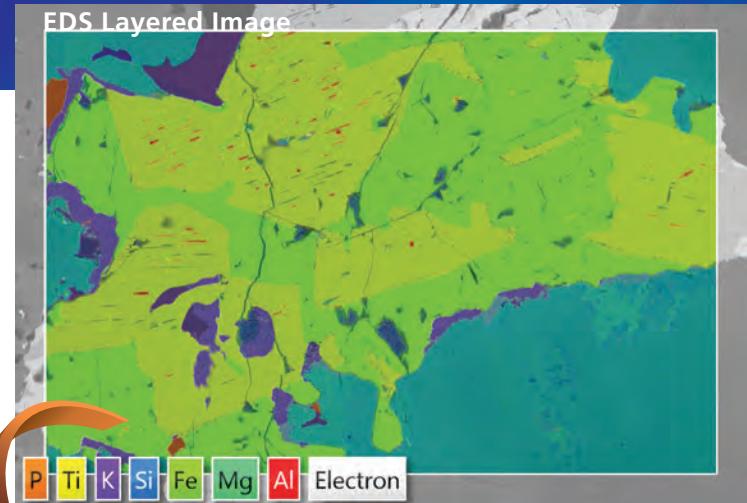
AutoPhaseMap is a new way to automatically create a phase distribution map of a specimen.

During or after acquisition, AutoPhaseMap automatically:

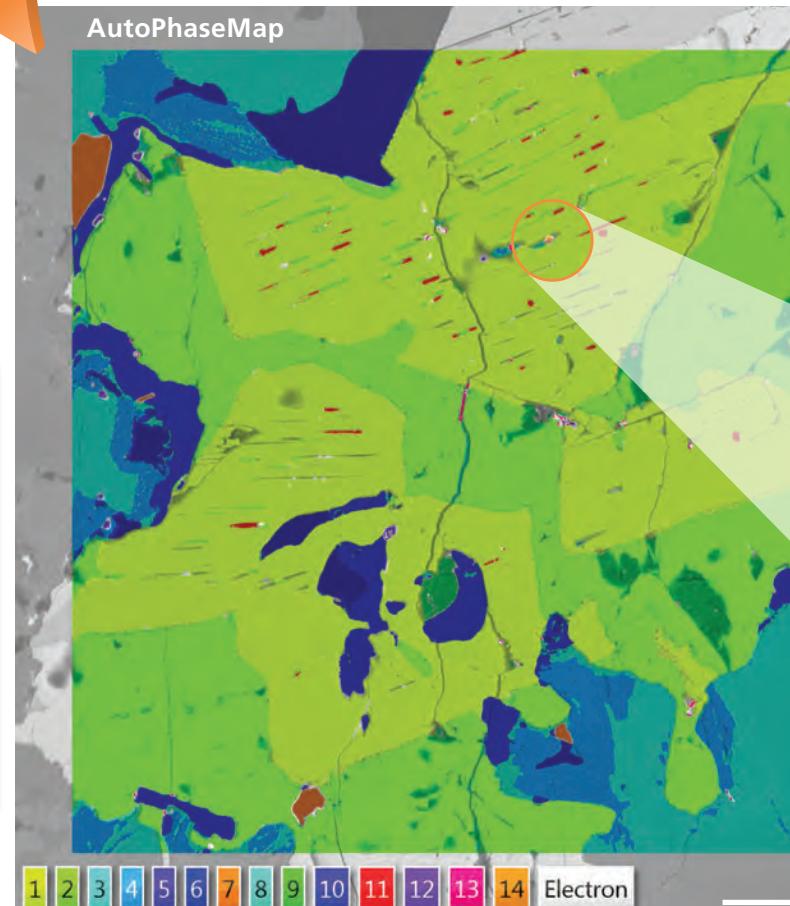
- Turns X-ray map data into Phase Map data in seconds
- Calculates and displays:
  - distribution of each phase
  - spectrum and composition for each phase
  - area fraction for each phase
- Finds phases for all size ranges, including nanomaterials
- Finds hidden phases, highlighting missing elements which are present in trace amounts

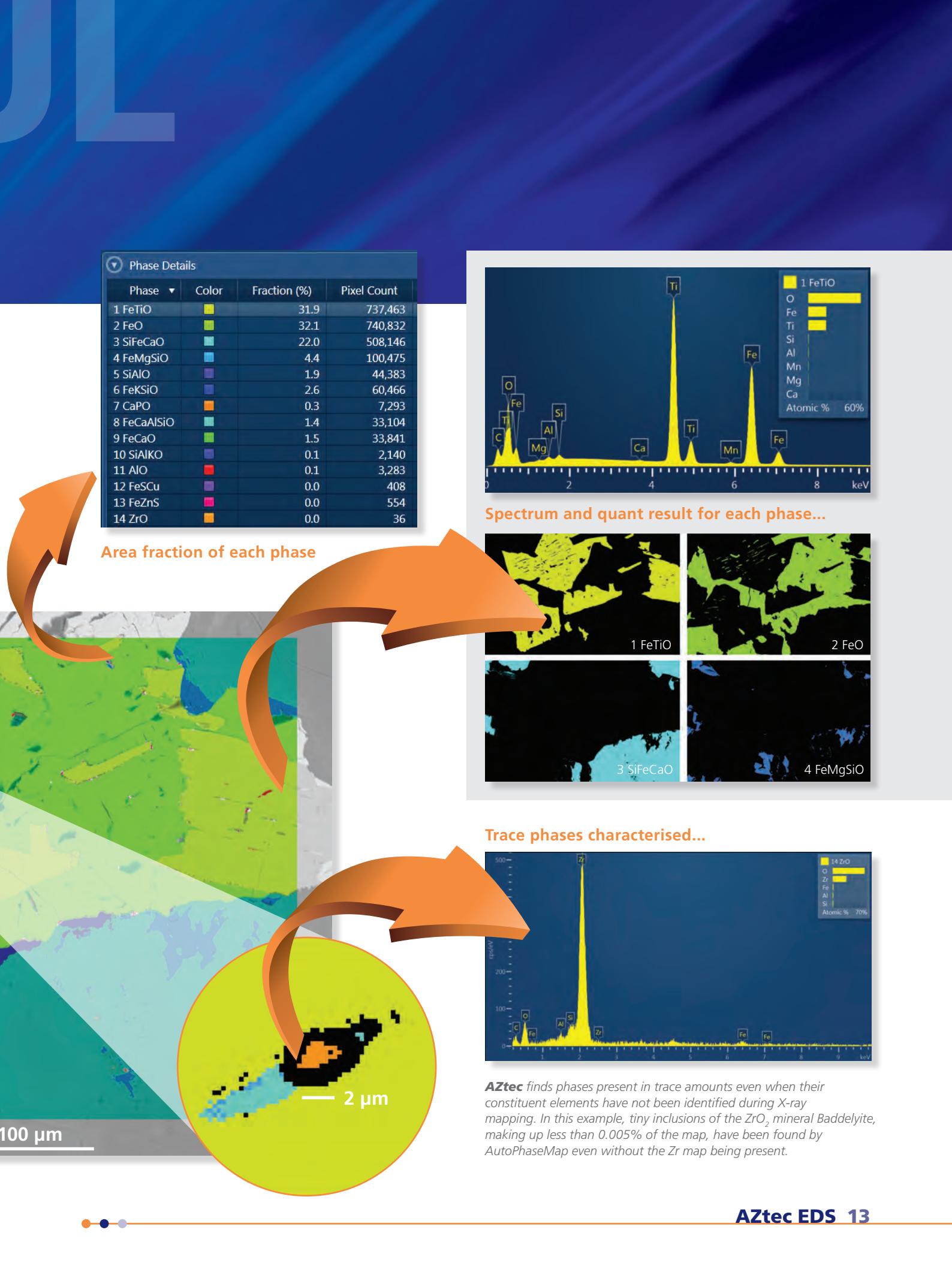


AutoPhaseMap separates phases at the nano-scale - for example, in this complex nano-structure of inter-metallics in a nickel based super-alloy.



In real-time, AutoPhaseMap automatically converts element maps into Phase Maps





# PRODUCT

## AZtecLAM: Large Area Mapping

### Automated data collection for increased productivity

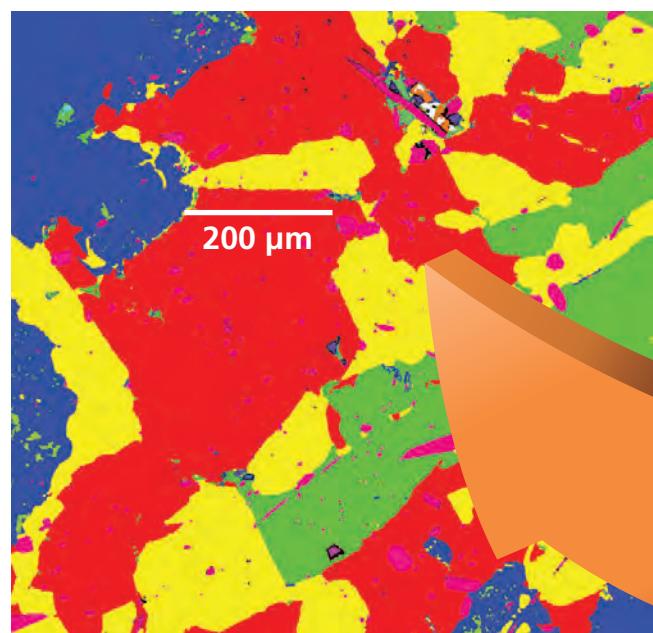
**AZtec**LAM enables the unattended collection of high resolution electron images, and EDS / EBSD maps from large specimen areas.

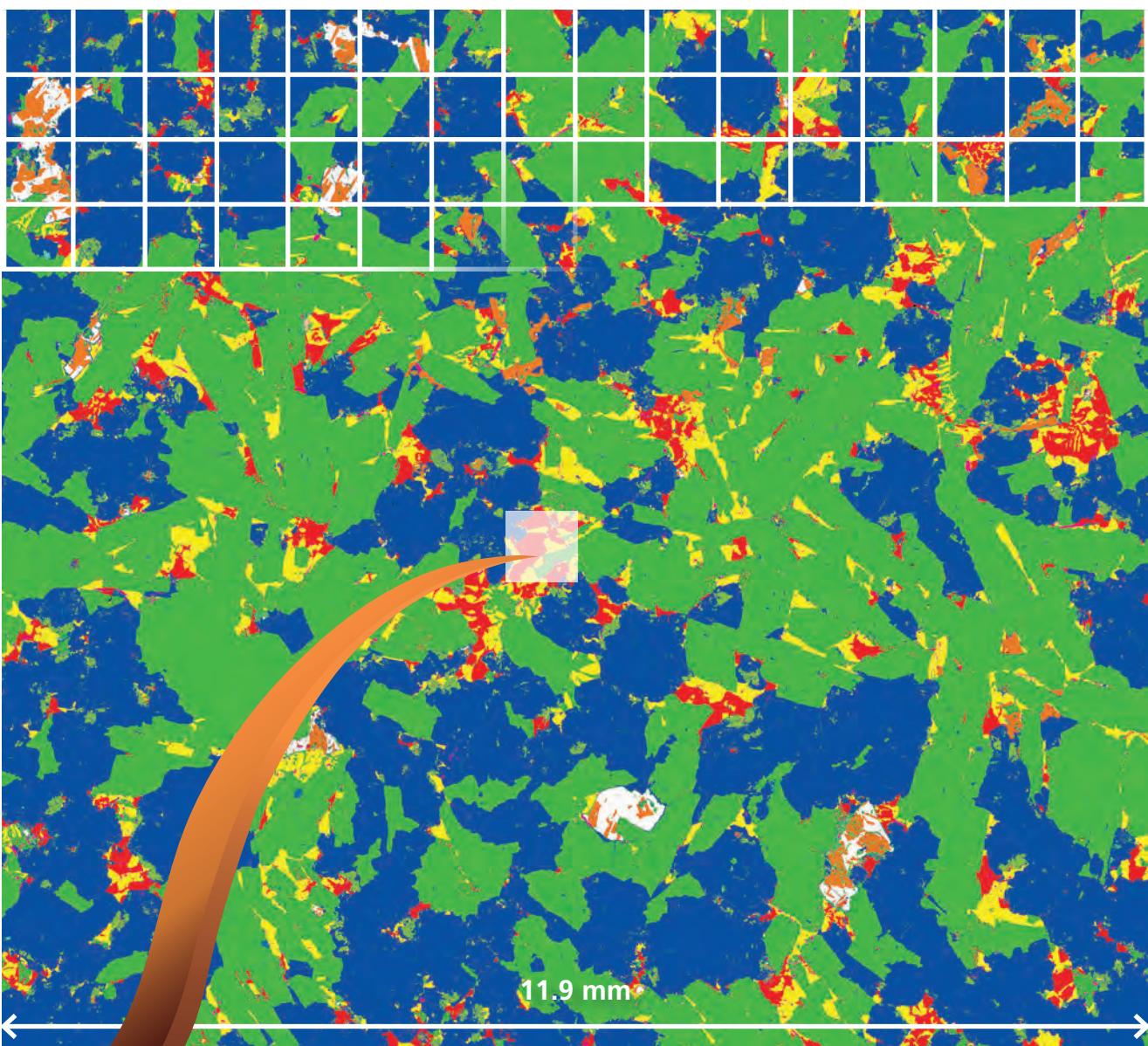
#### Making Large Area automated data collection an every day occurrence

- An easy to use wizard guides users through the setup process and ensures that even the most infrequent user can acquire a Large Area Map
- Accommodates tilted specimens to ensure that images are always in focus
- Images are automatically aligned during acquisition to ensure a seamless LAM dataset both before and after montaging
- Acquire up to 1500 fields, each with a maximum resolution of 8K x 8K, and X-ray maps with a maximum resolution of 4K x 4K, to create an image dataset of up to **96 billion** pixels and an X-ray dataset of up to **24 billion** pixels
- LAM is fully interactive during acquisition: enabling users to view all the data combined, and also zoom into the fine detail
- An individual field can be interrogated and X-ray map properties modified. Changes can then be applied to all fields in the LAM ...even during acquisition!
- Automatic system pause when a blown filament is detected - once the filament is replaced, acquisition can be resumed

Acquire up to 1500 fields  
...automatically

Zoom in to view and interrogate  
individual field data.





AutoPhaseMap image of a granite specimen comprising data collected from 224 individual fields.

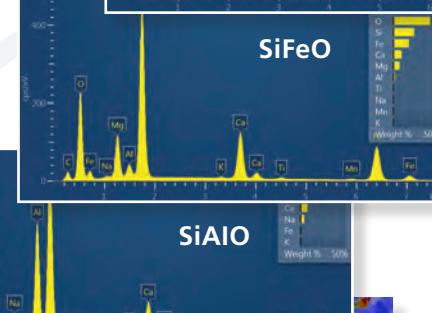
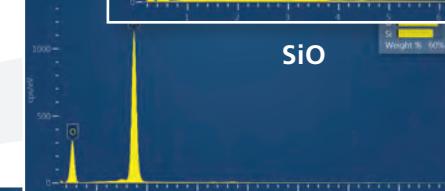
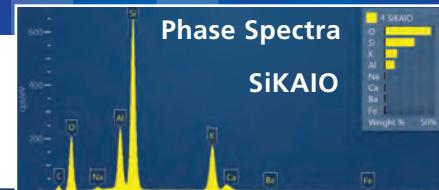
# AZtecLAM: Large Area Mapping

The story doesn't end after LAM acquisition

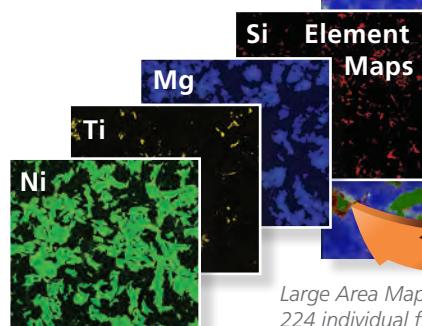
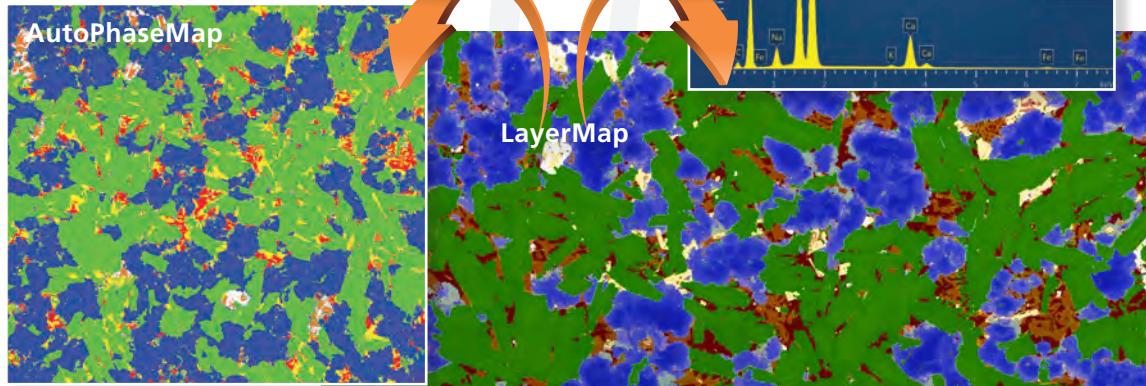
LAM montages all the acquired data into a single SmartMap dataset with up to 64 million data points.

Exploiting the power of 64-bit processing, users can interrogate the montaged data in the same way as a standard SmartMap dataset, and:

- Add/remove maps
- Reconstruct deadtime corrected spectra from the SmartMap data and obtain accurate quant results
- Create TruMaps and AutoPhaseMaps



SiAlO



Phase	Color	Fraction (%)	Pixel Count
1 SiAlO - Plagioclase	Green	44.0	29,323,306
2 SiFeO - Augite	Blue	39.3	26,080,067
3 SiO - Quartz	Yellow	6.1	4,048,423
4 SiKAIO - K feldspar	Red	4.5	3,007,415
5 FeTiO - Ilmenite	Orange	2.0	1,330,023
6 FeO - Magnetite	White	0.9	581,477
7 FeSiO - Pigeonite	Light Green	1.9	1,262,059
8 CaAlO - Apatite	Pink	0.5	35,22,297
9 FeSiO - Biotite	Light Green	0.5	330,548
10 FeS - Pyrite	Blue	0.0	15,804
11 CaSiO - Hornblende	Light Green	0.2	131,591
12 FeCuS - Chalcopyrite	Purple	0.0	14,078
13 CrSiO	Cyan	0.1	34,756
14 ZrO - Baddeleyite	Pink	0.0	2,611

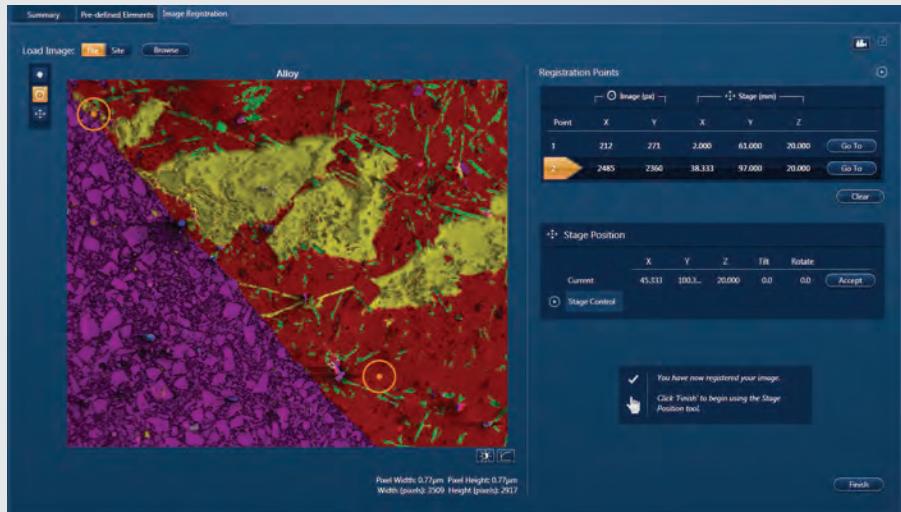
Large Area Mapping data (16K x14K) of a granite specimen. Dataset made up of 224 individual fields.

# Image Registration and MapQueue

## Image Registration

All **AZtec** acquired images can be used for specimen navigation and relocation

- **AZtec** takes control of the microscope stage and seamlessly relocates to points of interest
- During a session, any acquired image or map is automatically registered, enabling easy relocation to previously analysed areas
- Any image can be used for navigation i.e. an X-ray map can be used to navigate to an area rich in a particular element



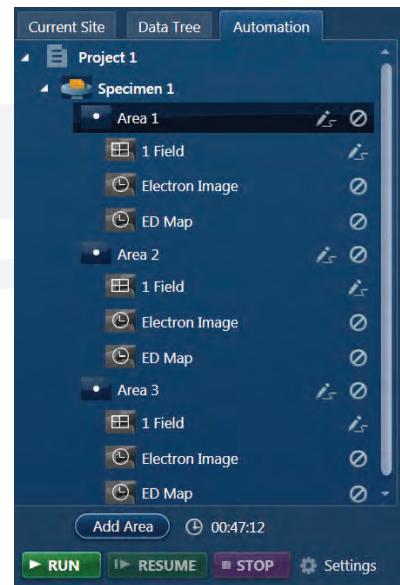
Imported image being registered with the **AZtec** software and microscope stage.

- Manually registering images enables specific areas of a specimen to be further investigated at a later date, even on another microscope

## MapQueue

Enables the automatic acquisition of multiple image or mapping experiments.

- Individual mapping experiments on different areas of a specimen, or different specimens, from different stage locations can be queued up for automatic analysis
  - Each mapping experiment can have different acquisition settings
  - Each acquisition can be an electron image or X-ray map, or both



Automation data tree showing discrete images and maps queued up for acquisition.

# LineScan, QuantLine and TruLine™

See the right line every time

## LineScan:

Visualise composition along a line.

**LineScan brings the concepts of AZtec real-time acquisition and reporting to the study of linear variations**

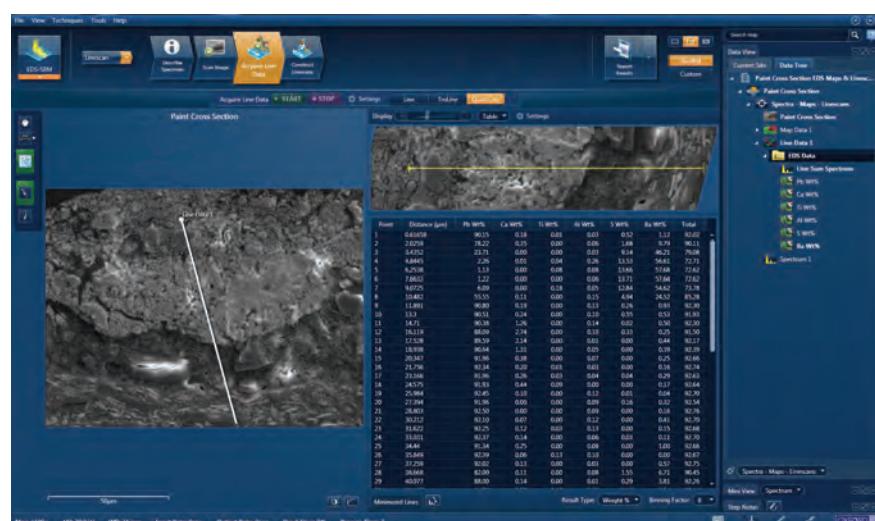
- Visualise LineScans clearly, quickly and easily
- Flexible views make interpretation easy
- View LineScans in stacked or tiled format
- Normalise display to compare major and trace element variations easily



## QuantLine:

**Utilise the accuracy and repeatability of Tru-Q to see quantitative element variations**

- No need to wait for lengthy data processing....see quantitative linescans live!
- View data in graphic form or as a table, with quantitative results shown in Wt% or At%
- Table of results can be exported to Excel
- Point spectra can be extracted for further, more detailed, analysis



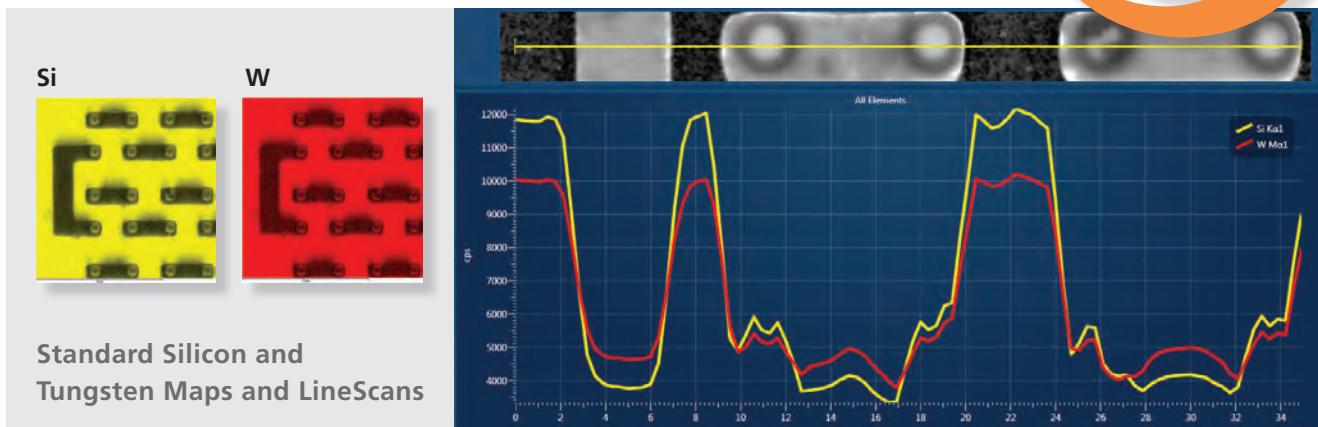
# VE FAST

TruLine:

Incorporates TruMap technology ensuring that you will see real element distribution

- Corrects for peak overlaps automatically
- Enhances real elemental differences by removing X-ray background variation
- Aligns image and LineScan for clear visual comparison
- Normalised intensity scales make comparison of major and minor elements simple

So quick,  
you will want  
to use it all  
the time



Standard X-ray Maps and LineScans indicate that Tungsten and Silicon are concentrated in similar regions of the structure, however, with TruMap technology the real positions of these elements are revealed.

# INNOVATE

## AutoLock™

Let AZtec do the hardwork

AZtec  
automatically  
corrects specimen  
drift so you  
don't have to

AutoLock provides a seamlessly integrated and powerful solution for collecting useful data when specimens drift.

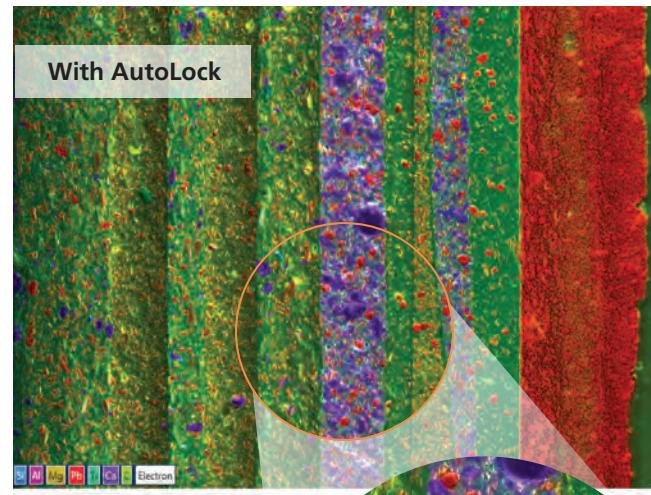
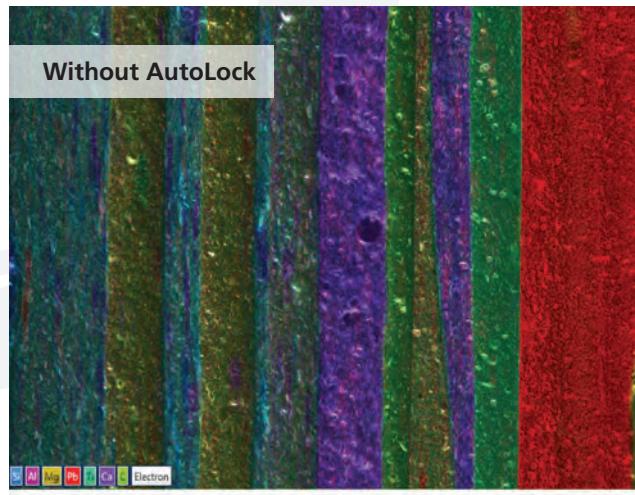
- Works in extreme situations, even on the nanoscale
- Keeps you informed about specimen drift
- Provides live updates of corrective action taken

### Innovative

- Unique blend of predictive and reactive drift correction routines cope with different types of specimen drift



Pb maps illustrating the power of AutoLock.



At first glance, both Layered Images look stunning, but on closer inspection the one with AutoLock shows rich detail of small particles, which are otherwise lost.

# LayerProbe®

## Layer thickness and composition analysis

Seamlessly integrated into **AZtecEnergy**, **LayerProbe** complements the element and phase information gained from conventional EDS analysis by calculating the composition and thicknesses of the individual layers beneath the surface.

### Non-destructive

- Multi-layered structures are characterised from an X-ray measurement, without the need to cross-section the specimen

### High spatial resolution

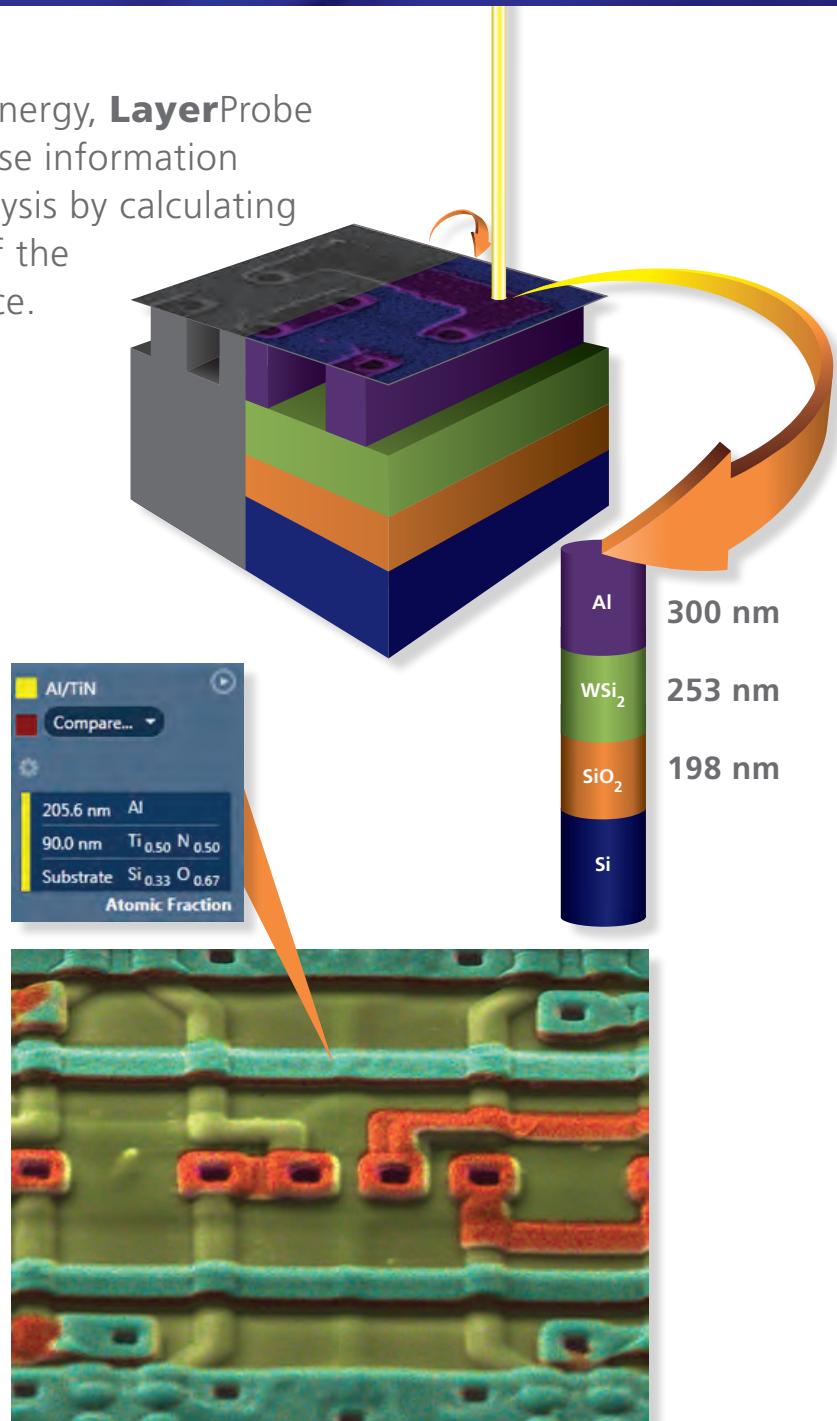
- Accurately characterises features down to 200 nm wide
- Layer thickness down to the nanometre scale can be measured quickly and accurately

### Cost effective

- Cost-effective: Use your SEM as a high-performance thin film and coating analyser

### Suitable for metallic layers:

- Metallic films can be measured at thicknesses far beyond their optical transparency



Visit [www.oxinst.com/layerprobe](http://www.oxinst.com/layerprobe)  
to download the brochure



# Guidance and Structure

Choose the way you want to work

**AZtec** is designed for all types of users and offers many different ways of working.

## Guided Mode

- Ideal for those who prefer a 'step by step' approach to analysis
- Each step of the Navigator has a clear purpose
- You can always see what is happening and what to do next

Describe Specimen – Record important experimental information.

Scan Image – Acquire electron images.

# RED

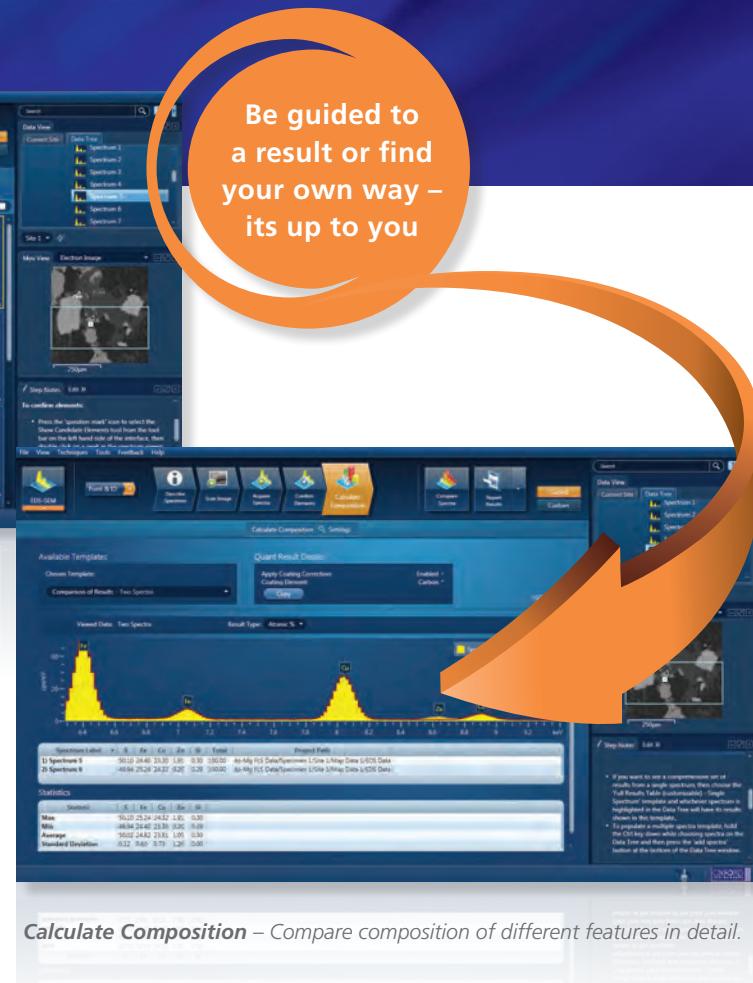


**Acquire Spectra** – Auto Peak ID and Quant updated in real-time.



In Custom Mode, you can expand your work over more than one display, still with widescreen resolution.

Be guided to  
a result or find  
your own way –  
its up to you



## Custom Mode

- Ideal for those who prefer the freedom and flexibility to do what they want, when they want
- You decide what functionality you want to see and where you want to see it
- Choose the visualisations that suit your task and expand them over as many monitors as you need

# INNOVATE

## Guidance and Structure

**Ensuring that everyone gets the job done correctly**

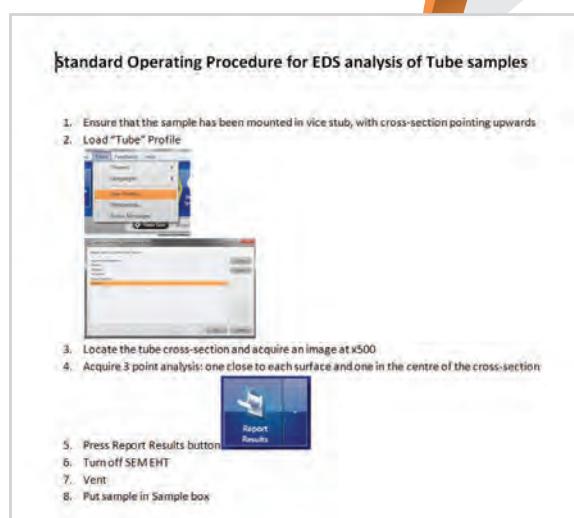
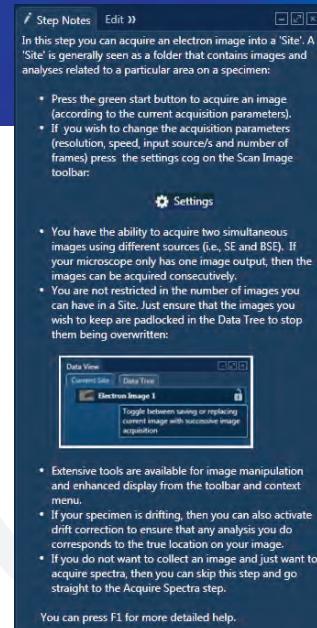
Step Notes and Standard Operating Procedures.

Step Notes are available on every Navigator step to help you get the most from AZtec in the quickest time possible

- Help precisely where you need it
- Easy to follow text and images ensure that you know exactly what to do next

Step Notes can be easily turned into Standard Operating Procedures (SOPs)

- Define on-screen SOPs using text and images
- By following a SOP, novice staff can be productive from the start, and achieve repeatable and reliable results every time



Copy from Word and paste into AZtec

Turn your system into an integrated SOP

# Productivity

## Making EDS analysis faster, easier, better

**Multi-tasking:** Change the way you work forever.

AZtec has true multi-tasking capability, meaning that every second of data acquisition can also be used for processing and reporting

- Interrogate and report on data from one project while acquiring data for a new project
- Interrogate data even during acquisition
- Unleashes the potential of the latest high-speed detectors
- Many tasks that used to take minutes now take seconds
- Revolutionise productivity

Acquire, process and report all at the same time.

**User Profiles:** Managing a multi-user environment is now straightforward.

**User Profiles take the hassle out of setting up the system for different users**

- Set-up your system once for a user, then save all the relevant settings into a user profile
- Next time simply load the profile and you are ready to go

Map Element Details

Element: Iron

Label: Automatic

Energy Window Selection

Automatic

Specify Line Series

Specify Energy Window

Color: 300

General Settings

Default Element Map Smoothing Level: 1 - No Smoothing

Default Element Map and Line Type: Window Integral Map / Line

Apply FLS Threshold

Sigma Threshold: 0

EDS Element Settings page, showing selected elements along with associated X-ray map colours.

# Integrated Reporting

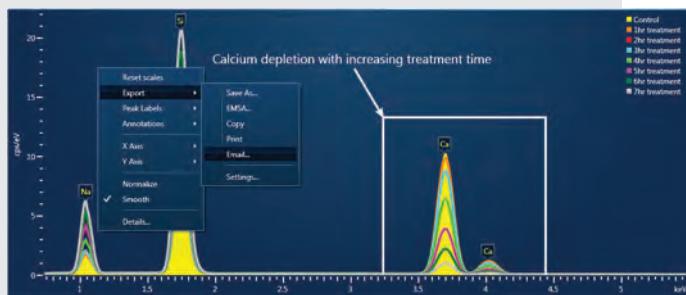
## Flexible or structured, always fast

**Integrated Reporting:** You talked...We listened.

- **Three** ways to report your data...
- **Three** ways to save time...
- **Three** ways to take the hassle out of reporting

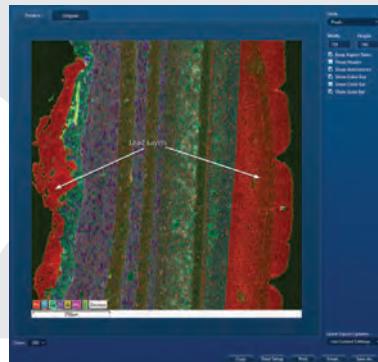
### Fast

- Reporting direct from the interface
- A simple right click and data can be e-mailed direct to your customer



### Flexible

- Dedicated export application
- Export your data in the format and resolution you want



### Structured

- Print a professional report with a single button press
- Comprehensive list of report templates tailored to each application
- A dedicated 'Site Report' will print out all data acquired during a specimen investigation
- Customise reports to incorporate your company logo

Want to create your own templates?

**AZtec's** integrated report template generator allows you to do just that!

- Simple easy to use interface
- Create templates for use across multiple techniques
- Create multiple page templates
- Create templates for single or multiple users

# REPORT

Report  
your data quickly  
and in the way  
you want

File Generate

### Report Template Generator

Title: Image and Spectrum

Properties

Technique:  EDS  EBSD

Categories:  Maps  Image  Spectrum  Linescans  % Quant  Project  SiteReport

Paper Size: A4

Orientation:  Portrait  Landscape

Components

- General
- Spectra
- Current Spectrum
- Color Spectrum
- Spectrum Details
- Spectrum And MiniQuant

Page: 1 of 1

Document Type: Word Orientation: All Paper Size: A4 Directory: All Category: All Technique: EDS

Title	Directory	File
Electron Image - Multiple Spectra	System	Electron Image - Multiple Spectra A4.docx
Electron Image - Spectrum - Quant	System	Electron Image - Spectrum - Quant A4.docx
Electron Image - Spectrum	System	Electron Image - Spectrum A4.docx
Electron Image	System	Electron Image A4.docx
FLS Maps (L)	System	FLS Maps A4 (L).docx
FLS Maps (P)	System	FLS Maps A4 (P).docx

Paint Section 2 3/14/2011

Electron Image 1

Map Spectrum

OXFORD INSTRUMENTS

Save As... Print Email... Set As Default Close

Current Electron Image

Color Spectrum

Page: 1 of 1

# Global Customer Support

**Accredited, experienced, responsive, dedicated**

Oxford Instruments recognises that your success requires not just only world-class products, but also world-class service and support. Our global service team is renowned for delivering outstanding service to customers and microscope vendors:

- Hands-on and theory classroom training
- On-site training tailored to your specific needs
- Web-based courses and training videos
- Consultancy and application support
- Multi-layered maintenance and service contracts



visit [www.oxford-instruments.com/AZtec](http://www.oxford-instruments.com/AZtec)

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