

EBSD

AZtecHKL

The Ultimate EBSD System



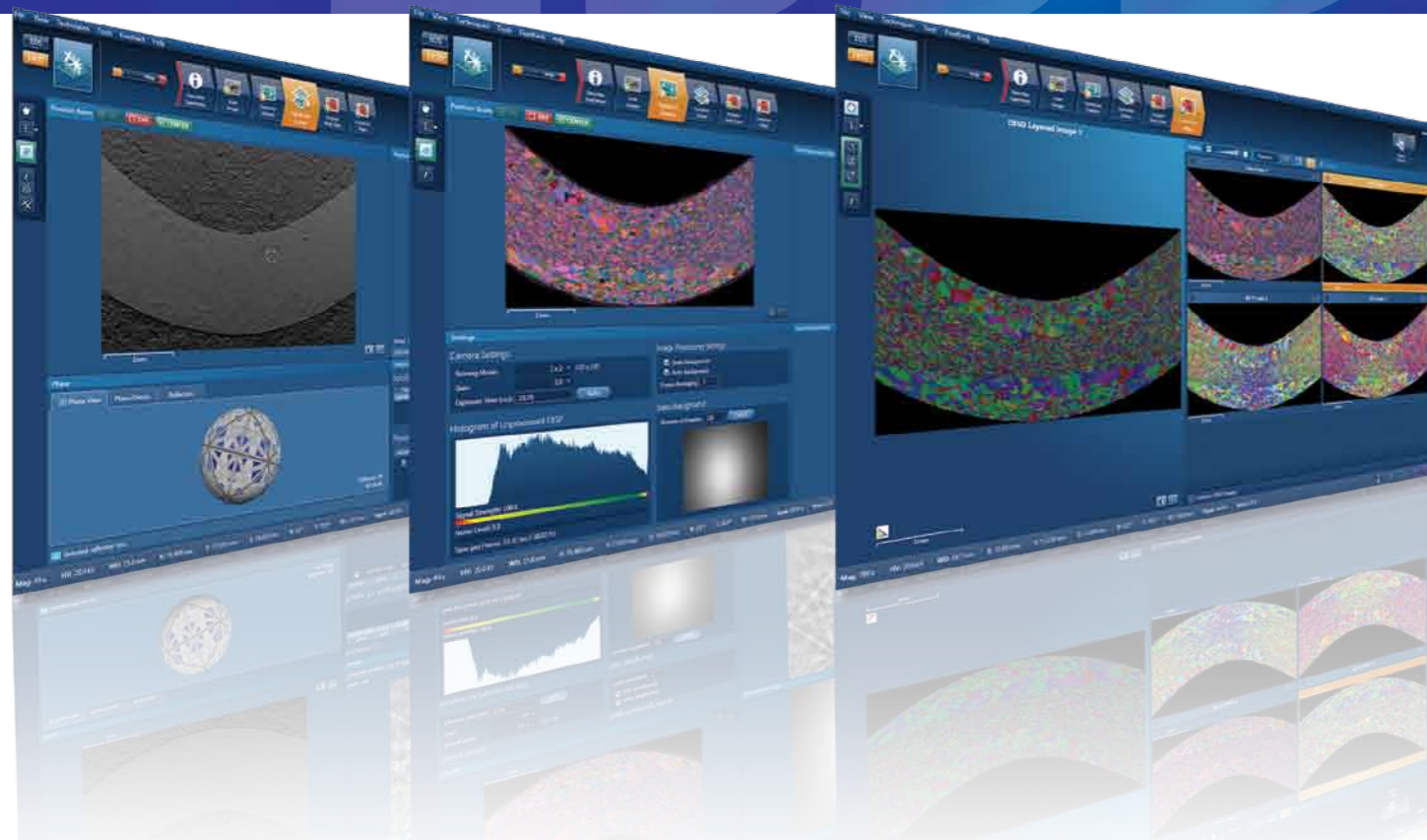
**The most powerful, most flexible materials
characterisation system you'll ever see**



The Business of Science®



The most powerful, most flexible EBSD system you'll ever see



AZtec® couples our customer vision with nearly 40 years of passion and expertise from Oxford Instruments to create the most powerful materials characterisation system you'll ever see. Designed to meet the requirements of all applications, **AZtec** is the product of a single development team tasked with building the ultimate microanalytical system.

AZtecHKL unravels the complexity of EBSD, so you can focus on your results and not your instrumentation.

Combined with the HKL**Nordlys** EBSD detectors and our range of EDS detectors, the **AZtec** system offers a new dimension in materials characterisation.

Acquire and solve data at speeds exceeding 600Hz*.

*Data collected at 640Hz and 98% hit rate from an austenitic steel using HKL**Nordlys**Max

At a glance...



Accurate

- Powerful new **AZtec**Tru-I solver engine gives you the best 'out of the box' results in real-time

Fast

- An intelligent optimisation process, you can concentrate on your results and not how you collect them

Integrated

- EBSD and EDS integration, combines Tru-Q™ and Tru-I™ for phase identification, plus combined EDS and EBSD real-time mapping

Innovative

- AutoLock provides predictive and reactive drift correction for simultaneous EBSD and EDS data collection

Flexible

- Work the way you want to, incorporating automated features and advanced manual settings

A-Z technology for nanoanalysis

FAST

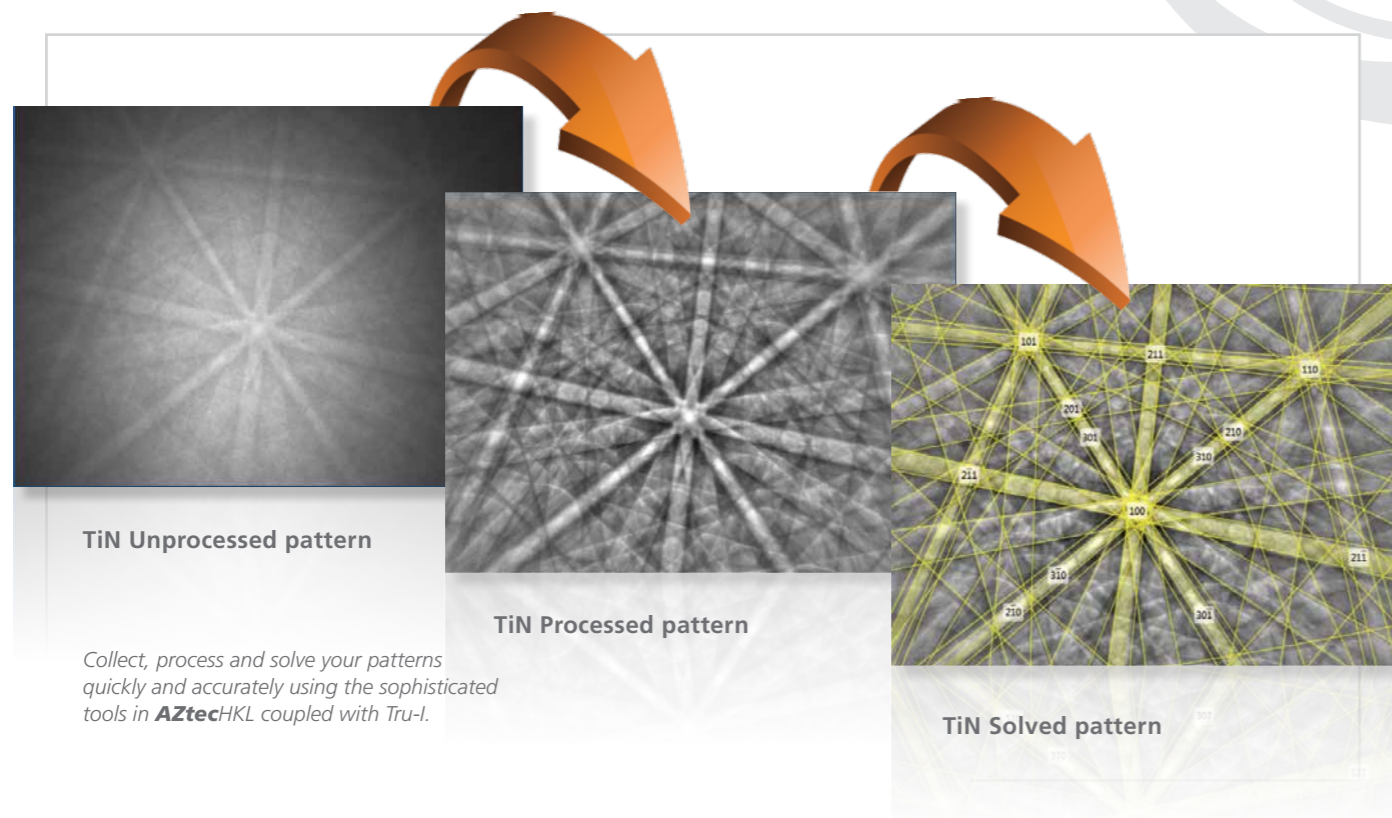
Power of Speed to Results

AZtecHKL is intelligent EBSD. You can change your acquisition conditions and still collect quality EBSD patterns at the click of a button. Concentrate on your results, not your instrumentation.

AZtecAutocal

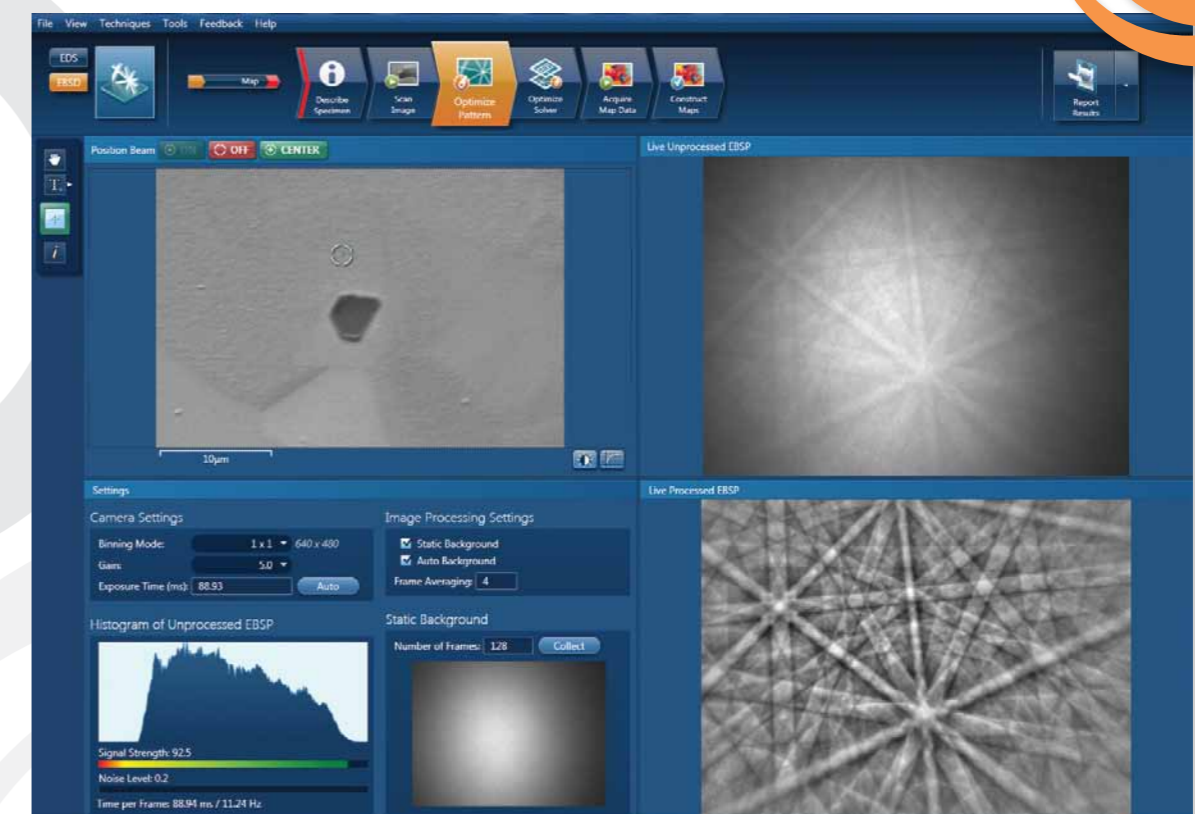
Collect accurate data routinely under a full range of working distance and detector insertion distances, without recalibrating

- **AZtec**AutoCal is a sophisticated geometric correction which works seamlessly and automatically to calculate calibration parameters based upon changes in geometry
- Compensates for changes to the projection parameters resulting from beam movement at low magnification
- As a result, your system is quick and easy to set up, whatever your experience level



AZtecHKL corrects for changes in acquisition conditions automatically and in real-time.

Focus on
your results
rather than your
acquisition



Tools to optimise
the system with
ease, while
including all the
flexibility you need.

Optimising your system for data acquisition is easier and more automated than ever before

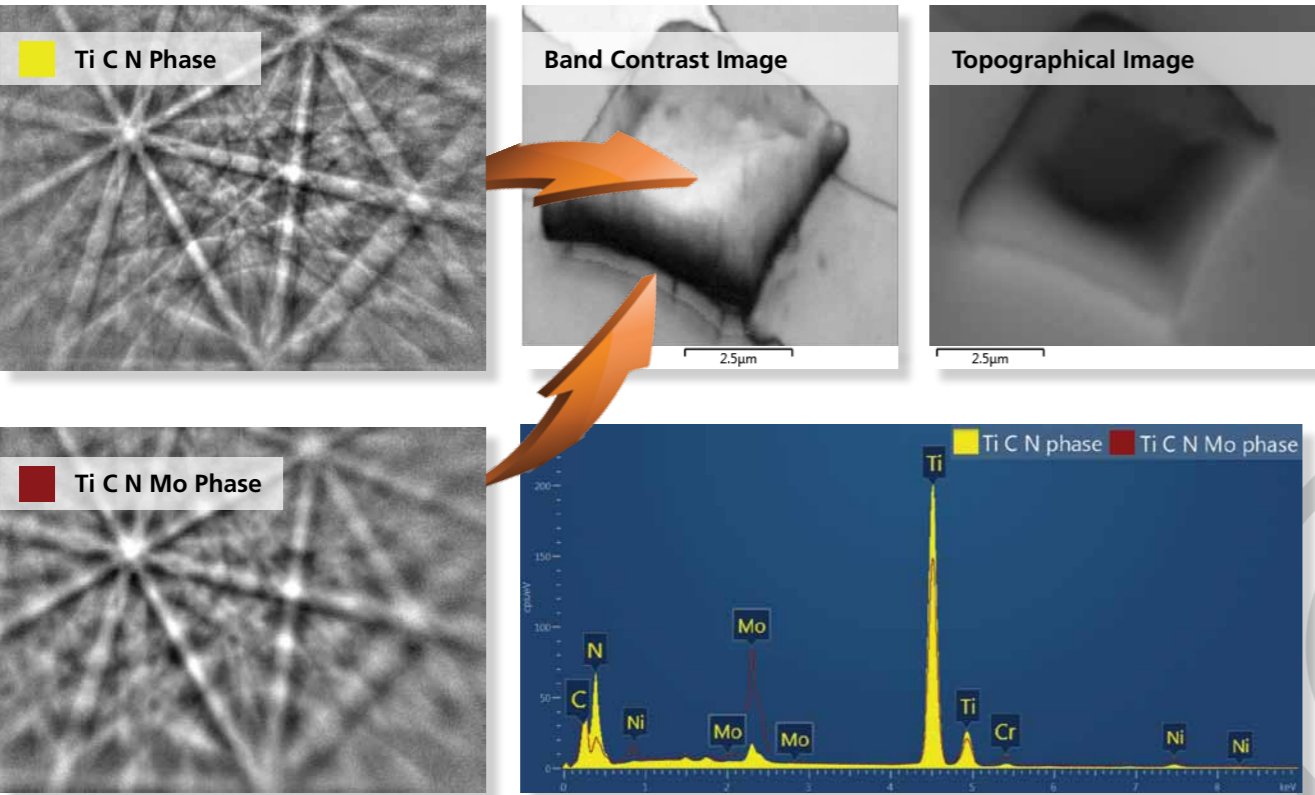
- Automatic detector exposure
- Intelligent auto background
- Detector control from within the user interface
- Change SEM conditions; kV, probe current, magnification, or stage tilt, without recalibrating and still collect an optimised EBSD which is correctly solved

Power of Integration

AZtecSynergy combines the innovation and power in **AZtec**Energy and **AZtec**HKL to create the ultimate materials characterisation system.

- EDS and EBSD are integrated in a single interface with no compromise on functionality or productivity
- View EDS and EBSD data simultaneously to easily optimise the acquisition parameters

Example showing the chemical variation within a Ti C N precipitate in a Ni alloy

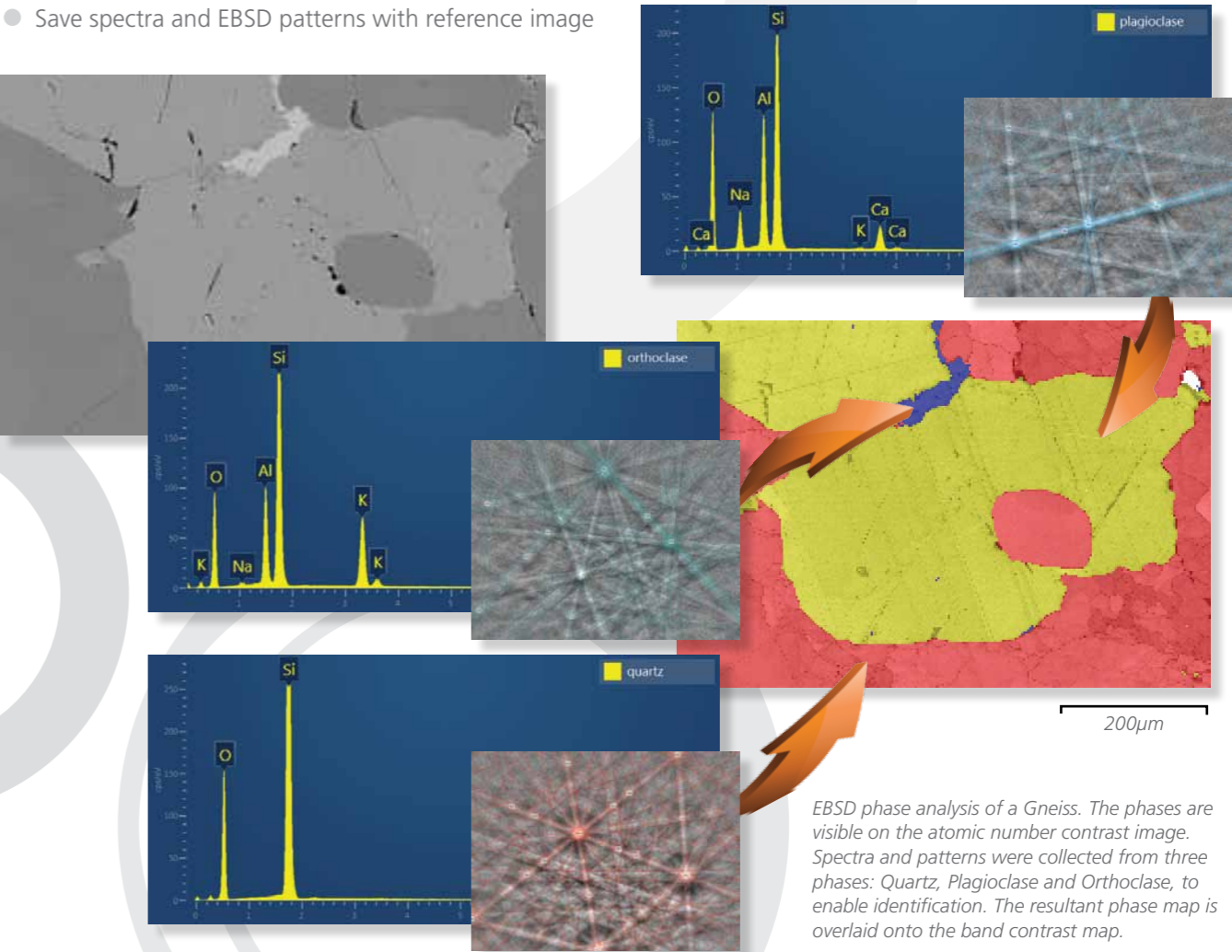


AZtec delivers excellent pattern quality, showing subtle sample detail. This example shows the chemical variation within a Ti C N precipitate in a Ni alloy.

The precipitate has the same crystal structure throughout, but the rim of the precipitate shows patterns of a poorer quality, illustrated in the band contrast image. Investigation shows that the patterns from this region are not as sharp as those from the centre of the precipitate. EDS analysis indicates that the rim of the precipitate include not only Ti, C and N but also Mo. This compositional change is related to the degradation in pattern quality, although it has no impact on the crystal structure.

AZtecPhaseID combines **AZtec**Energy and **AZtec**HKL, for the best phase identification.

- Powerful and fast phase search to identify candidate phases based on chemical information
- Accurately determine the phase from a list of candidate phases
 - Use superior Tru-I band detection and indexing
- Save spectra and EBSD patterns with reference image



EBSD phase analysis of a Gneiss. The phases are visible on the atomic number contrast image. Spectra and patterns were collected from three phases: Quartz, Plagioclase and Orthoclase, to enable identification. The resultant phase map is overlaid onto the band contrast map.

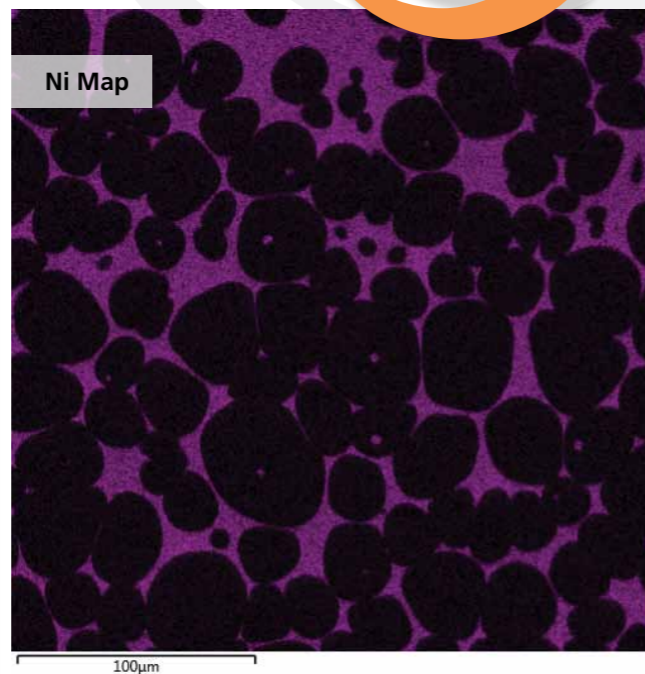
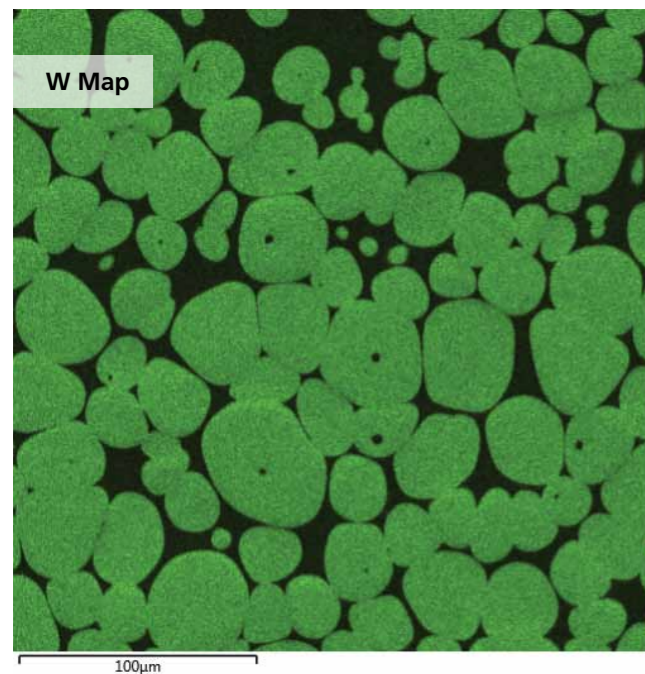
Power of Integrated Mapping

Integrated EBSD and EDS Mapping.

- A true crystallographic and elemental characterisation of your sample in real-time
- Collect full EDS spectral maps and EBSD data simultaneously
- Easy to use with no complex switching between techniques
- A single interface is used for data collection
- Use EBSD map as a reference image for EDS collection

Powerful
integration of
EBSD and EDS

X-Ray Maps

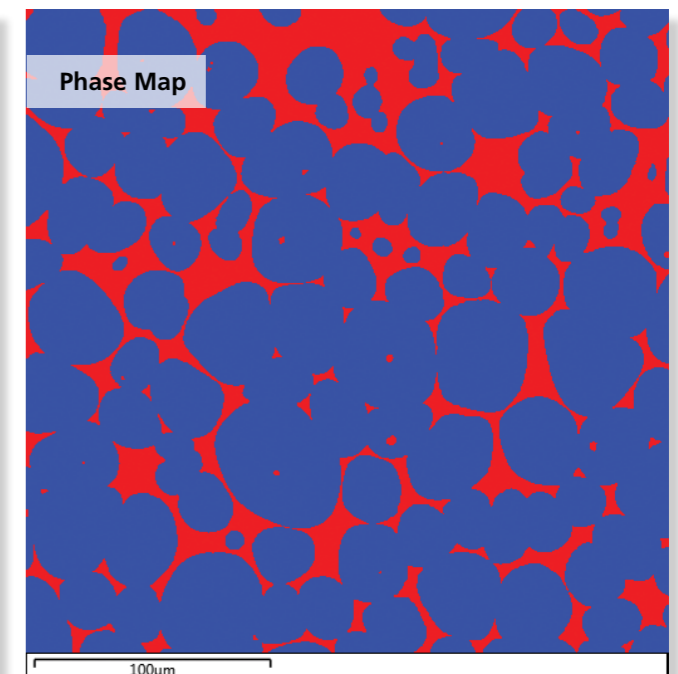
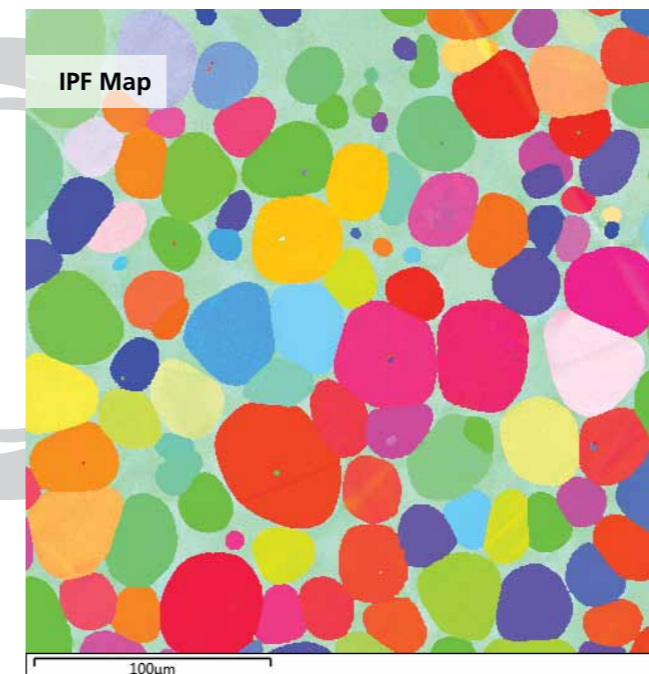


EBSD and EDS Spectral maps are collected simultaneously using **AZtec** for a full characterisation of the sample.
The example shows EDS and EBSD maps from a tungsten heavy alloy. The W and Ni EDS maps are shown coupled with the phase map and inverse pole figure map.

- **AZtecSynergy** is designed for the best performance when EBSD and EDS data are collected simultaneously
 - The system is optimised for the fastest acquisition speeds
 - Unleashes the power of **X-Max®** and **HKL Nordlys**
- View and Report EDS and EBSD maps simultaneously

- View **ALL** your data in real-time with **AZtecHKL**
 - EBSD patterns are indexed as acquired to create orientation and phase maps together with element maps
 - Change EBSD parameters and see the impact on your results immediately

EBSD Maps



■ Ni
■ W

AZtecHKL includes all of the sophisticated tools required to solve the most challenging samples.

Change solver parameters, post acquisition and re-analyse

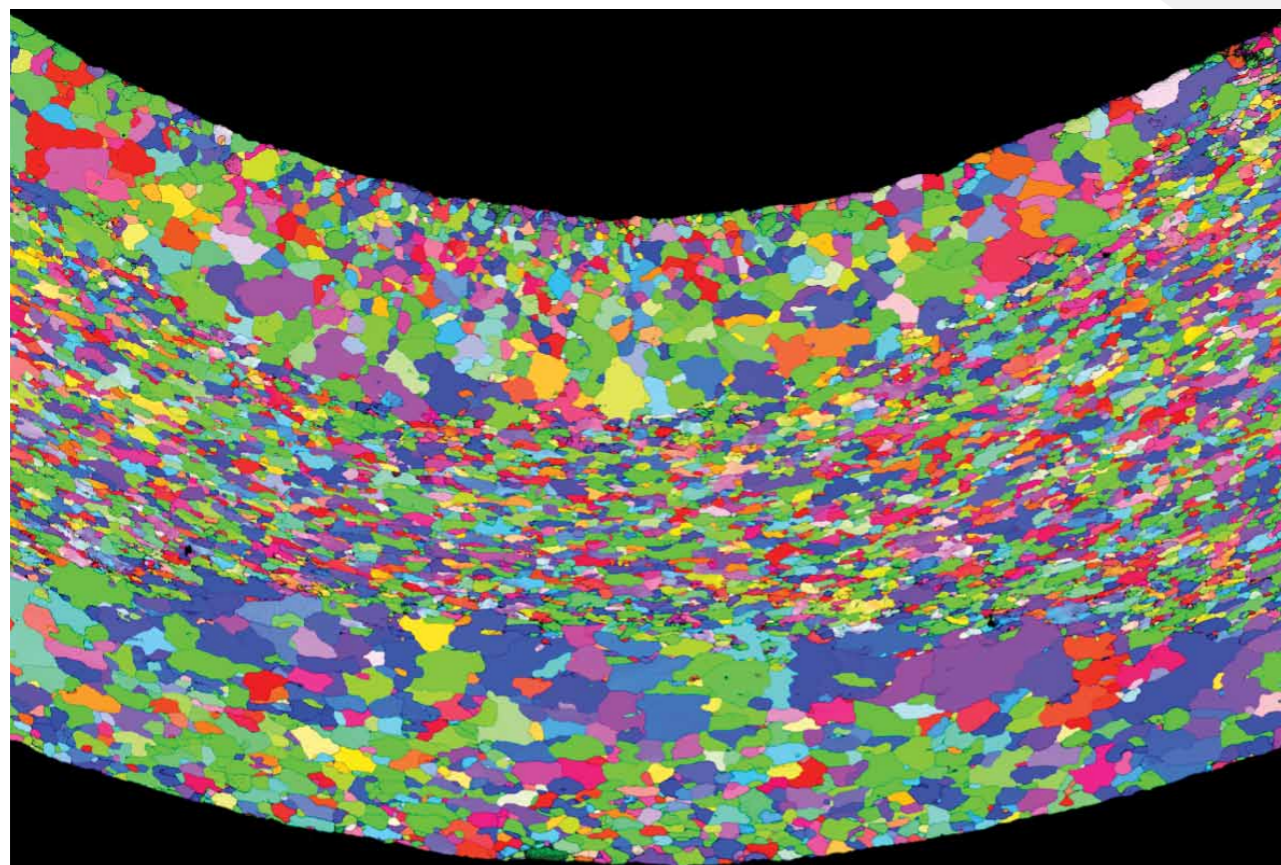
- Investigate stored patterns
- Make changes to optimise your solving

A calibration refinement tool is available

- Optimise the calibration if required

Collect more data in more detail

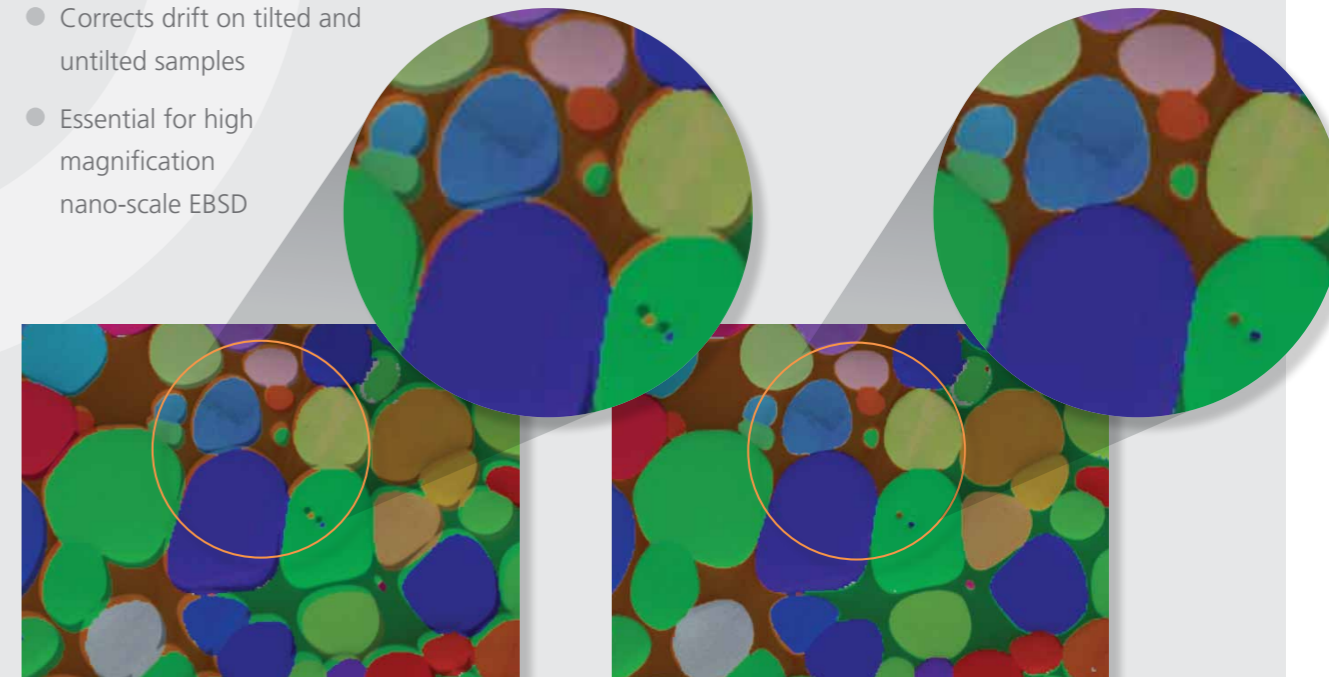
- 4k x 4k EBSD maps
- 8k x 8k images
- See the bigger picture
- Ideal for posters and presentations



High resolution inverse pole figure map of a bent steel sample.

AZtecAutoLock is an integrated drift correction tool that corrects EBSD and EDS data simultaneously, resulting in the most accurate maps.

- Unique blend of predictive and reactive drift correction routines
- Corrects drift on tilted and untilted samples
- Essential for high magnification nano-scale EBSD



Map A Without AutoLock

Map A shows an IPF map overlaid onto the electron image. The two images do not overlap exactly because the image was drifting as the map was being collected.

Map B With AutoLock

Map B was collected from the same sample area, with **AZtec**AutoLock drift correction switched on. Using AutoLock the electron image and the map are now correctly aligned. AutoLock ensures you collect the most accurate maps every time.

Define parameters exactly for your application so you can distinguish even closely related structures

- Set the number of reflectors individually for each match unit
- Distinguish between closely related structures or materials which exhibit pseudosymmetry

Flexibility to set the step size or the resolution for a mapping grid

- Ensure you sufficiently sample your microstructure
- Important for grain characterisation studies

Power of AZtec

Different laboratories have different requirements, and different analysts have different levels of experience...

Each navigator step is accompanied by Step Notes, incorporating on-screen help and images

Step Notes are associated with each stage of the interface. These are easily tailored to include specific instructions or operating procedures.



Step Notes can be tailored to incorporate specific Standard Operating Procedures (SOPs) into the AZtec interface

- Ideal for novice or infrequent users, or those following a procedure
- Assist all your users, for all experience levels
- Step Notes can also be used to describe other analytical considerations, such as sample preparation or optimum SEM conditions

Step Notes

Edit

In this step you can set the data analysis settings.

- The beam can be positioned by selecting . When the tool is selected the beam can be controlled by the mouse as well as by the keyboard (Shift will give a coarse shift and Ctrl will give a fine shift).
- Once the beam is positioned you are ready to snap a pattern. The analysis settings can be adjusted from in the Process EBSD quadrant.
- By selecting Auto, the system will automatically snap an EBSD, detect the bands and try to index with the selected settings. It will also automatically update whenever a change is made to the EBSD or the detected bands or the analysis parameters.
- If you do not select Auto, you must press SNAP DETECT
- INDEX In order to go through the steps or snapping a pattern, detecting the bands and indexing the pattern. Adjust the Hough resolution, number of bands and reflectors to get a correct identification of the acquired EBSD.
- In order to interact with the detected bands select . This will allow you to delete bands as well as to draw new bands or modify already drawn bands.
- Selecting will allow adjustment of the band detection area. When the tool is active the Area of Interest will be displayed on the EBSDP and by use of the mouse, the area can be moved or resized.

Optimize Solver

Work the way you want to.

Detailed analytical conditions can be saved in User Profiles and reloaded with ease

- Load the appropriate User Profile to adapt your analytical settings in seconds
- Link User Profiles to specific sample types or applications

Work efficiently while your data is acquiring

- **AZtec** is truly multitasking
- Write reports or interrogate data during acquisition

Agile reporting options

- Report directly from the **AZtec** interface
- Export your data in the resolution and format you need
- Comprehensive list of report templates for specific applications

Profile

Acquire Image settings

Acquire Line Data settings

Acquire Map Data settings

Acquire Spectrum settings

EBSO Camera settings

EBSO Phase selection settings

EBSO Solver settings

EBSO Specimen Geometry settings

Element settings

Peak Labels

Quant settings

Phases in Databases

Phase Database: HKL phases

Name	Space Group
Enstat	Orthorhombi...
Fe3C	Orthorhomb...
FeAl	Cubic...
For...	Orthorhomb...
Gale...	Cubic...
Gr...	Hexagonal...
Hallite	Cubic...
Iron...	Cubic...
Iron...	Cubic...

Phase Name: Iron

Auto Phase for HKL phases

3D Phase View

Reflectors: 43

kV: 20.00

Phases for Acquisition

Include	Phase	Reflectors	Color
<input checked="" type="checkbox"/>	Iron bcc (old)	39 reflectors	H...

Remove Phase

Clear All

Add from File...

Phase Details

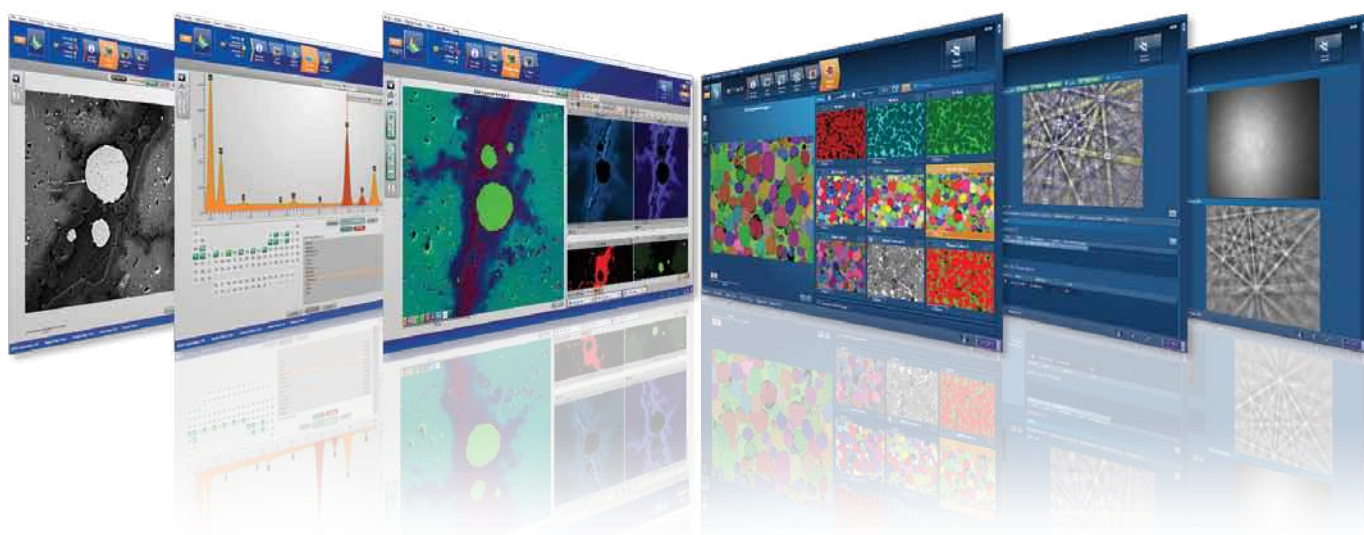
#	h	k	l	d [Å]	Intensity	Family	Critical
1	1	0	0	2.0...	100.0	1 - (110)	
2	1	0	0	2.0...	100.0	1 - (110)	
3	0	1	0	2.0...	100.0	1 - (110)	
4	1	1	0	2.0...	100.0	1 - (110)	
5	0	1	0	2.0...	100.0	1 - (110)	
6	1	0	0	2.0...	100.0	1 - (110)	
7	2	0	0	1.4...	50.7	2 - (200)	
8	0	2	0	1.4...	50.7	2 - (200)	

Effectively manage multi-user environments using user profiles. Store a range of parameters, including, phase selections, solver and camera settings, and geometry.

INTEGRATED

AZtec

The most powerful, most flexible materials characterisation system you'll ever see



AZtec combines latest generation detector hardware, multi-tasking software, and decades of microanalysis know-how to create the ultimate system for materials characterisation...

- One interface for all microanalysis techniques
- Collects full EDS spectral maps simultaneously with EBSD so re-analysis and re-interpretation is easy
- Integrated with industry-standard materials databases
- No compromise in speed or functionality

○iService®

Whether your requirements are hardware, software, or application oriented, our worldwide network of specialists will be there to support you.

Please visit www.oxford-instruments.com/AZtec or e-mail AZtec@oxinst.com

The materials presented here are summary in nature, subject to change, and intended for general information only. Performances are configuration dependent, and are based on **AZtec** Release 1.1. Additional details are available. Oxford Instruments NanoAnalysis Quality Management System is certified to meet ISO 9001: 2008. **AZtec** is a Registered Trademark of Oxford Instruments plc, all other trademarks acknowledged. © Oxford Instruments plc, 2011. All rights reserved. Document reference: OINA/AZtechKL/0411



The Business of Science®