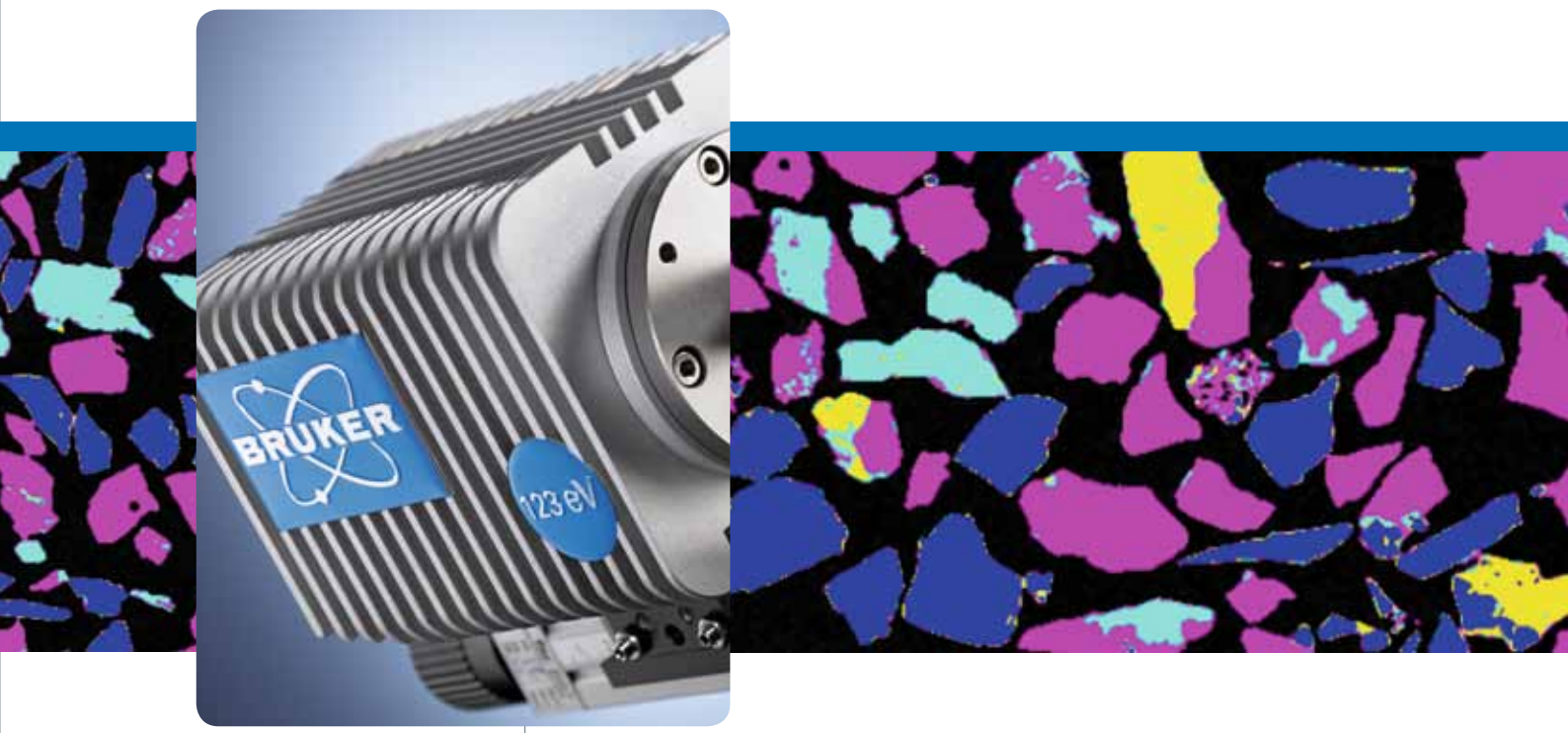


ESPRIT Feature

- Particle detection and chemical classification

Innovation with Integrity

EDS

Fast and Comprehensive Feature Analysis

Based on the speed and accuracy of the QUANTAX EDS system with its powerful and intuitive ESPRIT software, the Feature module brings new capabilities to the microanalysis package. The ability to automatically detect, measure and analyze any kind of particle or feature, whilst providing its chemical classification using the high throughput capability of the XFlash® silicon drift detectors, is at the heart of this solution.

Method-based approach

The configuration for particle detection and chemical classification can be stored as a method. Once set up by the expert, such a feature analysis method can be used over and over by the less experienced user.

Fast and accurate results

Feature analysis benefits from the high speed of the XFlash® detectors as well as the QUANTAX image digitizer, and gains accuracy from the superior element identification through the modern atomic data library and configurable quantification.

Full integration

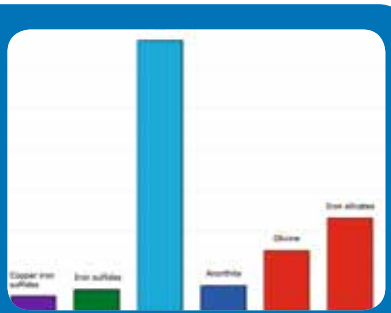
Full integration with the ESPRIT software package allows the Feature module to use all of the necessary functions of ESPRIT combined with the usability already familiar to the QUANTAX user.

Full automation

The integration also allows the feature analysis to be automated via ESPRIT Jobs. All settings and methods can be selected for a fully automated feature and chemical classification run, permitting unattended analysis of large areas and samples.

Combined morphological and chemical classification

Select one or multiple columns from the histogram and immediately see which particles fall into the according range. Our example shows all particles that belong to the chemical classes olivine and iron silicates in bright red.



ESPRIT Feature at a Glance

Configurable feature detection methods

- Image filters
- Binarization
- Morphology filters
- Property filters
- Display configuration

Configurable chemical classification

- Spectra acquisition settings
- Single point or average particle spectrum
- Two-tier classification setting for chemical classes defined as hits
- Selectable quantification method
- Classes with multiple chemical concentrations, comparisons and operations

One-button measurement using predefined methods

- Particle sizing performed with one push of a button
- Chemical classification including sizing with one push of a button
- Using the append button, multiple fields/measurements can be joined together with manual stage movements

Automation with StageControl and Jobs

- Automated (unattended) feature analysis of large areas
- Including: image acquisition, particle detection, chemical classification, overview image, reports and data export

Feature analysis using a HyperMap

- No further data acquisition necessary
- EDS spectra of particles are extracted from HyperMap and used for chemical classification of particles

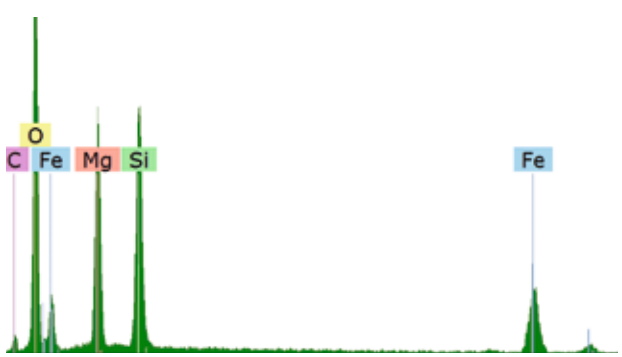
Review and reclassification

- Particle review dialog
- Reclassification without reacquisition

Charts and reports

- Configurable histogram chart
- Configurable binary and ternary charts
- ESPRIT report generation
- Particle list export to text or MS Excel®

Evaluation of EDS spectra



For each classified particle, the acquired spectrum is readily available.

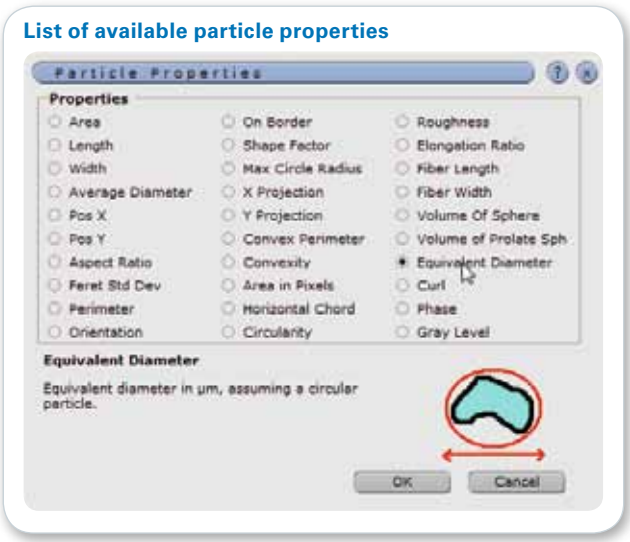
Feature Detection and Chemical Classification

Configurable feature detection methods

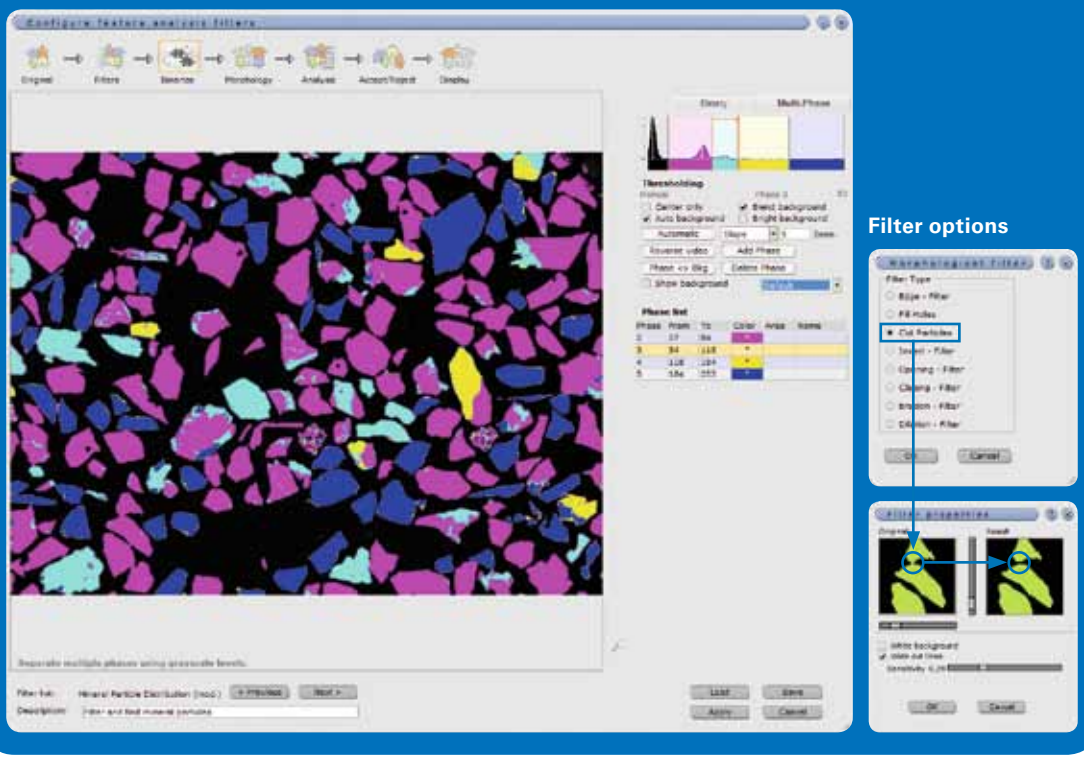
Any image with sufficient contrast (or even a HyperMap database) can be analyzed with a feature analysis method. The method can be set up to filter and enhance the original image. It differentiates background or unwanted features from the ones of interest and allows detecting multiple phases within a particle. Morphological filters enhance the binary image to suit the feature analysis.

The display can be configured to show which properties are listed, how the feature image is displayed, and which property and range is shown in the histogram. Any of the particle properties can be used to filter the final result.

List of available particle properties



Configuration dialog for the morphological classification

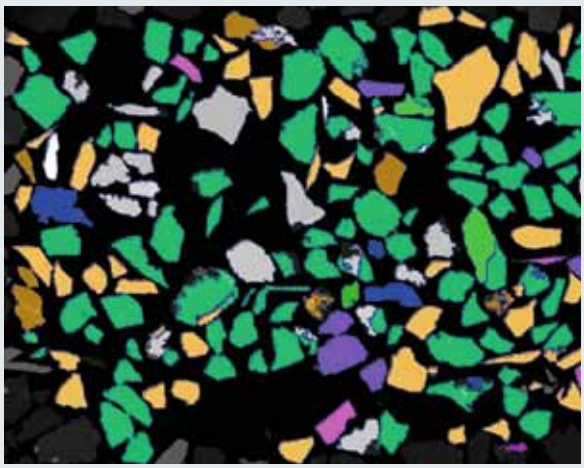


Configurability to suit your requirements

Configurable chemical classification

The high-speed XFlash® detector permits extremely fast chemical classification. Any particles determined to be of interest by the feature detection method are analyzed via EDS for their chemical composition. The particles are then sorted according to a specific chemical classification method that can be easily set up or modified for any kind of sample type. The classification method groups the particles according to ranges given for the concentrations of specific elements or uses sums, differences, products, ratios and Boolean operations such as AND or OR between the parameters. If particles with a specific chemical composition are of particular interest, hit classes can be defined and analyzed more extensively.

Grouping particles based on chemical classification



Based on the results of the EDS analysis, particles are sorted into chemical classes as defined in the chemical classification method.

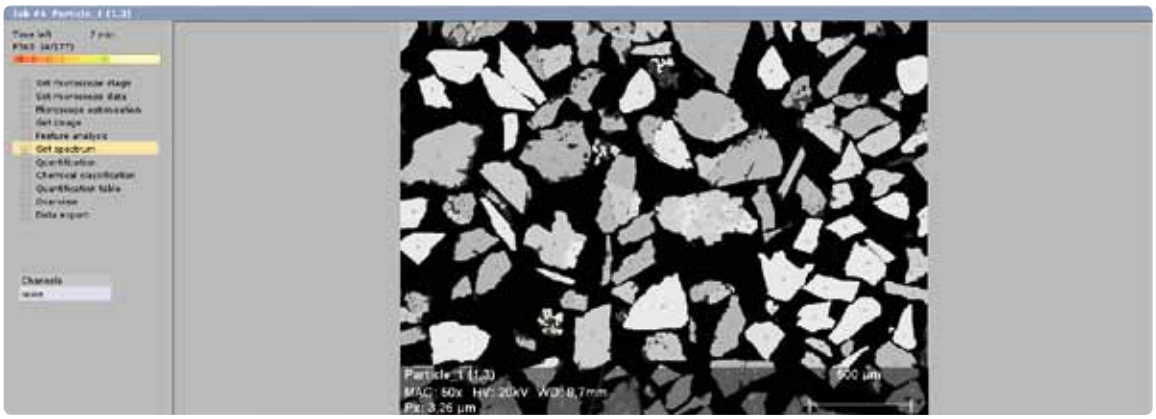
Chemical classification setup dialog

Automation of the Analysis Task

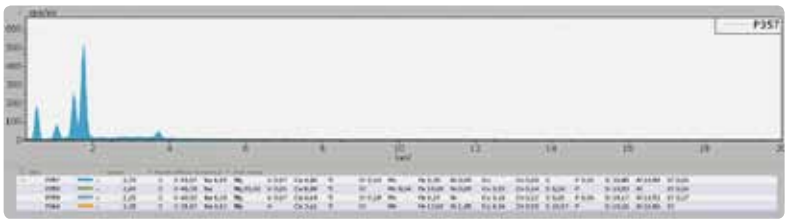
The feature analysis can be automated using the ESPRIT modules StageControl and Jobs. This enables the unattended analysis of larger areas and even multiple samples.

The methods for detection, chemical classification and result handling are all set within the job file.

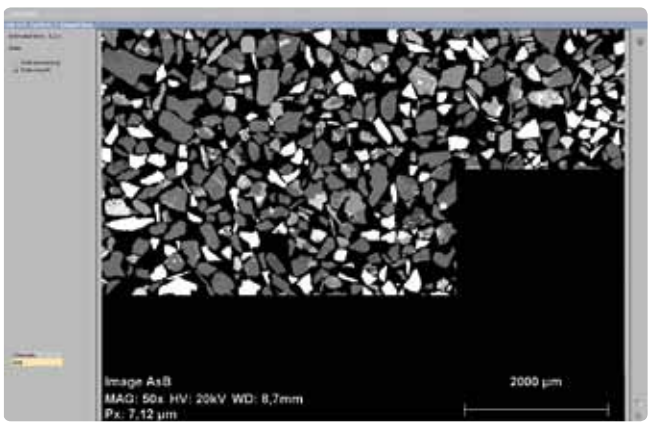
Detection of particles based on different gray leves in the BSE image



EDS spectra acquisition and quantification, chemical classification



Generation of an overview image and result tables



Feature Analysis and HyperMap

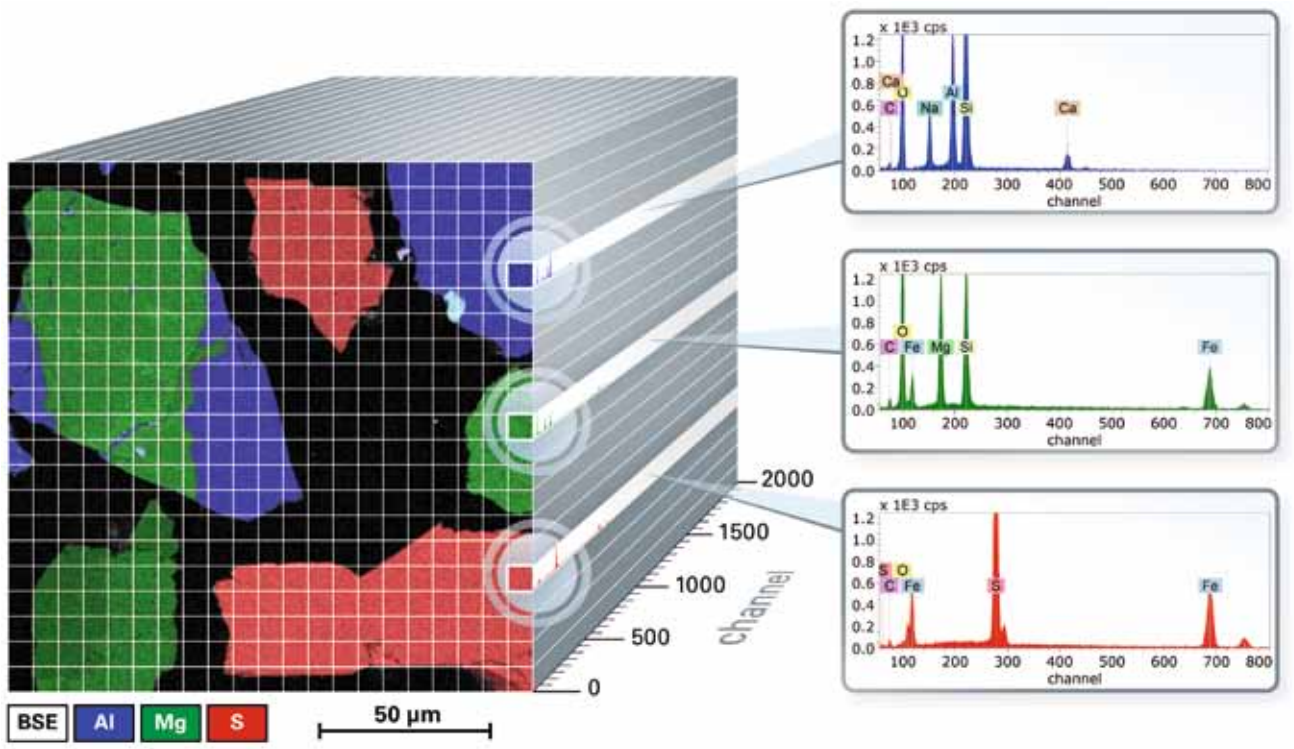
Feature analysis using a previously acquired HyperMap database

A HyperMap database, which contains a spectrum behind each pixel, can be loaded into Feature and used for particle analysis.

Using a HyperMap for setting up the feature detection method is especially helpful, if the BSE image does not show a difference in contrast between two phases, whereas a certain element map does.

By loading the HyperMap database in Feature, it is possible to manually mix in different element maps to allow contrast to be biased towards an element of interest, or deselect all element maps to use the electron image.

Using feature analysis on a previously acquired HyperMap database works very fast, because no new data needs to be acquired. The spectra under the particle area are summed up to produce good statistics for the spectrum, followed by a quantification and classification.



HyperMap database containing a spectrum for each pixel

Easy Postprocessing and Result Display

Review and reclassification

The review dialog helps to check or monitor results. Additionally, it is a valuable aid in developing methods for feature analysis and chemical classification. Moving to the next or previous particle or field, the results can be sorted according to classes or even hits. Unclassified particles can be located and evaluated. For a quick reclassification of particles, a new quantification routine, an additional class or even an alternative chemical classification method can be set up within this dialog and the reclassification can be executed without the acquisition of new spectra. If Jobs was used to cover a larger area of the sample, the review function allows to reconstruct a panorama image to help locate particles in different fields.

Feature review menu

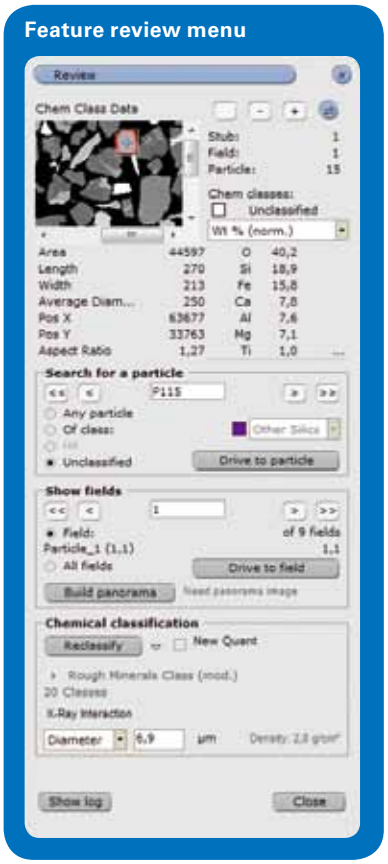


Chart and reports

The results of the particle analysis can be displayed in a number of forms. These include the particle list and images of the analyzed features. The spectra for all particles and a histogram with equally wide bins or ranges are also displayed. Furthermore, a binary or ternary chart with selectable parameters is available. The ESPRIT Report module can be used to automatically generate the final report.

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