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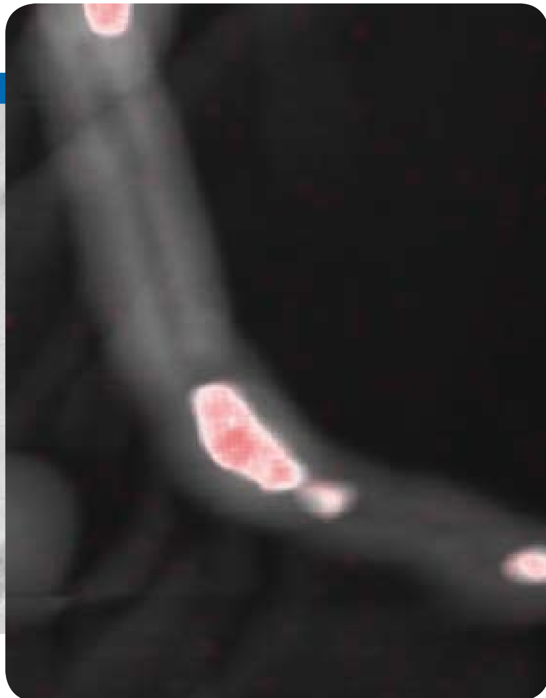
Bruker Nano



QUANTAX TEM

- Energy-Dispersive Spectrometry for (S)TEM

think forward

EDS

The XFlash® 5030 T

QUANTAX TEM combines the speed and accuracy of the XFlash® 5030 T Silicon Drift Detector with the latest generation ESPRIT software to provide excellent performance in qualitative and quantitative energy dispersive microanalysis in (scanning) transmission electron microscopes (TEM/STEM).

The XFlash® 5030 T, especially designed for operation on (S)TEMs, features excellent and stable energy resolution that supports optimum light element performance.

Due to Bruker´s advanced SDD technology, the detector is operated at temperatures around -25 °C, which are easily achieved using a simple Peltier cooler. This makes the detector ready to use within 1 minute after switching it on. It also guarantees absolutely vibration-free operation, avoiding any disturbance at the (S)TEM.

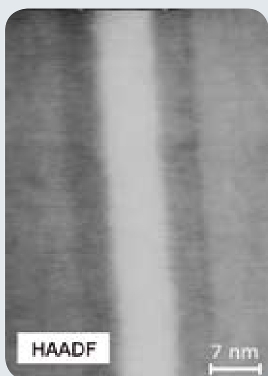
The special design of the SDD chip results in unmatched count rate capability that supports immediate data acquisition and allows the user to perform high-speed analyses.

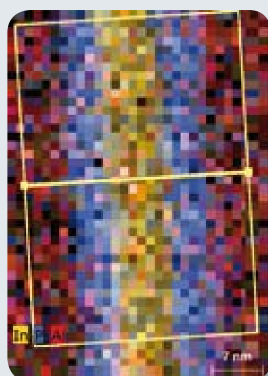
The position of the XFlash® 5030 T in the TEM is optimized to achieve a maximum solid angle.

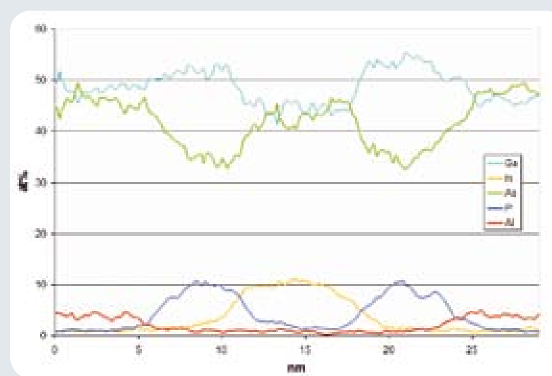
Hybrid pulse processor

Bruker's powerful hybrid signal processing electronics, especially developed for XFlash® SDDs, ensures that the superb collection capabilities of the detector are properly exploited and guarantees extremely fast analysis results.

HAADF image, selected element distribution (binned 8x8 pixel for quantification) and elemental profile of a multi-layer for quantum well research. AlGaAs (P, In) as desposited: AlGaAs, 5 nm GaAsP, 7 nm InGaAs, 5 nm GaAsP, AlGaAs. The raw data for the 244x342 HyperMap was acquired within 6 minutes using a 0.7 nm spot at 200 kV.

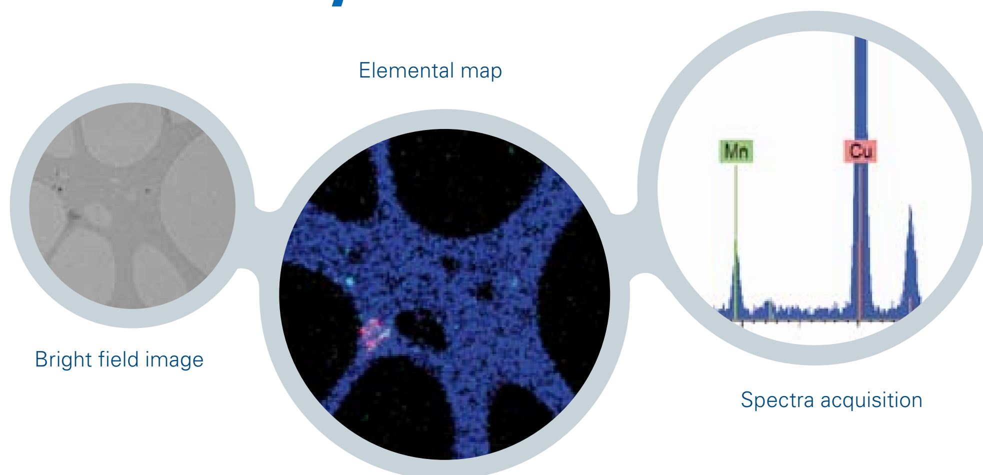






Sample courtesy of G. Tränkle, Ferdinand Braun Institute (Berlin) and A. Mogilatenko, W. Neumann, Humboldt University (Berlin).

ESPRIT analysis software



Elemental map

Bright field image

Spectra acquisition

ESPRIT provides the full range of analytical functions for X-ray microanalysis in transmission electron microscopy. For TEM this includes qualitative and quantitative spectrometry. For STEM multi-point analysis, line scan and mapping are additionally available.

The analytical functions are complemented by modules for fast system calibration, image acquisition and processing, as well as a powerful report generation tool with Word export. Also available are versatile automation features to run unattended analyses.

Qualitative analysis

Utilizing the world's most comprehensive atomic data library, ESPRIT ensures accurate automatic element idenfication. Bruker's database now contains 250 new L, M and N-lines below 4 keV, as well as revised line intensities, especially in the critical low energy range.

A powerful interactive or automatic element identification is also part of ESPRIT's versatile software tool for spectra acquisition and qualitative analysis.

Quantitative analysis

ESPRIT's software for quantititative analysis in TEM includes ESPRIT CLQuant. This tool supports both standardless and standard-based quantification of thin layers at high acceleration voltages according to the Cliff-Lorimer method and features:

- quantification using theoretically calculated Cliff-Lorimer factors
- quantification using Cliff-Lorimer factors determined experimentally from a suitable compound standard
- editable Cliff-Lorimer factor tables and charts
- calculation of the background based on a physical model specific to TEM applications.

Line scan

The intutitive ESPRIT software suite offers both qualitative and quantitative line scan options. ESPRIT Line permits the ultra-fast acquisition of spectral line profiles for any number of elements with the spectral database being saved. A fast and reliable quantitative evaluation of line scan spectra databases is provided by the software tool ESPRIT QLine.

Cliff-Lorimer method

The Cliff-Lorimer method is dedicated to the quantification of homogeneous thin films of a thickness below 0.1 µm and high electron energies. This predestines it for use in TEM. The method relies on calculating the concentration of two or more elements in relation to each other under consideration of their X-ray intensities (counts) and an element specific k-factor (Cliff-Lorimer factor). This factor can either be determined theoretically (from models of electron beam-sample interaction) or experimentally using standards.

ESPRIT Mapping Tools

QUANTAX's extreme speed and functionality permit excellent element distribution images to be collected within minutes. A variety of mapping options ensures that you find the right tool for your application.

ESPRIT Map

ESPRIT's basic qualitative mapping tool permits ultra-fast digital element mapping for any number of chemical elements.

ESPRIT QMap

Reliable quantitative element mappings can be easily obtained with ESPRIT QMap.

ESPRIT HyperMap

HyperMap is Bruker's position-tagged spectrometry (PTS). With this technique a complete spectrum is acquired and stored for each pixel of the map. This allows offline analysis at any time during or after the acquisition. In addition it provides functions for creating sum spectra of arbitrary regions in the map.

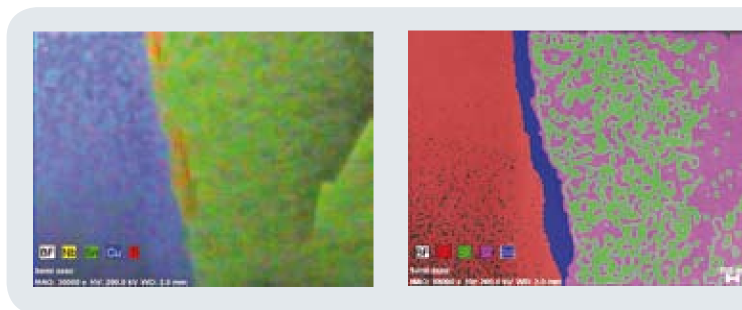
This is particularly useful for low count rate situations and fast data acquisition, as it can deliver better statistics and reliable quantitative results under these conditions.

ESPRIT Autophase

ESPRIT Autophase is a very efficient tool for phase analysis. It determines which phases are present in your sample using principle component analysis. This tool compares the element composition, intensity and quantitative results of an existing map and combines identical or similar pixels to one phase. Along with a sum spectrum, the composition and area fraction of each phase are calculated and displayed.

Maximum Pixel Spectrum

Maximum Pixel Spectrum synthesizes a spectrum out of the highest count value in each spectrum channel. It is an efficient tool to find the smallest traces of an element, even if it is only present in a single pixel of a HyperMap.



Element map (left) and Autophase results (right) of an intermetallic phase junction. Analysis performed in a STEM at 200 kV (scale bar 200 nm). While the element map indicates variations in composition, it is the phase analysis that helps to distinguish between projection effects and different phases.

All configurations and specifications are subject to change without notice. Order No. DOC-B82-EXS006, Rev. 1.
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