Integrated, Flexible and Successful Solutions for Scanning Electron Microscopy
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SCANDIUM - THE CONCEPT

SCANDIUM

Universal SEM Imaging Platform

Doing things ‘the digital way’ is spreading throughout the entire field of microscopy. Software-controlled microscopy is the catchphrase. The new opportunities now available have revolutionized the way people work at the microscope and the entire world of the laboratory. In conjunction with image processing software, scenarios once thought impossible are now becoming reality. Images and data can now be digitally acquired, transmitted, saved and analyzed, maximizing efficiency. Microscopes can be completely automated, remote controlled and included in comprehensive workflow structures. That is what exploiting digital technology to the fullest is all about and where Scandium comes into play, the SEM imaging platform.

Clearly structured

Scandium is systematically oriented towards the requirements, needs and workflows of the scanning microscopy field. This software sets a new standard of excellence with enticingly simple, yet intuitive user operation, a range of functions that interact perfectly and a structure that is flexible and modular. The platform offers enormous latitude regarding image and data display. It ensures effective data processing of spectra and images in multiple dimensions.

Practical

With a mere click of a button, images are transmitted from microscope to Scandium. Images are correctly calibrated automatically and include all microscope parameters. Within Scandium, the data can be processed, analyzed, archived and documented. Managing all results is done via an integrated archive and a report generator allowing for professional presentation of results.

Universal

Scandium is based on analySIS® FIVE. This offers the user significant advantages. With other analySIS® versions on the network and the appropriate licensing, users have mutual access to each others’ data. Users’ workstations and microscopes can all be interconnected. Comprehensive workflow structures linking individual microscopes and workstations can be set up.

Expandable

The base version of Scandium is easily expandable via solution-oriented software extensions, referred to as Solutions for this very reason. Solutions expand the range of available functions and are finely tuned for specific tasks in the field of scanning electron microscopy.

Desktop Licences

For every Scandium first license, additional desktop licenses can be purchased which are identical to the first license, aside from the image acquisition capability. The advantage for the user is being able to work in exactly the same way as if at the microscope. The key difference being, the user is not at the microscope taking up costly time. And any data the user requires can be accessed via the integrated network database.
ACQUISITION

Scandium pushes the envelope with its clearly structured and ergonomical window alignment, configuration and display features for images and data - and it is very user intuitive. A mere click of a button and the images generated by the SEM are transferred to the computer with correct calibrations, a basic requirement for more advanced work with the images.

Image transfer
Transferring images is extremely simple. Just a click of a button, and the image along with all current microscope data is transferred to the image gallery. Scandium offers various options for transferring images, each requiring just one click of the mouse. It does not matter whether the image is transferred directly from the SEM or acquired using an external scanning interface. The easiest option is transferring images into the Scandium image gallery. Successive images are automatically written to the next available image buffer. Images may also be automatically transferred to an integrated database. In addition, all image and microscope data are automatically transferred with the image. Another option is taking images and microscope data to automatically create an impressive report. Template selection is the user’s choice.

Controlling the microscope
Scandium offers - depending on the type of microscope - software control of a wide range of microscope functions. These include the motorized stage of the microscope which is an essential requirement for automation of complex processes. One example would be generating an overview image using the panorama-image function.

Microscope information included
For each image and graph transferred to the computer, Scandium reads out all available microscope data as well. This information is called XMI data (eXtended Microscope Information). It documents the microscope acquisition settings and is displayed in a user-friendly way along with other image information. When an image is inserted into a database, all data is automatically transferred to the corresponding database fields. These fields can be linked to a report template and when it comes time to generate the report, the fields are filled out automatically.

Data bar
All image and microscope data are displayed in a data bar, which does not cover any part of the image. Users define what data is to be shown in the data bar making it very convenient to keep an eye on currently selected settings. This databar is added to the images when this is saved.

Image stacks
Image series can be loaded as stacks. Scandium supports a multi-dimensional image format such that a single image file can contain multiple images acquired at various Z positions or at various times. Images in this format can be loaded into Scandium, further processed and visualized accordingly.
Scandium offers many options for post-acquisition image enhancement. These include a large list of filters, visualization tools and a special measurement user interface.

Filtering

The standard image processing filters for monochrome and color images are integrated with Scandium as predefined or user-definable functions. In addition, Scandium offers many specially developed tools and filters which open up completely new image and data processing opportunities. For instance, the software offers special noise-suppression filters such as sigma and rank filters along with the DCE filter for improving local contrast enhancement.

Intensity operations

Scandium offers many options for post-acquisition image enhancement. These include adjusting contrast and brightness, gamma corrections, various options for equalizing intensity differences. Also included are functions like resolution modification, rotation, reflection, bit depth alteration and aligning two images simultaneously. Furthermore, after thresholds have been set, images can be phase analyzed.

Arithmetical functions

Using the operands box positioned between the Multiple ViewPort Manager and Image Manager, numerous image processing operations can be performed. This makes it very simple to connect images with other images, masks or constants - arithmetically or logically.

LUTs

In Scandium, Look-Up-Tables (LUTs) can be applied to images. These are for taking monochrome images and turning them into false-color images - in a precisely defined way. With 16-bit images, users can interactively define how they’re displayed. There is an image pocket calculator for making it easy to define even complex connections between images. It can be used for both arithmetical and logical connections.

3-D surfaces

Using height and texture information, the 3-D surface functions available within Scandium calculate, visualize and animate realistic-looking three-dimensional views. Animated sequences may also be saved as AVI files.

SliceViewer

Scandium includes a tool for visualizing and animating three-dimensional data. The SliceViewer provides 3-D visualization of image stacks. Users can move about interactively within the 3-D visualization and then have the entire process animated from the desired perspective. The single view offers display of both the XYZ slice as well the individual component slices. Any view generated can also be directly copied into an image buffer. The SliceViewer’s multiple view shows all four views within a single document. The XYZ view may also be animated. The respective projections are updated corresponding to the data selected in the XYZ slice. This view may also be simply copied into an image buffer.
MEASUREMENT

Scandium features a unique measurement environment suitable for interactive measurement tasks and dimensioning.

Measurement interface

The measurement user interface consists of the “Measurements” tab where all settings are made – such as selecting measurement parameters, switching on online statistics and deleting measurements. All measurements conducted are shown in a clearly structured tree control. Measurement lines, measurement objects and measurement values appear in color in the image. There is a direct connection between measurement results and the image – and the measurements on multiple images can be combined in one result. The user-defined online statistics provide immediate information on the respective precision and dispersion of the measurement results. Measurement results and statistics can be shown in sheets and can be displayed as a diagram or via a graph for more extended processing routines. Measurement results and graphics can be automatically saved in the database archive or inserted into reports. And of course, sheets can be exported into MS Excel with just a click of the mouse.

Spectra

Scandium provides the Graph window for displaying, processing, and evaluating one-dimensional data like EDS spectra. Numerous filters are available for preparing this data. The actual graphs can be labelled and displayed with a variety of views. Evaluation functions offer users more advanced data processing. Graph supports a variety of spectrum file formats and can display multiple spectra in a single window.
ARCHIVING

The database integrated with Scandium offers management of images and spectra, sheets, diagrams, reports and other files. Some of the attractive features this database has to offer include its tremendous flexibility, ease of use and quick access to data.

Database assistant
When setting up a new database, there’s a helpful database assistant to guide users step by step. The entire database structure can be defined with minimum database expertise. For much of the relevant data - such as image information and dates - there are predefined database fields that users can add their own fields to. The database assistant offers various templates to use as the basis for individual solutions (e.g. for managing client orders or entire projects).

Truly flexible
Users will find that filling out various fields is a lot easier with pick-lists or default entries. This also diminishes the possibility of error. Fields can be filled out automatically when inserting series of images.

Data fields
Alongside predefined database fields, users can define their own individual fields and categories. Microscope-relevant fields are automatically filled out when images are inserted. Any field can be used for database queries, entering data or displaying results. Users define which fields are visible and in what order - for all views (form, sheet, query, info query, insertion). So users can compose their database according to their own precise requirements. Database fields can also be defined as mandatory - i.e., when an image is inserted, they must be filled in.

Views
There are a variety of views available for this database. The full view offers both a sheet view and a gallery view. Users can select a structure bar and a gallery bar making it easy to select the perfect view for the task at hand.

Queries
The database offers fast, high performance query functions with logical connections of database field contents and the use of wildcards. Via the sample filter, users can conduct simple queries for contents of multiple fields (via logical AND). Free query functions support complex queries and SQL query syntax is also supported.

Networkable
This database was developed with network use in mind. Data can be saved on a central database server giving all users simultaneous access to all network data. The speed with which data can be accessed can be optimized using thumbnail-storage concepts. This ensures fast and efficient use of database content without using too much network capacity.

Data backup and access
The integrated database supports data backup and external data storage. There are assistants to help users out here as well. This provides users with both premium data security and accessibility - without having to pay ‘through the nose’ for a separate and expensive IT concept.
REPORTING

The integrated report generator makes report creation easy, fast and convenient. Users have the multifaceted range of functions offered by a layout program combined with the efficiency of word-processing software - all at their fingertips.

Documentation
The report generator in Scandium is template-based and offers a broad range of options for conveniently and fast creation and management of reports and images. One decisive advantage is the time users save making reports - in particular, because of document automation. The integrated report generator has all the features usually available in separate software programs for creating layouts and processing text. Multi-page reports with different types of pages can be interactively or automatically created and filled with the relevant images and related data. Data can be dragged from the Image Manager or database or be taken directly from an acquisition.

Creating templates
Reports are based on user-definable templates. Templates can be defined by individual users or for entire workgroups. The report generator supports all graphical elements such as images, sheets and diagrams. Text fields can be filled out automatically with database field content or analysis results. A full-fledged text editor and numerous graphical features are included along with an autotext function - for page numbers, dates, etc. In addition, positioning aids simplify creating templates. Another advantage is that a variety of layouts for cover page, sheet pages, image appendices and conclusions can be used. Creating reports from multiple report templates is simple.

Drag & Drop it
Inserting images and other information from the database into reports is very user-friendly. Images and image information can be automatically inserted into predefined image elements and fields. Database fields linked to templates are filled out automatically at specific places in a report.

For presentations
The following functions are just a few of the options available for image display: standard magnifications, digital post-acquisition magnification, digital image clipping, mouse control selection of image segments, digital zoom function, image rotation, scale bar on/off and zoom indicator. Multi-level digital zooming permits users to highlight important details without losing sight of the 'big picture'. Successive, multi-level zooms are also possible. Each zoomed area can have its own frame, magnification indicator and scale bar.

Efficiency
The report generator also works with preview images and images that are embedded or referenced. This ensures that making reports is fast and image resolution is optimal. Reports can be exported as RTF files or directly transferred to MS Word. Outputting reports can be with or without image compression. And reports can be viewed by any network user using the analySIS® Viewer (which is free of charge).

Digital delivery - right now
Reports can be e-mailed right in Scandium. And reports can be managed via database.
SCANDIUM SOLUTIONS

Scandium can be further expanded according to your individual needs via a wide range of specially developed solutions. Users can thus put together their own personal software solution for dealing with their particular application. All solutions work together seamlessly. The list of the available solutions is growing continually.

Scandium Solution Automation – The Scandium Solution Automation supports fully automated positioning of the motorized microscope stage. Dies on structured wafers and lithography masks can be addressed directly.

Scandium Solution Detection – The Scandium Solution detection offers automatic, fast and flexible particle detection and classification.

Scandium Solution Height – The Scandium Solution Height is for generating and measuring surface height and roughness information.

Scandium Solution Metallography – The Scandium Solution Metallography combines various functions for analyzing metallographic samples quantitatively.

Scandium Solution Metrology – The Scandium Solution Metrology offers sophisticated metrology tools like CD-measurements.

Scandium Solution Volume – The Scandium Solution Volume offers display and navigation through FIB/SEM image stacks and high-performance software for 3-D voxel reconstruction, display and evaluation.

Scandium Solution X-Ray – The Scandium Solution X-Ray combines the Scandium platform with EDS microanalysis systems. The electron beam position for the spectrum acquisition can be selected manually or can be taken from the particles detected by the Scandium Solution Detection.

SEM hardware solutions – The ADDA is a solution for those with older, analogue scanning devices (SEM, STEM) yet requiring a digital, image-acquisition system.

System Diagram