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XL30 S FEG
Scanning Electron Microscope



- **In-house Schottky emitter**
- **Dedicated lens mode for low-kV operation**
- **Compact in-the-lens detector**
- **Low kV back scatter imaging standard, including energy threshold setting**
- **5 Axis motor stage**
- **Excellent short and long term beam current stability**
- **Optimized EDX mode**
- **Computer optimized alignment procedures**
- **Optional BF/DF STEM detector**

The XL30 S FEG is a top performing Schottky emitter based immersion microscope that suites the needs of users in material science, life-science, semi-conductor FA and process development labs.

The system is optimized for operation at low kV, allowing un-coated and isolating materials to be examined with minimum charging. Operation of the system is very straightforward and simple as a result of the software coupling of many parameters and the computer assisted column alignment. Therefore it is easy for new users to get optimum results in a very short period of time and without going through an extensive period of training. The flexible and fast choice of the primary parameters leads to fast and excellent results.

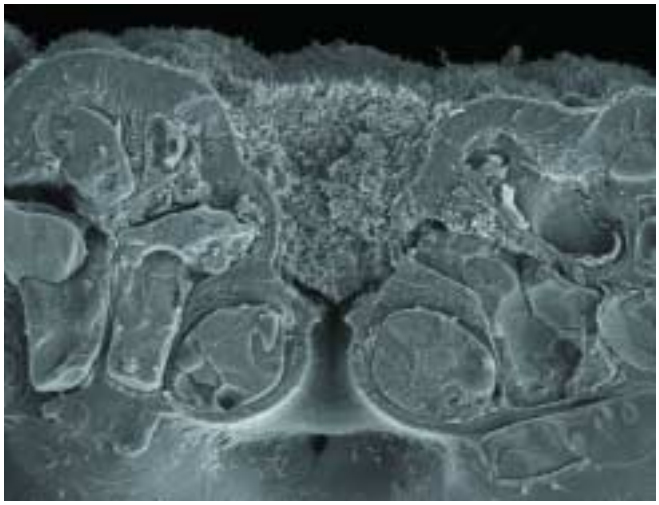
FEI's in-house Schottky technology offers excellent beam stability, both short and long term. With the HexaLens concept, the emitter is kept at a constant condition with beam current control obtained by condenser lens operation. It is therefore stable, fast and easy to operate via simple menu selection.

The detector system is build within the final lens and includes a backscatter mode that allows imaging of Z-contrast, even at low kV and high scan

PHILIPS



Cryo-fractured DMPC emulsion



Cryo-fractured cross-section of Pine needle stomata

rates. With a selectable energy threshold this imaging mode can be further optimized. The conical shape of the final lens and the use of TLD/SE/BSE allows tilting of the sample at short working distances, and in many cases the user thus avoid compromising WD and tilt imposed with lens fitted detectors.

One new and important accessory is a dedicated BF/DF STEM detector which allows a high magnification imaging of thin samples, for example, made from FIB cuts in addition to or prior to regular TEM examination. A multiple holder for standard 3 mm grids in combination with the capability to do BS imaging and fast X-ray sub-micron mapping at high magnifications, turns this system into a very valuable high resolution analytical tool.

Finally, the total system software includes many user friendly functions such as compucentric rotation, user coordinates, on-line measurement, database storage of images and the MS-Windows NT operating environment system ensures compatibility with networking and other regular software packages.

ELECTRON OPTICAL SYSTEM

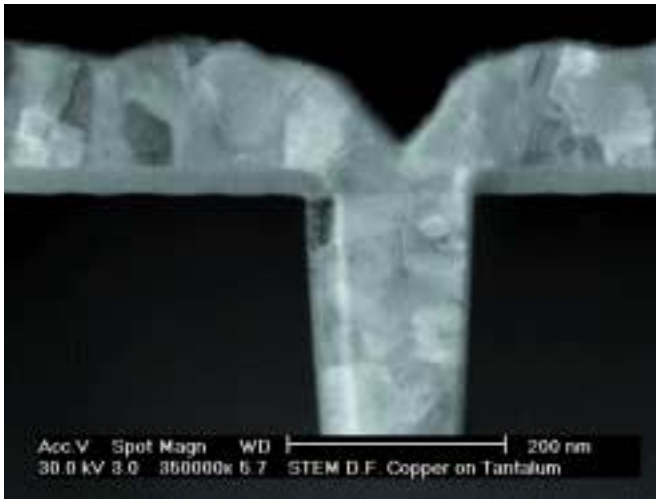
Gun
Schottky based field emission gun. Gun configuration control fully automatic. Optimised for total voltage range.

Alignment
Computer assisted alignment allows free choice of spot size and high voltage without the necessity of re-aligning the system.

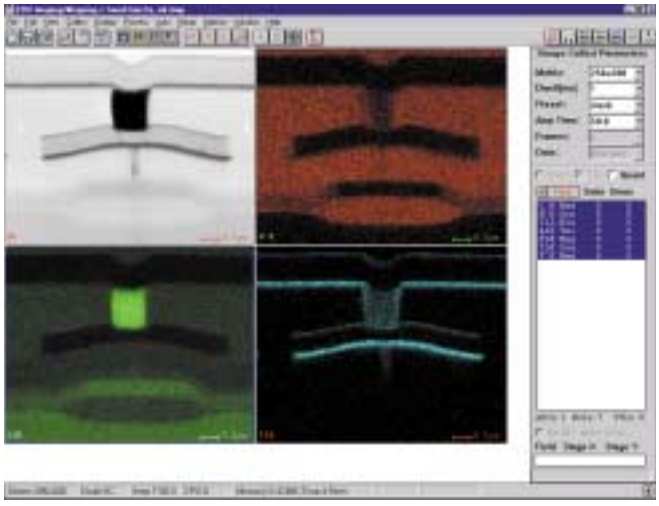
Resolution
1.5 nm at 10 kV or higher and 2.5 nm at 1 kV.

Continuously Variable Accelerating Voltage
Over the range 0.2 - 30 kV. Fast and easy change of required kV. Focus compensated.

Beam Current Control
Adjustable in seven steps under software control. Beam current range <1pA to >25nA.



DF STEM image of Copper layer on Tantalum layer on SiO_2



EDX high spatial resolution maps taken while in STEM mode

Hexalens column
Software assisted electronic alignment procedure. Focus range between 1 - 45 mm dependent on mode of operation. Autofocus standard. Dedicated mouse function for manual focus,
with focus sensitivity adjusted to magnification. Dynamic focus for tilt angles +80 degrees.

Multiple Objective Lens Aperture
Click stop mechanism for user selectable apertures. Standard strip aperture with seven positions. Selectable and alignable externally.

Stigmators
Autostigmator standard. Manual control of X and Y simultaneously. Visual indication
of actual setting. Sensitivity automatically adjusted to magnification.

Continuous electronic image shift
Total range for both X and Y 40 µm in High Resolution mode. Sensitivity adjusted to magnification. Direction always consistent and independent of scan rotation.

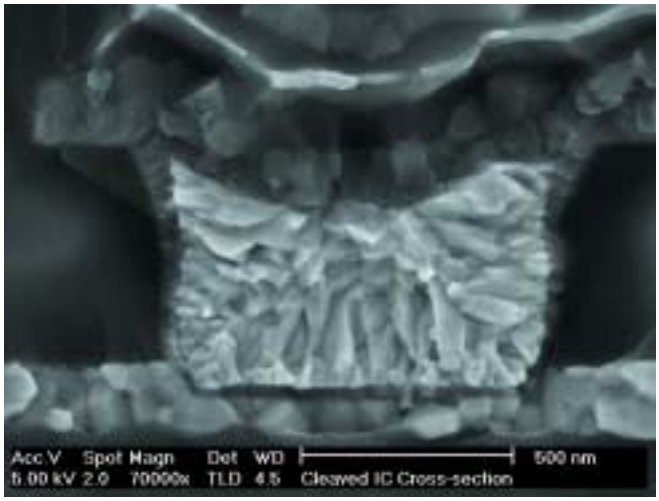
SCANNING SYSTEM

Magnification Range
(related to image width of 12 cm) 20 to 800,000x. User defined presets, stepped and continuous control. Selected magnification value independent of working distance. Trackzoom and automatic scaled µ-marker. Magnification consistent with selected output medium. Standard on-screen X and Y measurement.

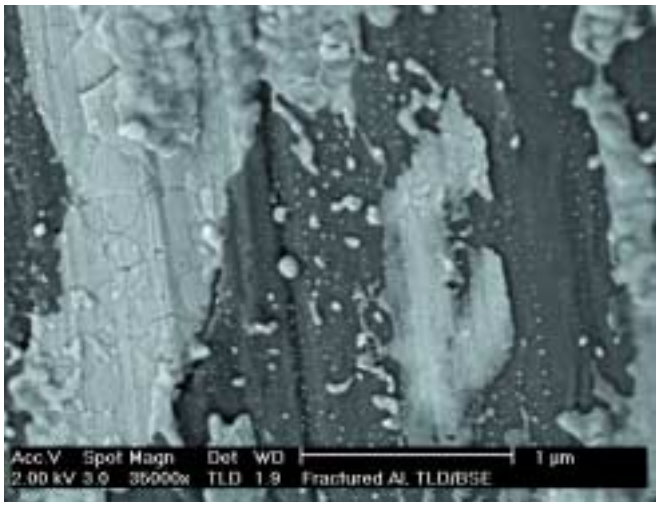
Scan rotation
At all available scan rates including TV Scan rotation from -180 to +180 degrees.

Survey Mode
User selected region of interest automatically centred, followed by power zoom to required magnification. Image conditions and position can be stored and labeled, then survey resumed.

Scan Modes
Full frame, selected area, horizontal line, spot. Built-in low pass filter automatically adapted



Cleaved cross-section of IC



Through-Lens-Detector BSE image of fractured Aluminium

to selected line time and magnification. Size and position of selected area user defined. Optional external scan mode. Split screen, dual magnification and dual detector modes.

Scan Generator

TV plus 4 user preset slowscans including photo-scan available. Preset conditions of linetime and lines per frame can be chosen from > 80 combinations depending on user and or application orientation. Capable of digital line scans for EDX. Chosen conditions are stored until changed. Default values can always be reset.

SPECIMEN HANDLING

Eucentric Goniometer Stage 5 axis Motorised stage (X, Y, R, Z and T) with manual override. Integrated readout on-screen of all movements for motorised stage. Motorised stage supported by extensive software capability including 3 point alignment. Tilt eucentric working distance at 5 mm with optimum detector geometries.

Compucentric rotation

Computerised stage control calculates the off centre rotation for any point of interest. This allows viewing at any angle of rotation the same point of interest.

Specimen movements

X = 50mm, Y = 50mm, Rotation = 360° continuous. Tilt range -15° to +75°, for large specimens 0° to +45°. Z movement: 50mm total Max. free space maximum = 59mm.

Specimen exchange

Drawer type entry, vacuum regained < 5 minutes (typically 3.5 minutes).

Specimen chamber dimensions Inside chamber diameter 284 mm.

ELECTRON DETECTION

In High Resolution mode ET-detector with long-life scintillator for SE and/or BSE. Automatic control of contrast and brightness. TLD detector can also be applied in High Resolution mode.

In Ultra High Resolution mode TLD detector with a balanced-field extraction system and high-efficiency scintillator for low kV detection of both SE



1kV Cryo-fractured Yeast cells showing delicate membrane structure



Uncoated Indium Tin Oxide layer on glass

and BSE. Energy thresholding from low energy SE to BSE. Charge red mode.

IMAGE PROCESSOR

Video Outputs

User selectable displays from a maximum of 8 available images. Convenient TV output at any scan rate. Optional output for second monitor, colour images, Red/ Green stereo, detector coding and image manipulation.

SCSIbus Digital Interface

For internal communication between PC and built-in control processors

Image Storage

Standard definition (SD) image: 702 x 484 pixels (8 bit). High definition (HD) image up to 3800 x 2800 pixels (8 bit) and subsets.

Processing Capabilities

Fast processing: copy image, recursive filtering, integration, image in image selected area display, lookup tables for enhancement, user selected gamma. Graphics, µ-marker and databar with user selected microscope parameters. Enhanced graphics editor standard.

DISPLAY AND RECORDING

Viewing monitor

Choice between following options:

- 17” shielded high-brilliance colour monitor
- 15” high brilliance LCD display
- 18” high brilliance LCD display

second monitor: software controlled optional.

High Resolution Photomonitor

Vertically positioned 7", 2000 line monitor.

Recording Options

Video hardcopy unit, range of cameras. Storage of digital images on hard disk or on floppy disk. Archiving software standard. Digital image store in TIFF format for transfer to other software packages.

VACUUM SYSTEM

Specimen Chamber Oil Diffusion Pumping System

End pressure 10^{-4} Pa (10^{-6} mbar) Edwards DIFFSTAK® pumping assembly: 135 l/sec. Leybold prevacuum rotary pump: 170 l/min. Pirani gauge in prevacuum section; Penning gauge as standard. OR

Turbomolecular Pump System

End pressure 10^{-4}Pa (10^{-6} mbar) magnetically levitated turbo-molecular pump: 190 l/sec Penning Gauge as standard.

Intermediate vacuum Ion getter Pump System

End pressure 10^{-5} Pa (10^{-7} mbar) typical. 25 l/sec. IGP vacuum readout as standard.

Gun vacuum Ion Getter Pump System

End pressure 5 x 10^{-7} Pa (5 x 10^{-9} mbar) typical. 25 l/sec. IGP vacuum readout as standard.

HARDWARE OPTIONS

Specimen Chamber CCD camera fully integrated in SEM display.

Stage Accessory Kit

Multiple stub holder, pre-tilt holder, adjustable clamp, and analytical holders for 25mm and 32mm mounts.

Detectors

Solid state backscatter detector, specimen current detector suitable for both imaging and measuring, CL detector, various EDX detectors, EBSP, STEM.

Cryo Transfer System

'In-situ' investigation can be made on Life or Material Science specimens with the addition of a high quality, high performance Cryo transfer system fitted to the specimen chamber.

SOFTWARE OPTIONS

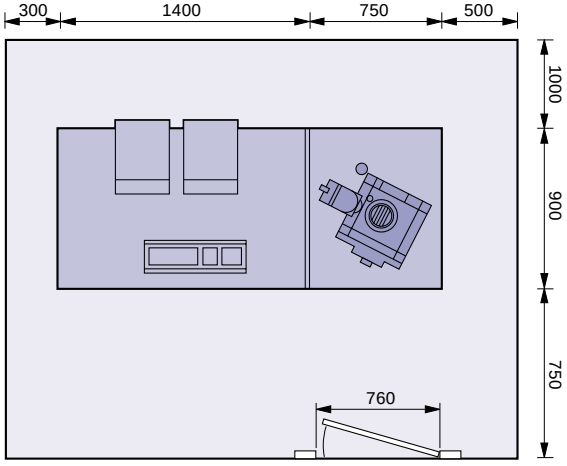
Options

- **Colour enhancement of images and image manipulation**
- **Multi-user software shell**
- **Serial communication software**
- **Embedded EDX system**

Fully MS Windows NT Compatible
Application programs including MS Word, MS Excel and Word-Perfect can be utilised for report writing. The XL software supports 32 bit interfacing, using Windows' DDE mechanism and DDL protocol for communication between Windows based software module.



1kV image of active bonded chemicals on copy paper



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