Hitachi High-Tech

News Release

FOR IMMEDIATE RELEASE

Real-time 3D Analytical FIB-SEM Composite Instrument NX9000 Released

High Precision 3D Structural Analysis Realized with Proprietary Column Configuration

Tokyo, Japan, July 30, 2015 — Hitachi High-Technologies Corporation ("Hitachi High-Tech") announced the release of the real-time 3D analytical FIB[*1]-SEM[*2] composite instrument, NX9000. The new instrument features improved 3D structural analysis precision and throughput.

Observation of surface properties using optical microscopes and SEMs is performed in a wide range of fields from advanced materials and semiconductor devices through to medicine and biology. However, in gaining a more accurate grasp of the true structure of a sample, analysis of its internal structure is becoming increasingly important. FIBs are therefore seeing wider application as an essential tool in cross-sectional SEM observation and TEM[*3] analysis, as they are able to prepare cross sections at specified positions as well as ultra-thin lamellas.
Meanwhile, there has also been significant interest recently in 3D structural analysis by FIB and SEM composite instruments. Automatic repetition of FIB cross section preparation and SEM observation provide a series of cross sectional images enabling 3D structural analysis of a specified microscopic section.

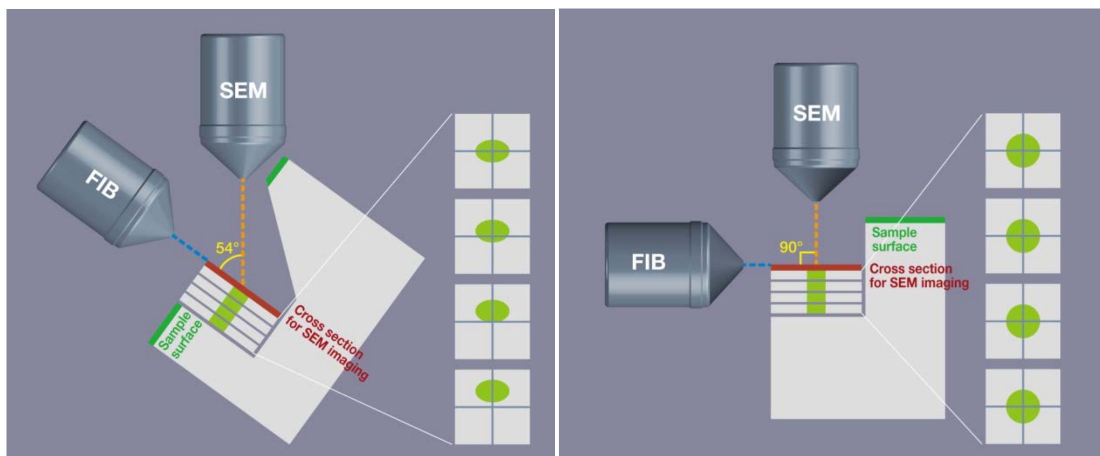
The newly developed NX9000 is the next product to be developed in collaboration between Hitachi High-Tech and its wholly owned subsidiary Hitachi High-Tech Science Corporation following the Focused Ion and Electron Beam System & Triple Beam System NX2000 that was launched in September 2014.

In the NX9000, the SEM column and FIB column are arranged orthogonally rather than the usual diagonal configuration. This configuration is optimal for 3D structural analysis. It avoids the issues that affected conventional FIB-SEM composite instruments, namely shrinking of cross-sectional SEM images and non-alignment of the visual field on recovery of an image series, enabling stable collection of images that faithfully represent the true structure of the sample. A high brightness cold field emission electron source and high sensitivity detection system, which have a well-established reputation among customers, provide high contrast, high resolution observation of a wide variety of samples, from biological tissue to magnetic samples such as steel. Moreover, combining EDS[*4] and EBSD[*5] enable evaluation of the 3D distribution of elements and crystal orientation. These features have made possible high precision 3D structural analysis that had previously been difficult to achieve. The NX9000 will contribute to development of new materials and devices, and new understanding of biological functions.

Hitachi High-Tech plans to introduce the NX9000 at the commercial exhibition of Microscopy & Microanalysis 2015, to be held at the Oregon Convention Center in Portland, U.S.A, from Sunday, August 2 through Thursday, August 6, 2015.

*1: FIB: Focused Ion Beam
*2: SEM: Scanning Electron Microscope
*3: TEM: Transmission Electron Microscope
*4: EDS: Energy Dispersive X-ray Spectrometer
*5: EBSD: Electron BackScatter Diffraction

Real-time 3D Analytical FIB-SEM Composite Instrument NX9000



Comparison of Conventional FIB-SEM and Orthogonally-arranged FIB-SEM

Main Applications

・Orthogonal-beam cross sectional SEM observations faithfully reflects the true structure of the sample
・Can be used on various materials to perform Cut & See*6, 3D EDS**, and 3D EBSD**
・High brightness cold field emission electron source and high sensitivity detection system provide high resolution, high contrast SEM observation
・Highly stable, high precision stage realizes high resolution 3D structural analysis
・Micro-sampling** and Triple beam system** enable preparation of high quality TEM and atom probe samples

＊＊Option specifications
*6: Cut & See: a function that obtains a series of cross-sectional images by automatically repeating FIB cross section preparation and SEM observation

Main Specifications

SEM optics	
Electron source	Cold field emission electron source
Acceleration voltage	0.1 – 30 kV
Resolution	2.1nm@1kV, 1.6nm@15kV
FIB optics	
Acceleration voltage	0.5 – 30 kV
Maximum beam current	100nA
Resolution	4.0nm@30kV
Stage	
Traverse range	X: 0 – 20 mm, Y: 0 – 20 mm, Z: 0 – 20 mm, T: -25 – 45° R: 360° *Stroke length may be limited by the sample-holder
Sample size	6 mm square × 2 mm thickness

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