

FOCUSED ION BEAM (FIB) CAPABILITY



Overview

ZEISS Crossbeam 540 combines powerful imaging and analytical performance of a field emission scanning electron microscope (FE-SEM) column with superior processing ability of a next-generation focused ion beam (FIB).

Ultra-high resolution SEM complemented by EDS capability creates solid basis for an advanced characterisation tool. Focused Ga-ion beam combined with gas-injection system (GIS) and micromanipulators serves as excellent nanofabrication tool for any required sample treatment, modification or handling.

The synergetic of a hybrid system creates new capabilities, accelerates both techniques and makes them more efficient. In particular, in-situ non-destructive SEM control makes milling process more precise and enhances throughput. Consecutive sample FIB slicing followed by in-situ SEM-imaging produces nano-tomography capability. The EDS module enables conducting compositional 3D analytics.

Capability profile

Main applications: nano-patterning, 3D-patterning, cross-sectioning, 3D analytics (nano-tomography), TEM lamella fabrication, device repair and FIB imaging.

This nanofabrication tool is available for collaborative work with academic and commercial clients.

The FE-SEM profits from advanced GEMINI II (40nA) electron optics with fast high-resolution analytics reaching 0.7, 0.9 and 1.8nm at 30, 15 and 1kV, respectively. The analytics part also includes chamber secondary electrons-secondary ions and in-lens secondary electrons detectors, energy selective backscattered electrons detector integrated in objective lens, specimen absorption current monitor and Oxford Instruments Silicon drift detector X-max 80. AZtecEnergy EDS Microanalysis software can be used for elemental analysis of the milled cross-section.

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The nano-fabrication part of the system is based on the Capella FIB column with fully integrated electronics and software, Ga-liquid metal ion source with high current stability. Ion beam patterning parameters can be adjusted in a wide range of voltages (500V-30kV) and probe currents (1pA-100nA). The ion beam resolution reaches 3nm at 30kV.

The system is further enhanced with GIS for 5 sources (Pt, C, SiO_x, XeF₂ and H₂O), electron flood gun for neutralization of positive charges during FIB milling and two micro-manipulators: OmniProbe 400 and Kleindiek MM3A-EM. The former has capability to apply bias voltage.

The SEM-FIB chamber with 18 accessory ports, auto pendulum anti-vibration system and 6-axis motorized super-eucentric stage is accessed via airlock with 80mm gate valve. Integrated plasma cleaner provides an option of in-situ sample cleaning capability. The tool is located on external anti-vibration platform.