TECHNOORG
L I N D A

GENTLE MILL

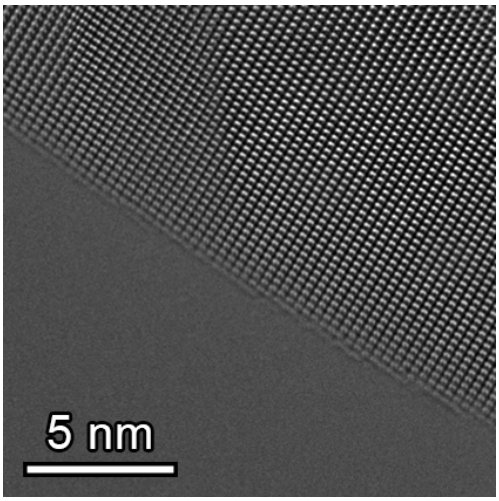
Ion beam workstation for preparing highest quality TEM/FIB samples

- Dedicated cleaning tool for achieving immaculate FIB lamellae
- The lowest energy for the most sensitive samples (0.1 keV to 2 keV)
- Highest-quality sample preparation
- Multistep automated operation

The Gentle Mill series of Technoorg has been designed for final polishing, easy cleaning, and improving of samples previously treated in standard high-energy ion mills or FIB columns. Gentle Mill models are recommended to users who want to prepare **artifact-free** and **damage-free** XTEM, HRTEM, or STEM samples with the best possible quality.

STATE-OF-THE-ART LOW-ENERGY ION SOURCE

The Gentle Mill ion beam workstations operate with an outstanding patented hot-cathode low-energy ion source. The extremely low energy of the ion beam guarantees elimination of surface damage and ion beam induced amorphization. The exceptional construction of the ion source allows the world's most gentle cleaning and the final thinning of the sample using the same device.



C-face sapphire FIB lamella, finished at 16 kV. Technoorg's low-energy ion source effectively eliminates all amorphous and damaged layers.

ARTIFACT-FREE SAMPLE PREPARATION

The Gentle Mill's exclusive capability of producing damage-free samples at low-energy ion bombardment provides unique opportunity to study the real nanostructures in synthesized and natural materials in all fields of technical sciences and materials research.

AUTOMATED OPERATION

The third generation Gentle Mill is provided with full computer control utilizing an easy-to-use graphical interface. All milling parameters including ion source setup, gas flow control, setting of other milling parameters such as sample motion and tilt angle, perforation detection can be stored or pre-programmed in arbitrary number of steps. This fully automated feature allows to produce high-quality samples with minimum user intervention. Gentle Mill is supplied with a software extension for online support, which enables instant error detection and problem elimination via the Internet.

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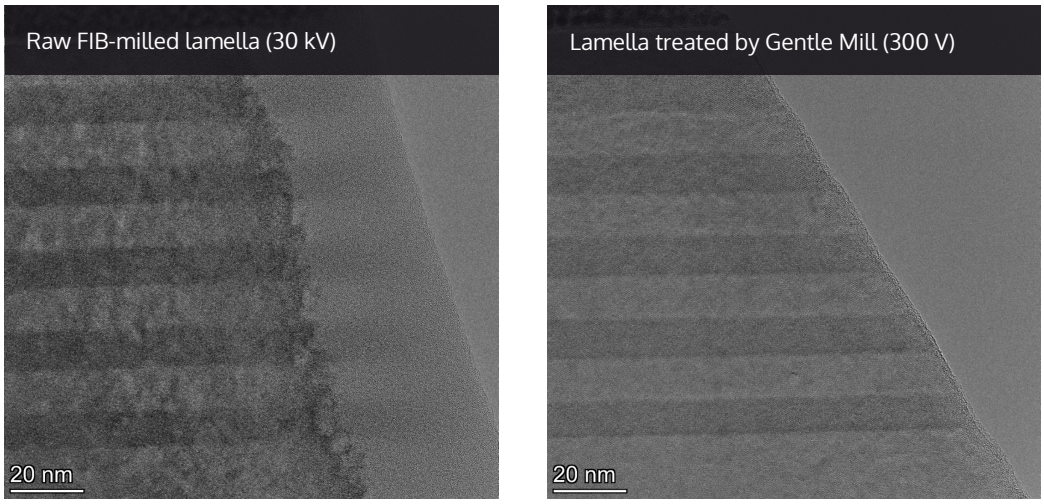

Si-SiGe multilayer heterostructure was treated for 2 minutes on both side to remove amorphous artifacts of the FIB lamella preparation. This reduction in amorphous layer thickness is clearly visible at the edge of the FIB lamella.

SPECIFICATIONS

LOW-ENERGY ION SOURCE

- Ion energy: 100 - 2000 eV, continuously adjustable
- Ion current density: max. 10 mA/cm^2
- Beam current: up to 80 µA, continuously adjustable
- Beam diameter: cca. 2 mm
- Electronically optimized working gas flow
- 28 µm/h milling rate on c-Si at 2000 eV ion energy and at 30° angle of beam incidence

SPECIMEN STAGE

- Milling angle: 0° - 40°, electronically adjustable in 0.1° increments
- Computer controlled in-plane specimen rotation and oscillation (from ±10° to ±120°, electronically adjustable in 10° steps)
- Remarkable thickness range of the accepted TEM samples (maximum 200 µm)

SPECIMEN HANDLING

- Vacuum load-lock system for fast specimen exchange
- Fully mechanical, glueless specimen loading system
- Fast, safe, and easy sample handling during and after the sample exchange.

VACUUM SYSTEM

- Pfeiffer vacuum system with oil-free diaphragm and turbomolecular pumps equipped with compact, full-range Pirani/Penning vacuum gauge

GAS SUPPLY SYSTEM

- 99.999% purity argon gas of 1.3 - 1.7 bar absolute pressure
- Dry nitrogen venting option
- Electronic working and venting gas pressure monitoring
- High-precision working gas flow control

IMAGING SYSTEM

- CMOS camera image for full visual control and milling supervision/termination
- High-resolution color CMOS camera
- Manual zoom video lens of 50 - 400× magnification range

COMPUTER CONTROL

- Built-in industrial grade PC
- Easy-to-use graphical interface and image analysis module
- Easy control of all important parameters by mouse clicking or dragging
- Highly automated operating regime for minimum user intervention
- Pre-programmed or manually set milling and cleaning cycles
- Automatic termination: optical termination of the milling process supported by an image analysis module (detecting the sample perforation or monitoring the surface topography)

POWER REQUIREMENTS

- 100 - 120 V/3.0 A/60 Hz or 220 - 240 V/1.5 A/50 Hz – single phase

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