

# News Release

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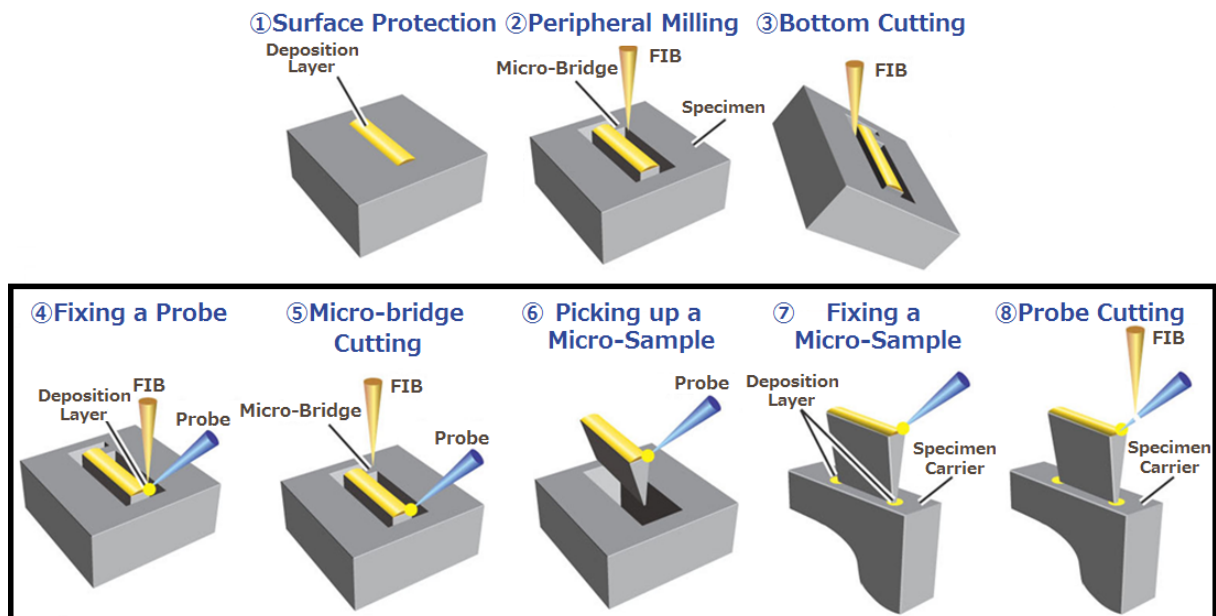
## Hitachi High-Tech has Developed a New Micro-sampling System for Automatic Sample Preparation for Transmission Electron Microscope

— For Higher Throughput Process Evaluation and Failure Analysis of Semiconductor Devices—

TOKYO, Japan, November 5, 2015 – Hitachi High-Technologies Corporation (TOKYO: 8036, Hitachi High-Tech) announces the development of a new Micro-sampling system which realizes automatic sample preparation for Transmission Electron Microscope (TEM). This system allows consistent sample preparation across operators to enable high precision, high efficiency measurement of miniaturizing semiconductor devices in structural evaluation and failure analysis for improved productivity in semiconductor device production.

Micro-sampling technique enables the extraction of micron-order sample, including the part to be analyzed, out of semiconductor wafer using Focused Ion Beam (FIB) and precision probe\*<sup>1</sup>. The extracted micro sample is then thinned by FIB for high-resolution observation and high precision analysis using TEM. Hitachi Group became a leading company in the world to market Micro-sampling system in 1999, and today the system is widely used throughout the world for the process evaluation and failure analysis of semiconductor devices as well as for the analysis of advanced materials.

Micro-sampling consist of FIB processes: (1) surface protection, (2) peripheral milling, (3) bottom cutting, and precise probing processes: (4) fixing the probe, (5) micro-bridge cutting, (6) picking up a micro-sample, (7) fixing the micro-sample to the TEM's specimen carrier, and (8) probe cutting (Refer to Figure 1). While FIB processes from (1) to (3) have already been automated, precise probing processes from (4) to (8) needed manual, skilled operation with attendance of operators for high precision position control in three dimensions.



**Figure 1: Micro-Sampling Process Flow**

New micro-sampling system automates the precise probing processes from (4) to (8), in addition to the FIB processes from (1) to (3).

In the newly developed Micro-sampling system, Hitachi High-Tech's accumulated beam technologies and image processing and matching technologies are employed to realize automatic recognition of probe which was long-standing problem for automation of precise probing processes from (4) to (8). This advancement allows automation of precise probing processes and enables easy extraction of micro sample for TEM analysis without operation skill.

The new Micro-sampling system also allows unattended continuous operation by registering multiple processing positions and fixing position for extracted micro samples. This development increases process volume for higher throughput analysis, contributing to yield enhancement and production ramp of semiconductor devices.

Hitachi High-Tech plans to introduce the new system at the 35th Annual NANO Testing Symposium ("NANOTS 2015") held from Wednesday, November 11 until Friday, November 13 at the Senri Life Science Center (Toyonaka City, Osaka Prefecture).

Automated Micro-sampling system is planned to be applied to Hitachi High-Tech FIB-SEM<sup>\*2</sup>.

\*1: The precision probe is a system to manipulate a sharpened tungsten needle at sub-micron precision using a micromotion mechanism.

\*2: SEM: Scanning Electron Microscope

\*Patents held related to micro-sampling: JP3709886, USP7397051, etc.

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