

AutoTEM 5

Fully automated preparation of high-quality TEM samples with DualBeam, for any user

AutoTEM 5 software enables the fastest and easiest, fully automated, site-specific preparation of the highest quality S/TEM samples for a large variety of materials.

Thermo Scientific™ AutoTEM™ 5 software for DualBeam™ systems provides fast, reliable, repeatable preparation of site-specific, ultra-thin samples for high-resolution scanning/transmission electron microscopy (HR-S/TEM). AutoTEM 5 software is a unique solution on the market supporting fully automated *in situ* lift-out method for a wide range of materials science samples.

Sample preparation for S/TEM analysis is considered to be one of the most critical but challenging and time consuming tasks in materials characterization labs. Conventional methods used to prepare ultra-thin samples required for S/TEM are slow, typically requiring many hours or even days of effort by highly trained personnel. This is further complicated by the variety of different materials and the need for site specific information. Building on more than 25 years of expertise in DualBeam technology, Thermo Fisher Scientific has developed AutoTEM 5 software which significantly shortens the process time for expert users and enables novice users to routinely obtain, highest quality results in less than one hour.

AutoTEM 5 software supports complete, fully automated (unattended) *in-situ* and *ex-situ* sample preparation workflow, including chunking, lift out, and final thinning steps. In addition to the standard top down geometry for *in situ* lift out, AutoTEM 5 supports fully automated fabrication of plan-view and inverted S/TEM samples. In order to achieve the highest quality results, final polishing with low energy ions is required to minimize surface damage on the sample. An automated low voltage final cleaning capability in AutoTEM 5 software ensures creation of ultra-thin TEM lamellas with sub-nm damage layers.

Key benefits

Highest quality S/TEM sample preparation for users of any experience level in less than one hour

Complete *in situ* S/TEM sample preparation workflow, including automated chunking, user guided lift-out and automated final thinning

Fully automated in-situ sample preparation using different geometries: top down, plan view and inverted.

Robust, predictable results for a wide range of material science samples

Highest throughput with fully automated, unattended multi-site *in-situ* and *ex-situ* lift out and auto cross-section capabilities

Highly configurable workflow to enable preparation of challenging samples

Support of all ThermoScientific DualBeams, including Ga FIB and Plasma FIB platforms

Very easy to use, intuitive user interface with hints and instructive graphics

Where manual techniques are difficult and thereby exhibit low reproducibility, AutoTEM 5 software delivers reliable and predictable high quality thin sections, preserving the bulk sample for further analysis at other sites. Highly configurable workflow ensures optimal performance on a broad range of materials—hard, soft, or both—with minimal artifacts. Once a template is selected, the user simply chooses a region of interest on the bulk sample for lamella extraction and defines the position on the TEM grid. AutoTEM 5 software is a unique solution for highest quality TEM sample preparation, and will satisfy the needs of any user – whether high throughput, ultra-thin or lowest damage are the requirements.



Figure 1. AutoTEM 5 software user interface: workflow steps at the bottom and settings on the right side. Intuitive UI with user guidance and instructive graphics helps to create highest quality samples for users with any experience level.

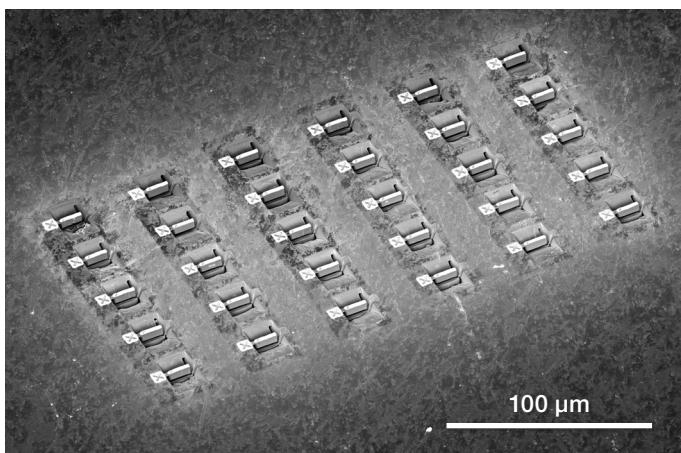


Figure 2.1. Aluminum sample, where a 5x6 array of S/TEM lamellas has been prepared with AutoTEM software fully unattended, undercut and ready for lift-out in 6 hours. The software allows automatically defining the array and shifting individual locations, to more precisely position the lamella.

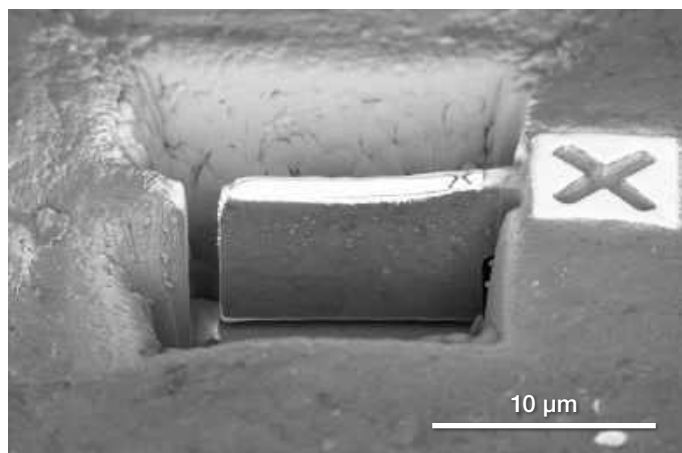


Figure 2.2. Example of a sample after chunking and undercut, ready for *in situ* lift-out. The large fiducial on the side is used for chunking automation, while the smaller one on the lamella will be used later for final thinning automation.

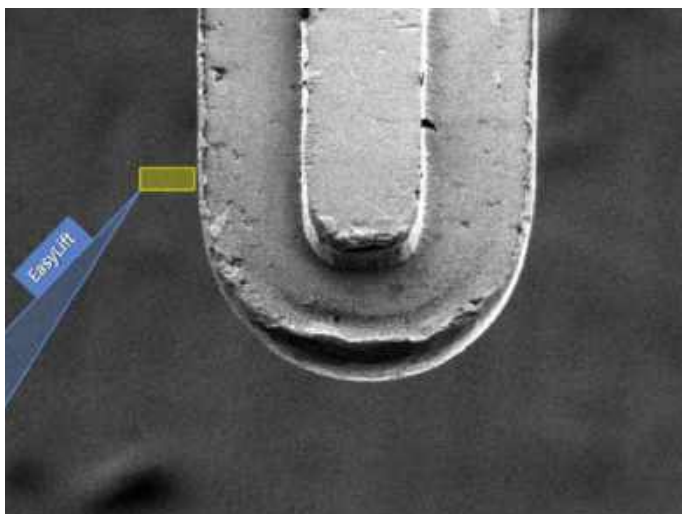


Figure 3. Defining a lamella position on a copper grid for *in situ* lift-out method in AutoTEM 5 software.

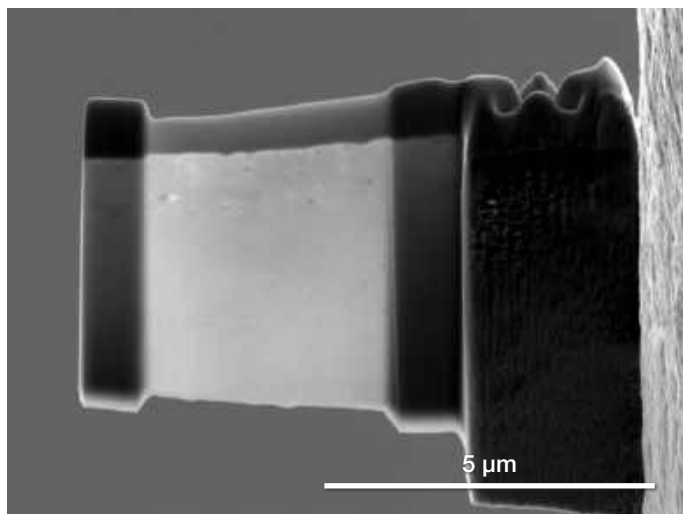
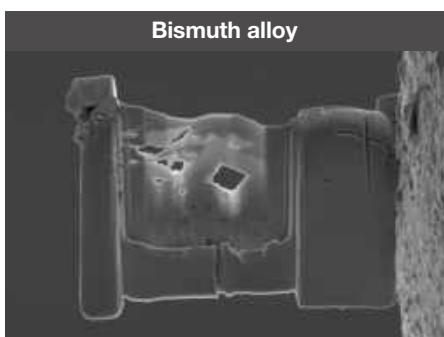
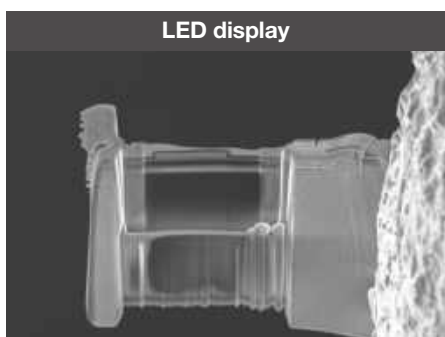


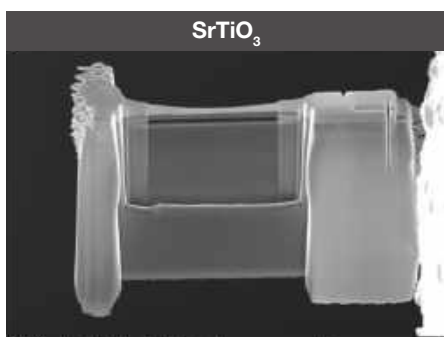
Figure 5. SEM image of a finished lamella, prepared with Auto TEM software from a shot-peened Aluminum sample in less than 1 hour.



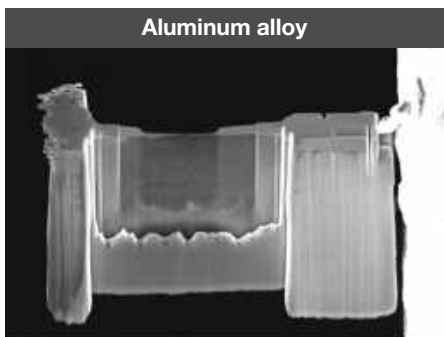
Bismuth alloy



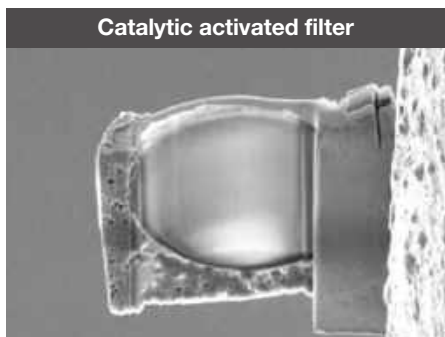
LED display



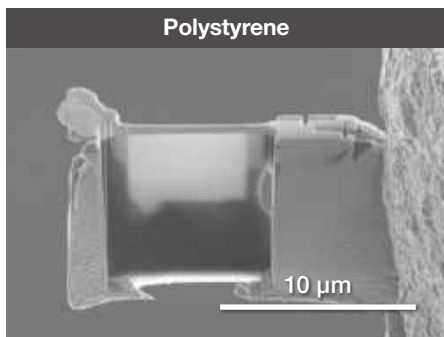
SrTiO₃



Aluminum alloy



Catalytic activated filter



Polystyrene

Figure 5. Examples of TEM lamellas prepared from a wide range of materials using AutoTEM software with DualBeam.

