thermo scientific

DATASHEET

AutoTEM 4

Highest quality TEM sample preparation with DualBeam, for any user

AutoTEM 4 software enables the fastest and easiest site-specific preparation of the highest quality S/TEM samples for a large variety of materials.

Thermo Scientific™ AutoTEM™ 4 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 4 software is a unique solution on the market supporting the 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 20 years of expertise in DualBeam technology, Thermo Fisher Scientific has developed AutoTEM 4 software which significantly shortens the process time for expert users and enables novice users to obtain routine, highest quality results in less than one hour.

AutoTEM 4 software supports a complete *in situ* sample preparation workflow, including fully unattended multi-site chunking, user guided lift-out and automated final thinning. 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 4 software ensures creation of ultra-thin TEM lamellas with sub-nm damage layers. The software includes ex-situ TEM preparation method, which automatically prepares single or multiple samples without operator intervention, significantly increasing the throughput.

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
Robust, predictable results for a wide range of material science samples
High throughput with multi-site ex-situ lift-out and auto-cross-section capabilities
Highly configurable workflow to enable preparation of challenging samples
Full support of both Ga FIB (Scios, Helios) and Xe FIB (Helios PFIB)*
Easy to use, intuitive user interface with hints and instructive graphics

Where manual techniques are difficult and thereby exhibit low reproducibility, AutoTEM 4 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 4 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.

ThermoFisher SCIENTIFIC

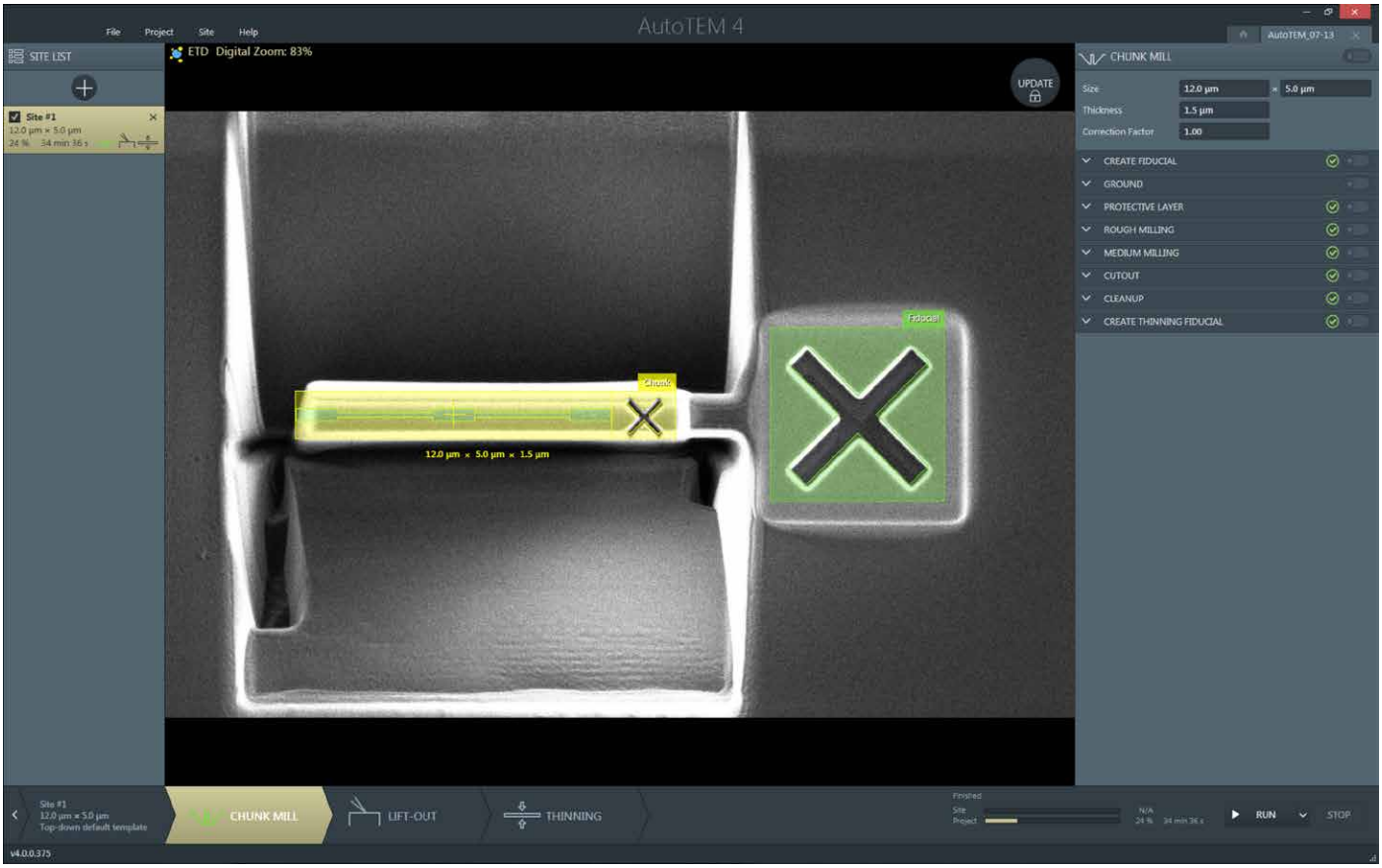

Figure 1. AutoTEM 4 software user interface: workflow steps at the bottom and settings on the right side. Intuitive UI with user guidance and instructive graphics helps to create highest quality samples for users with any experience level.

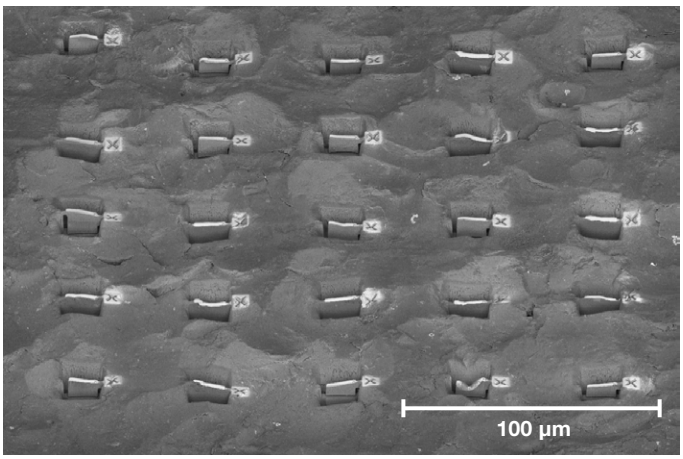

Figure 2.1. Extremely rough, shot-peened Aluminum sample, where a 5x5 array of S/TEM lamellas has been prepared with AutoTEM 4 software fully unattended, undercut and ready for lift-out in 6 hours. The software allows automatically defining the array and shifting individual locations, to more precisely position the lamella (see shifted top-left lamella).

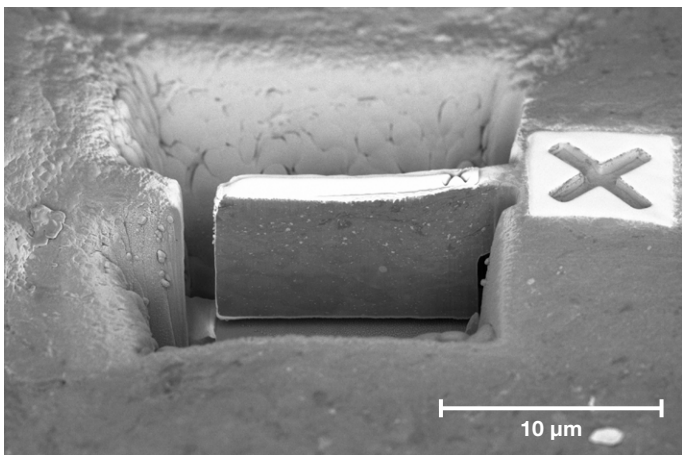

Figure 2.2. Example of a sample after chunking and undercut, ready for *in situ* lift-out. The large fiducial on the side is used for chunking automation, while the smaller one on the lamella will be used later for final thinning automation.

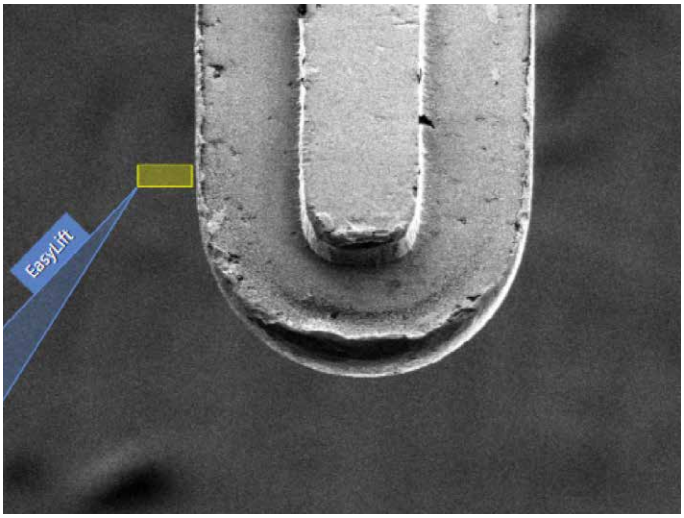

Figure 3. Defining a lamella position on a copper grid during *in situ* lift-out method in AutoTEM 4 software.

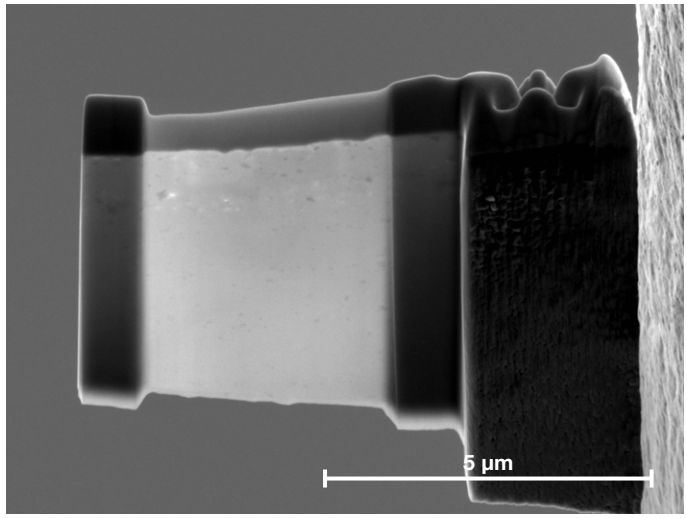

Figure 4. SEM image of a finished lamella, prepared with Auto TEM 4 software from a shot-peened Aluminum sample in less than 1 hour.

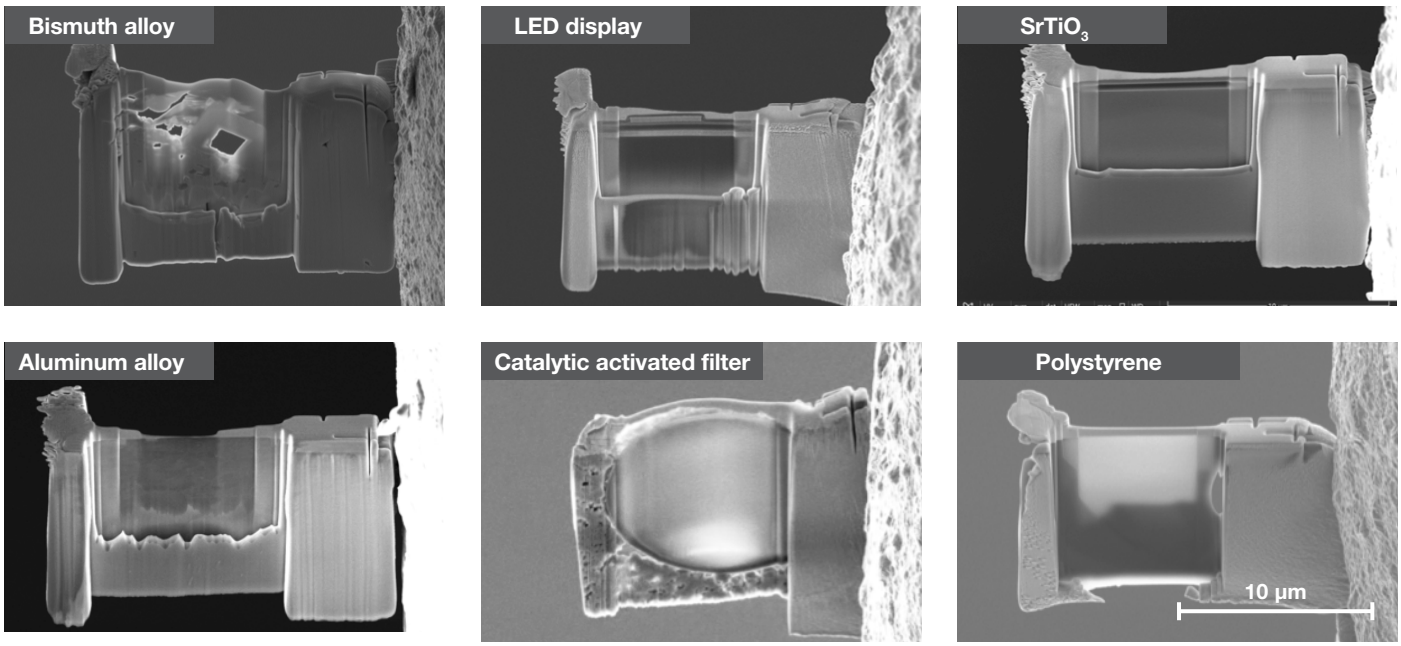

Figure 5. Examples of TEM lamellas prepared from a wide range of materials using a guided workflow with DualBeam.

thermo scientific

		Manual Preparation	AutoTEM 4
Materials	Metals and Alloys (diff. mill rates, roughness)	✓	✓
	Semiconductors	✓	✓
	Polymers and ceramics (charging, beamsensitive)	✓	✓
Process coverage	Chunk milling	✓ Manual	✓ Automated + Interactive
	Lift-out process	✓ Manual	✓ Automated + Interactive
	Final thinning	✓ Manual	✓ Automated + Interactive
	Low energy polishing	✓ Manual	✓ Automated + Interactive
Specifications	Throughput	60 – 120 mins	<45 mins
	High Quality	User dependent	Protocol dependent
	Repeatability	×	✓
User	Experience level	Expert	Beginner

Notes

Find out more at **Thermofisher.com/EM-Sales**

ThermoFisher SCIENTIFIC