

Pico-Second Laser Tool for Producing TEM Lamella Larger Area & Enhanced FIB Productivity

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INTRODUCTION

Preparation of TEM lamella is the critical step in obtaining high quality TEM samples for imaging and analytical analysis. The primary technique used is Focused Ion Beam (FIB) however FIB is not perfect and there are some deficiencies in spite of the engineering developments by users and tool suppliers. A new technique will be presented that uses a pico-second laser tool in combination with FIB to minimize some of the limitations of FIB and to dramatically increase FIB productivity.

The microPREP™ is a pico-second laser standalone tool designed specifically to prepare samples for both scanning and transmission electron microscopy. The power and speed of the laser has been selected to minimize the Heat Affected Zone (HAZ) while maintaining an ablation rate 3 to 4 orders of magnitude larger than a FIB. The speed can be utilized to target regions in the sample not accessible with a FIB. Secondly, the lamella size can be significantly larger than that prepared by a FIB only process. Thus large grain material can be observed or statistically viable data can be obtained by preparing regions of interest 10 to 100 times larger than a lamella prepared by FIB alone.

Results for multiple sample geometries, both TEM and SEM, will be presented showing the advantage of combining a pico-second laser tool with a FIB to maximize the speed and localize a large region of interest. The figure below shows several TEM examples where the microPREP™ was used to make a 500 um wide window only 10 um thick to be further thinned in the FIB. The results presented will also offer a new approach for extending the standard FIB preparation workflow.

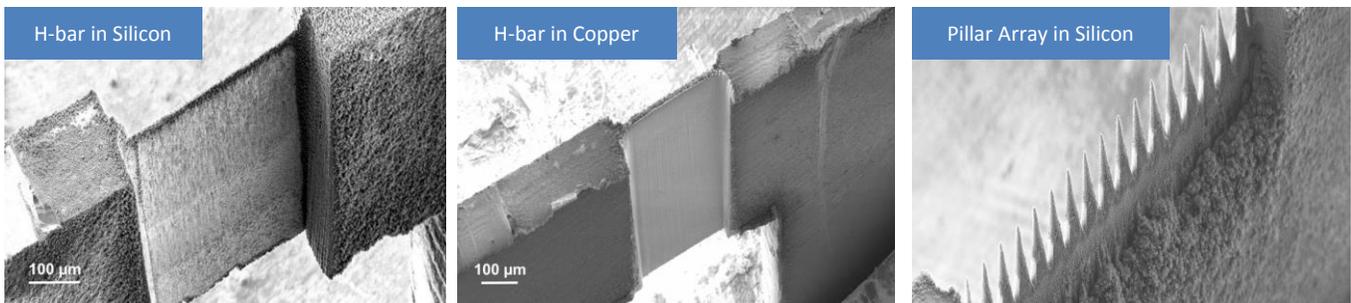


Figure: Examples of windows created using the microPREP™ for TEM sample preparation. Total prep time is under 10 minute to make a 3 mm half grid from the sample and then thin a 500 x 500 um x 10 um window.

KEYWORDS

Pico-second pulsed laser ablation, TEM sample preparation, FIB, broad argon beam tool