



Prepare TEM and SEM samples of pre-specified, micron-sized regions

**Model 590**

The Model 590 Tripod Polisher® was designed by researchers at the IBM East Fishkill Laboratory to accurately prepare TEM and SEM samples of pre-specified, micron-sized regions. For TEM samples, this technique has been used successfully to limit ion milling times to less than 15 minutes and, in some cases, has eliminated the need for ion milling. Although this technique was designed for preparing semiconductor cross-sections, it has been used to prepare both plan-view and cross-section samples from such diverse materials as ceramics, composites, metals, and geological samples.

#### Operation - Standard Technique

The Tripod Polisher® can be used to prepare a sample for both SEM and TEM cross-sectional analysis. To accomplish this, the sample is mounted on the face of a special SEM stud which is clamped into the “L” bracket of the Tripod Polisher®. Initial grinding is done on a 15µm metal bonded diamond disc. Further lapping and polishing continues with a succession of diamond films ranging in size from 30µm to 0.5µm. The final polish is done with a colloidal silica such as Syton or Glanzox. As lapping progresses, the two rear micrometers are used to adjust the plane of polish. With periodic examinations in an inverted microscope, the plane of polish is adjusted until it is parallel to the plane of interest. At this point the SEM stud may be mounted in the modified ion mill stage for a quick milling to remove fine scratches, polishing debris and to give the surface topography prior to SEM analysis. The SEM stud can be mounted directly in the SEM for analysis. When analysis is complete, a TEM sample of the same area is made. The sample is removed from the SEM stud and attached to a single aperture TEM grid. The “L” bracket is removed and the TEM grid is attached to the round sample mount which is affixed to the center of the polisher. The sample is now mechanically thinned using SBT Diamond Lapping Film. During this process the sample is periodically examined in an inverted microscope and the micrometers are adjusted to maintain the correct plane of polish. The sample is FINAL polished to 1µm or less and then ion milled for up to 15 minutes.

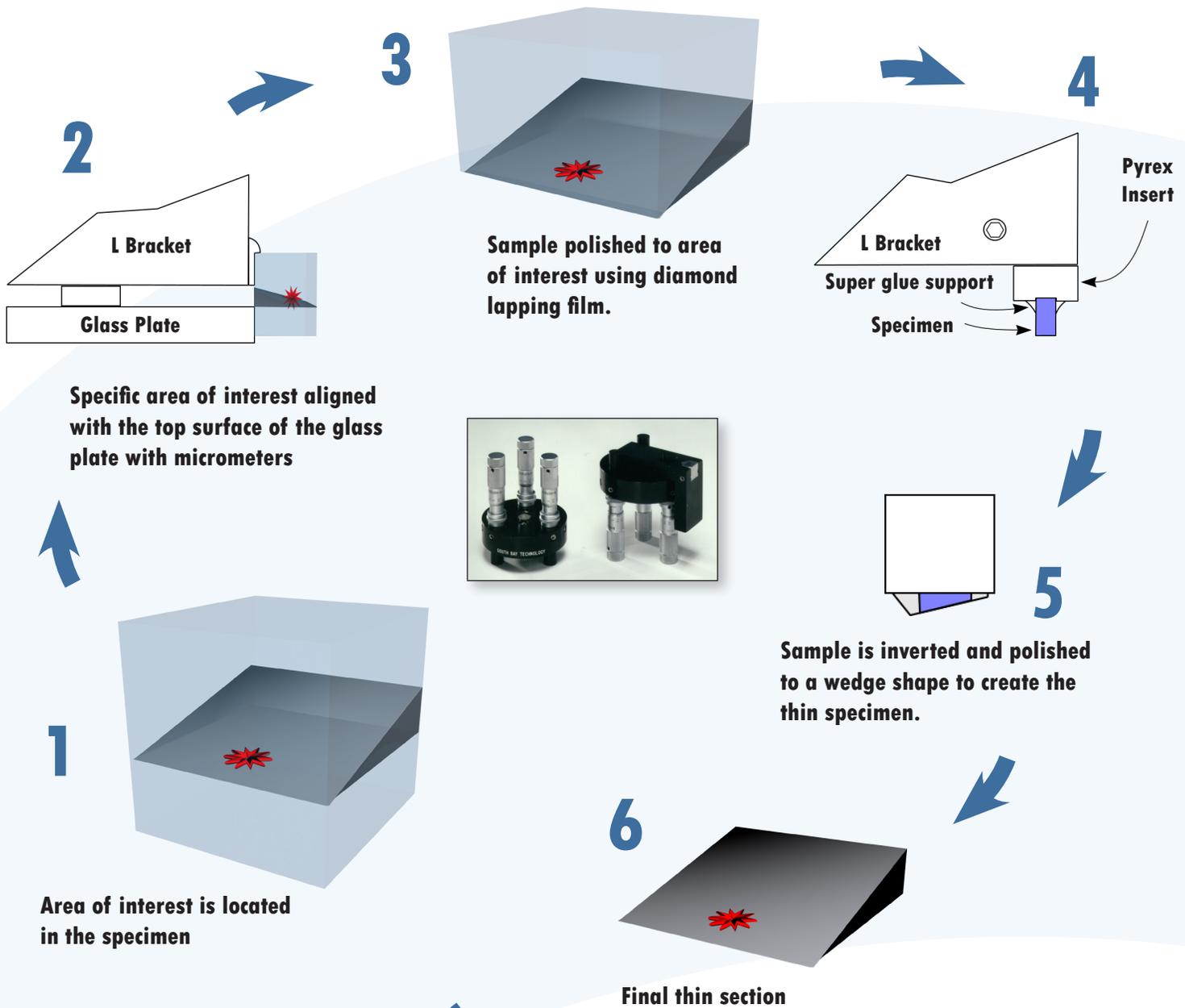
#### Operation - Wedge Technique

The preferential thinning and surface topography that occur in briefly ion milled samples makes the study of interfaces between dissimilar materials difficult. These problems can be reduced by completely eliminating the ion milling step and mechanically polishing the sample to electron transparency by employing the wedge technique. With this technique the SEM stud is replaced, in the “L” bracket, with a pyrex insert. The sample is mounted on the face of this insert. After the plane of interest is obtained, the sample is removed and mounted on the bottom of the pyrex insert. The two rear micrometers are adjusted and the micrometer nearest the sample is retracted to produce a wedge shape as material is removed from the sample. The sample, with the features of interest at the apex of the wedge, is thinned from the back side until the edge of interest is ~1µm thick. The sample is then polished on a flock twill cloth with Syton or Glanzox until thickness fringes are visible (below a few thousand angstroms). The sample is then removed from the pyrex insert and attached to a single aperture TEM grid for analysis.

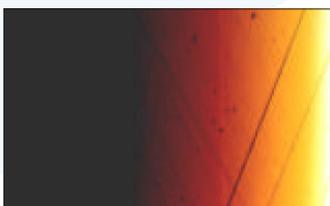
- Precise cross sectioning at the TEM level
- Repeatable and rapid production of TEM samples
- Reduces ion milling times to minutes as opposed to hours
- Produces large thin areas over the entire specimen

## Tripod Polisher® “Wedge” Technique

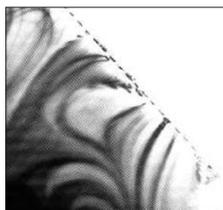
The Model 590 Tripod Polisher® has become an unsurpassed method for preparing both plan view and cross section TEM specimens. The small hand polishing tool allows for precision cross sectioning at the TEM level and has been used for a wide variety of materials.



## Result:



Wedge polished specimen of Si showing thickness variation as a result of the wedge shaped specimen.



Low magnification TEM image of Si based semiconductor device. Note large thin area.

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