LASER BASED SAMPLE PREPARATION FOR ADVANCED PACKAGING APPLICATIONS

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- 25 years experience in microstructure diagnostics.
- Comprehensive base of equipment:
  - Non-destructive testing
  - Reliable target prep
  - State-of-the-art nano analytics
- Continuous development of preparation and analytical methods.
Fraunhofer Center for Applied Microstructure Diagnostics CAM

Services Offered

- Microstructure Diagnostics
  - Materials & Process Development
  - Failure Analyses
  - Analyses of Reference Samples
  - Including Surface Analytics

- Development of Prep & Test Equipment
Fraunhofer Center for Applied Microstructure Diagnostics CAM

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- Microstructure Diagnostics
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  - Failure Analyses
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Including Surface Analytics

Development of Prep & Test Equipment
microPREP™

The Advantage of Being MUCH Faster

<table>
<thead>
<tr>
<th>#</th>
<th>Size of cut</th>
<th>Time required</th>
</tr>
</thead>
<tbody>
<tr>
<td>69</td>
<td>3.000 x 300 x 300 µm³</td>
<td>23 min 40 s</td>
</tr>
<tr>
<td>70</td>
<td>300 x 300 x 250 µm³</td>
<td>3 min 40 s</td>
</tr>
</tbody>
</table>

*Not practical for a FIB system

**microPREP™**

**Price to Be Paid for Being MUCH Faster?**

- Flanks of laser micromachining
- Recrystallized volume

Laser-affected zone is omnipresent.

It needs to become removed with ion-beam polishing.

![Image showing laser micromachining and debris](image.png)

- Femtosecond Laser
- Laser-cut kerf
- Debris ($\text{SiO}_2$)

- Recrystallized volume
- Laser-affected zone

- $<100 \text{ nm}$
microPREP™
Advanced Packaging, Surgical (Excavation)

5 min (Laser)

60 min (FIB)
microPREP™

Advanced Packaging, Surgical (Excavation)
microPREP™
Advanced Packaging, Surgical (Excavation)

- XL Chunk™ holder
microPREP™
Advanced Packaging, Surgical (Excavation)

tilting

rotating
microPREP™
Advanced Packaging, High-Throughput (Cutting)

20 min (13 mm cut)
microPREP™

Advanced Packaging, High-Throughput (Cutting)

SU5000 5.0kV 6.2mm S-x100 BSE-ALL 07/21/2016

SU5000 5.0kV 6.0mm S-x1.00k BSE-ALL 07/21/2016
microPREP™
Advanced Packaging, High-Throughput (Cutting)
microPREP™

Advanced Packaging - Conclusions

- microPREP™ to speed up preparation by orders of magnitude.
- Applicable to all (including at-the-wavelength-of-laser transparent) materials.
- Laser-affected zone precisely controlled.
- Positioning of the laser to less than within 2-3 µm.
- Minimal cross-contamination of ion-beam-erosion tools.

- Harmonized workflows with PECS to facilitate prep for advanced packaging.
microPREP™
A Versatile Plattform
microPREP™
Standard Cleanliness/Damage

- Debris, courtaining
- Rounded flank entrance
- Thermal load to edge
microPREP™
Advanced Cleanliness & Reduced Damage

- No burr, sharp flanks
- Applicable to all materials
- No debris
microPREP™
A Versatile Plattform Serving Manifold Workflows
microPREP™

Come Closer and Have a Look!