Temporary Bonding Solutions

Laser Debonding

Facts

- High chemical and thermal stable materials available
- Real room temperature debonding due to cracking of chemical bonds – no thermal stress subjected to the device wafer
- Force-free debonding
- Low laser maintenance because of HVM proven solid state laser
- High throughput

EVG’s Laser debonding is a deliberate solution using a solid state laser in the UV region, leading to a low cost process combined with high throughput.

Temporary bonding is an enabling technology for thin wafer handling, used in various applications like FoWLP, 3D IC, MEMS and semiconductor power devices. Because of the existence of high temperature resistant materials laser debonding is compatible with a wide range of applications. There are several EVG-evaluated materials for UV laser debonding available.

EVG’s product portfolio includes semi- as well as fully automated tools, enabling all crucial debonding process steps. This includes film frame mounting, laser debonding, as well as cleaning of the device and reusable carrier wafer.

Your Benefits

- Lowest cost solution in the market
- Highest beam reproducibility for stable debonding results
- Extensive process know how
- Various adhesive materials available - single layer or double layer systems
- Footprint optimized layout
- Carrier recycling within debonding tool possible
- High carrier lifetime

EVG®850 DB
Automated Debonding System up to 300 mm

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Laser decision

Wavelength
Laser debonding with a UV laser excludes thermal impact to the device wafer, as the debonding process is dominated by photochemical reaction and cracking of the chemical bonds at the carrier / adhesive bond interface. This photochemical decomposition of the polymers leads to successful debonding. The dominance of photochemical debonding, no thermal impact, ease of use as well as the existence of various commercially available UV laser debond materials makes this solution clearly leading from other laser debonding methods using different wavelengths.

Beam Profile
The optimum beam profile for laser debonding is a top hat to minimize and exclude any heating effect. Since laser debonding is a threshold process, any energy below this threshold leads to excess heating. The same goes for redundant energy above threshold energy, which generates carbonization. Hence, top hat beam profiles are a demand for effective and highly reliable debonding.

Consumables
Running costs are a key parameter in the cost of ownership. Excimer and solid state lasers are UV lasers which differ in the kind of consumables. For excimer laser the consumables like halogen gas, laser tube and halogen filter leading to higher maintenance compared to the laser diode and UV conversion part exchange in the solid state laser.

Laser Debond Comparison

<table>
<thead>
<tr>
<th></th>
<th>EVG Solution</th>
<th>Solid State Laser</th>
<th>Excimer Laser</th>
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<tbody>
<tr>
<td>Repetition Rate</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Consumables</td>
<td>Minimum</td>
<td>Laser Diode, UV conversion part</td>
<td>Excimer laser gas, laser tube, halogen filter, ...</td>
</tr>
<tr>
<td>Beam Profile</td>
<td>Quasi top hat → efficient use of laser energy</td>
<td>Gaussian → high excess energy can lead to carbonization</td>
<td>Top hat → efficient use of laser energy</td>
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<tr>
<td>Complexity of Optics</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Scan Method</td>
<td>Fixed wafer, laser scans across wafer</td>
<td>Fixed wafer, laser scans across wafer</td>
<td>Step and repeat – wafer is mounted on moveable stage, laser beam is stationary</td>
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<tr>
<td>Throughput</td>
<td>++</td>
<td>+</td>
<td>+</td>
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