Brewer Science® Advanced Packaging

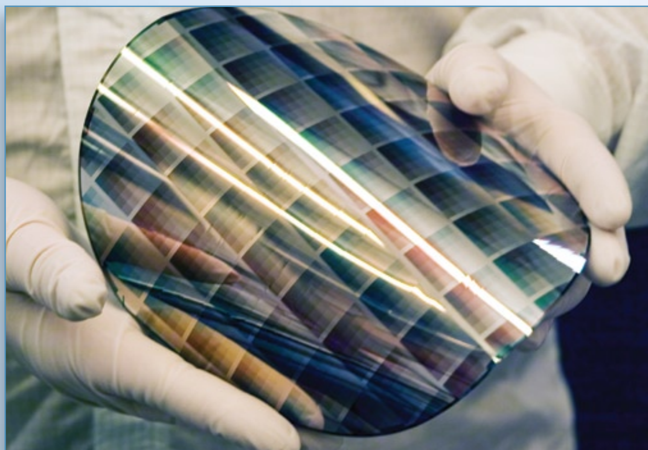
Solutions for FEOL and BEOL Packaging Applications

Advanced packaging technology is critical for enabling dramatic improvements in device performance as well as package form and fit factors.

Key Application Areas:

- Thin Wafer Handling
- Planarization & Trench Filling
- Micromachining
- Surface Protection

Thin Wafer Handling



Three-dimensional (3-D) integration and packaging of devices is being driven by the need for reduced size and weight, higher functionality, and higher power efficiency.

The various methods being pursued to achieve these 3-D structures have one thing in common, thinned silicon. Thinned silicon wafers are fragile and require a temporary rigid support that allows the wafer to be successfully processed further for stacking. When finished, the thin processed wafer must be separated from the rigid support using a simple, cost-effective process, without resulting in damage.

The bonding materials used to attach the device wafer to the rigid support, or carrier, must meet very stringent requirements. They must survive extreme temperatures, harsh corrosive and solvent chemistries, and mechanical stresses created by thermal excursions. They must permit separation (debonding) of the very delicate wafer from the rigid carrier and leave no residue after debonding and cleaning.

Brewer Science offers multiple temporary bonding technology options with corresponding processes and bonding materials:

- Chemical debonding processes
- Thermal slide debonding processes
- ZoneBOND™ low-stress thin wafer handling process

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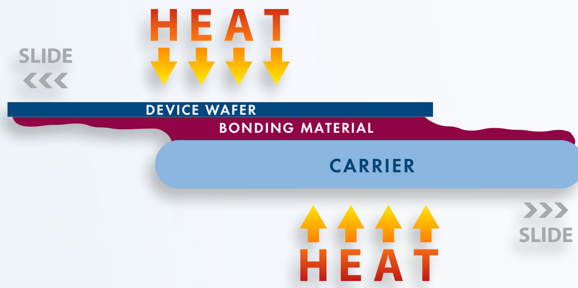
Thin Wafer Handling (cont'd)

Thermal Slide Debonding Process



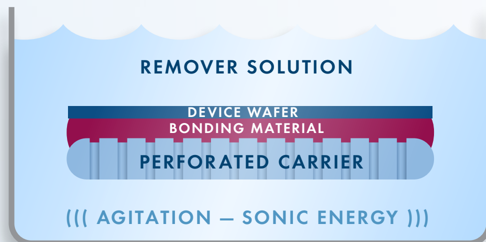
During slide debonding, the device wafer is debonded from the rigid carrier using a thermomechanical process. The bonded wafer is heated to a specified temperature at which the adhesive is softened, followed by mechanical sliding of the carrier from the ultrathin wafer.

Brewer Science® WaferBOND® HT materials enable the creation and backside processing of ultrathin wafers by providing:

- A stable platform for wafer thinning and backside processing
- Excellent uniformity
- Protection from harsh process chemicals
- High throughput and yield

PRODUCTS:
WaferBOND® HT 10.10 material
Cee® 1300DB semiautomatic debonder

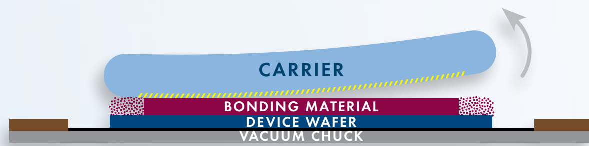
Chemical Debonding Process



During chemical debonding, the device wafer is debonded from the rigid carrier by immersion in solvents. This process utilizes a perforated carrier wafer that allows diffusion of solvent to the adhesive layer.

PRODUCTS:
WaferBOND® CR200 material

ZoneBOND™ Low-Stress Thin Wafer Handling Process

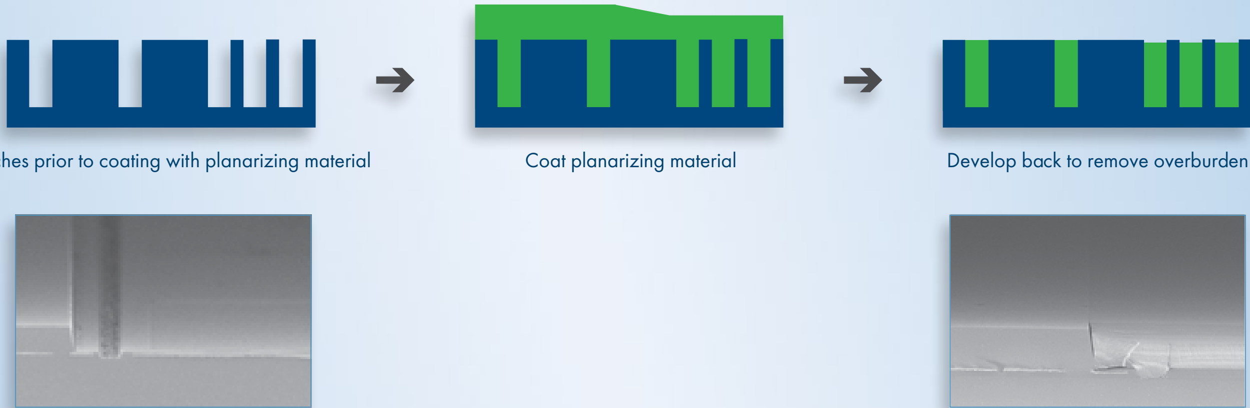


The ZoneBOND™ low-stress debonding process detaches the carrier wafer from the laminated device wafer at room temperature using very low mechanical force for the separation. The technology utilizes two different zones for controlled adhesion of the device wafer to the carrier wafer. The device wafer is truly adhered to the carrier wafer only in a small area along the outer edge, while the rest of the wafer remains unbonded but completely supported.

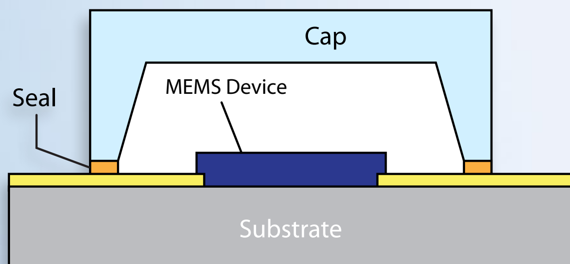
One of the unique advantages of the ZoneBOND™ process is that it can be used to perform a simple "flip" of the thin wafer to access to the wafer's front side, which is the device side, for further processing or testing. The thin wafer is supported on a carrier through the entire flipping process.

Planarization & Trench Filling

3-D fabrication and packaging process flows may include steps that necessitate coating resists and other materials over deep and wide features such as trenches. These steps typically result in low yield and low throughput as several layers of the resist are needed to fill the trenches prior to lithography. Brewer Science offers planarization technologies, including materials and processes to planarize the deep features.



Micromachining



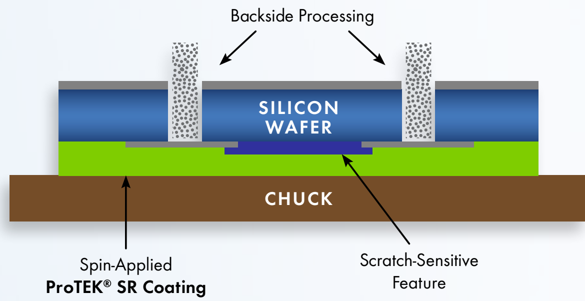
Wafer-level packaging (WLP) is commonly used for packaging of MEMS and LED devices, as it offers advantages in cost, yield, and reliability. In a WLP scheme, MEMS structures or LED die are encapsulated between bonded wafers, one of which has cavities that are fabricated most commonly by bulk micromachining.

Bulk micromachining is a process typically used in applications such as micromachinery or microelectromechanical systems (MEMS). Unlike surface micromachining, which uses a succession of thin film deposition and selective etching steps, bulk micromachining defines structures by selectively etching inside a substrate. Whereas surface micromachining creates structures on top of a substrate, bulk micromachining produces structures inside a substrate.

PRODUCTS:
ProTEK® A coatings
ProTEK® B coatings
ProTEK® PSB coatings
Brewer Science® Cee® processing equipment

Surface Protection

Mechanical Scratch Resistance



Backside processing steps such as etching and deposition require direct contact of front-side circuitry to the chuck in the deposition or etch chambers. The handling and chucking process can damage the fragile and expensive circuitry. Brewer Science offers scratch-resistant and spin-coatable materials for the protection of the front surface for backside processing and dicing.

PRODUCTS:

ProTEK® SR scratch-resistant coatings

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