

Waferbonding

1. General Description

The term waferbonding describes all technologies for joining two or more wafer substrates directly or using certain intermediate layers. At Fraunhofer ENAS waferbonding technologies like anodic or silicon direct bonding, eutectic bonding, metal thermo compression bonding, glass frit bonding, adhesive bonding and laser assisted bonding are applied to package sensor and actuator components as well as electronics at wafer level. 3D integration technologies using metalized through silicon vias (TSV) could be performed additionally.

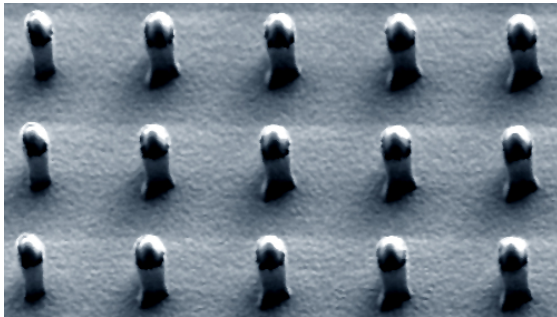


Fig. 1: Nano structured bonding interface

One important point is the modification of the bonding partner's surface regarding the applied bonding technology. The surface quality and roughness is most important for direct, thermo compression, and anodic bonding and could be optimized by CMP. Glass frit and adhesive bonding are more tolerant and even allow buried layers.

Actual research work is focused on decreasing the bond temperature below 400°C. For that application low temperature direct bonding techniques have been developed which uses temperatures between RT and 200°C depending on the material joined together. A second emphasis is the nano scaled structuring of bonding interfaces like needles or pins. By forming and contacting densely allocated metal pins, it is possible to join or even seal micro devices at temperatures around 150°C up to 200°C.

At least it is possible to characterize and evaluate all the bonding results with the well known blade, micro chevron, and hermeticity tests as well as with optical (VIS, IR), ultra sonic, scanning electron and atomic force microscopy.

2. Technologies available

- Silicon Direct Bonding
- Anodic Bonding
- Glas Frit Bonding
- Eutectic Bonding
- Adhesive Bonding
- Laser Assisted Bonding
- Metal Thermo Compression Bonding
- Chemical Mechanical Polishing (CMP)
- Bonding & DRIE (BDRIE)
- SOI-Substrates

3. Equipment

- Cleanroom labs class 10 to 10.000
- Mirra and IPEC 472 CMP tools
- Deposition by PVD, CVD, ECD
- Screen Printer R29 Spectrum
- Suss Spin- and Spray-Coater (RC8 & Gamma)
- Suss Cleaner CL 200
- Suss Bondaligner BA6/8
- Suss Substrate Bonders SB 6/8e
- Centrotherm High Temperature Horizontal Furnace
- Micro Chevron Test, Blade Test
- Tactile and non tactile Profilometry
- Light, IR, SE, and AF Microscopes

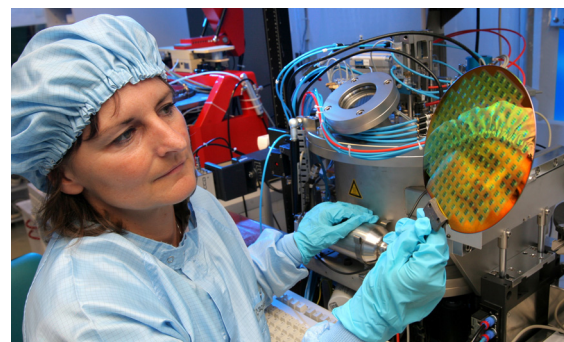


Fig. 2: Successfully bonded wafers within the packaging lab

Every process could be offered for customer specific technology runs individually.

3. Contact

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