

Wafer Bonding: The Suss MicroTec substrate Bonder SB6e™ and the Suss bond Aligner BA6.

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Since september 2006 a Suss MicroTec substrate bonder SB6e™ and a Suss bond Aligner BA6 are available in the cleanroom MiPlaza at the Nat.Lab. The aligner is used to align the wafers, wafer to wafer, with Back Side Alignment (BSA). The substrates can be silicon, glass or pyrex wafers. The bonder is a universal tool for bonding processes for micro electro-mechanical system applications such as MEMS, micro-fluidics, substrate transfer, wafer level packaging and bio-chips.

1. Introduction

Within all of these bonding techniques a lot of materials are used, see overview below.

- Anodic Bonding glass/pyrex Si
- Silicon Fusion Bonding Si-Si
- Adhesive Bonding SU-8, BCB
- Thermal Compression Bonding
 Au-Au, Cu-Cu, Cu-Sn-Cu
- Eutectic bonding Au-Si,
- Temporary Bonding

The most critical parameters are: intermediate layer, pressure, temperature, and time

2. The aligner

The aligner is shown in figure 1.

Some features are:

- Aligning in a controlled environment.
- Wafer and substrate size is 6 inch at the moment and in the future 8 inch, both circular.
- Thickness of the total stacked wafers is maximum 6 mm.

If two silicon wafers have to be aligned on the aligner, markers on the backside of one of the silicon wafers are required.

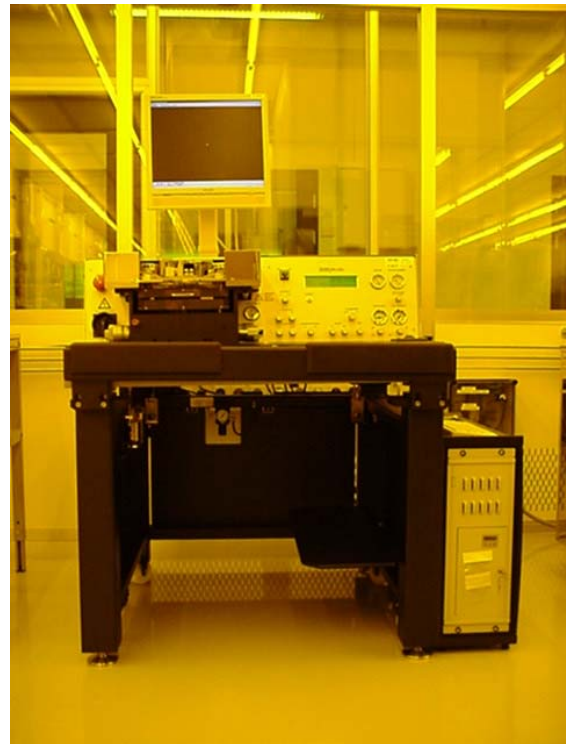


Fig. 1: Suss bond Aligner BA6

After alignment on the aligner the substrate stacks are either mechanically clamped using the transport fixture (figure 2) for further processing in the bonder. So the machine is a semi automatic tool.

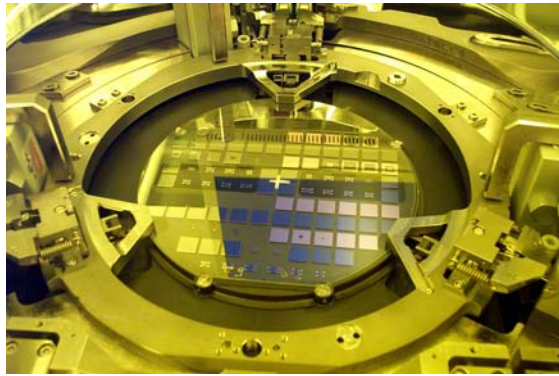


Fig. 2: Suss bond Aligner BA6 – inner detail

3. The bonder

The bonder is shown in figure 3.

Features are:

- Bonding in controlled environment.
- Wafer and substrate size is 6 inch at the moment and in the future 8 inch, both circular.
- Vacuum down to 5×10^{-5} mbar.
- Max tool force is 20,000N
- Overpressure up to 3 bar absolute.
- Temperature top and bottom chuck is 500°C



Fig. 3: Suss MicroTec substrate bonder SB6e

A schematic view of the process chamber is shown in Fig. 4 and consists of a

- Chamber body
- Chamber door
- Chamber lid

4. Conclusion

The bonder is a universal tool for bonding processes for micro electro-mechanical system applications such as:

- Anodic Bonding
- Silicon Fusion Bonding
- Adhesive Bonding
- Thermal Compression Bonding

The first bonding experiments are started but a lot of research still needs to be done on this machine to find the optimal settings for each bonding technique.

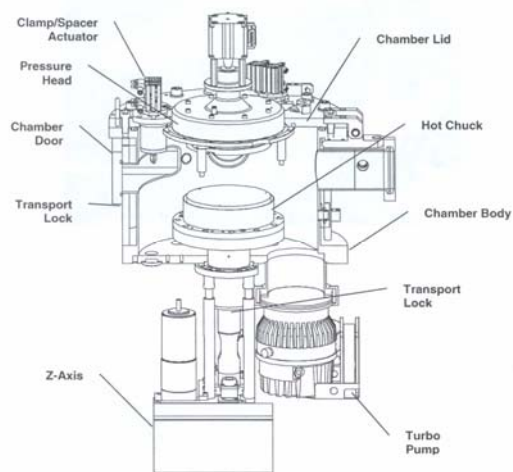


Fig. 4: Schematic scheme of the bonder