AML - AWB PLATFORM

The AWB systems offer the versatility to perform in-situ aligned bonding of 2” to 8” wafers using a wide range of techniques:

Anodic, Eutectic, Direct (High & Low Temperature), Adhesive, Solder, Thermo-compression, Glass frit and ‘iCAB’ in-situ chemistry align & bond.

In-situ Chemistry: AML’s unique in-situ alignment and process capabilities enable chemical preparation (for example, oxide removal in Cu-Cu bonding) or activation of the bonding surfaces immediately before alignment and wafer contact, without exposure to air between stages.

INTEGRATED SYSTEM FOR ALIGNMENT AND BONDING:
• In-situ alignment: 1 micron accuracy
• Wafer sizes from 2” to 8” & chip bonding
• Pressure: 10-6 mbar vacuum to 2 bar process gas (UHV option also available)
• Voltage: up to 2.5kV
• Temperatures: up to 560°C - Wafers can be held at different temperatures
• Contact force: up to 40kN
• In-situ UV cure
• Market-leading short cycle times: fast-bonding/high throughput

APPLICATIONS:
Wafer bonding has found many applications in the field of MEMS, III-Vs and ICs, and AML machines are widely used in the following:

• High-accuracy aligned adhesive bonding; acknowledged as ‘best tool’
• MEMs devices – pressure sensors, accelerometers, microfluidics
• Vacuum encapsulation; acclaimed ‘best system on the market’.
• Wafer Scale Packaging – for MEMS & IC
• III-V bonding - new high performance LEDs
• 3D Interconnects & TSV
• Advanced bonded substrates; for example silicon on glass (SOG)
• Smart cut - Layer transfer

LONG EXPERIENCE AND BONDING EXPERTISE
AML has over 25 years of experience in Aligned Wafer Bonding and MEMS fabrication. A pioneer in the design and fabrication of devices, AML now focuses solely on wafer bonding equipment.

ALIGNER WAFER BONDERS

BENEFITS – AML WAFER BONDERS:

TECHNICAL BENEFITS
• In-situ alignment at temperature offers more reliable and accurate post-bond alignment – live view allows adjustment in real time.
• See bond formation via in-situ optics. Confirm alignment immediately before bonding, resulting in fewer misalignments and higher yields.
• No contact or contamination of bond surfaces - no transfer jig or flags required.
• High throughput – simultaneous alignment with vacuum pump-down and heating; < 20-minute cycle times possible.
• Controlled heating and cooling to minimise stresses.
• Large wafer separation up to 30mm enables:
  • Differential wafer temperatures for Getter processes, up to 350°C
  • In-situ surface preparation (for example, oxide removal)
  • Faster outgassing and pump-down to high vacuum
  • Bonding of Wafer stacks up to 30mm thickness.
• Alignment of wafers at room temperature or at higher bonding temperatures.
• Current-limited Anodic Bonding for improved process control, device reproducibility and reduced stress.
• Flexible platform: AWB systems can be configured to suit customer requirements for bonding techniques, wafer sizes, chips and in-situ chemistry.
• AML offers in-house support, from process feasibility to qualification - uniquely, AML has extensive experience in device design and bonding processes and is able to offer expertise in process development.

COMMERCIAL BENEFITS
• Lowest cost per bond and ownership of any align/bonding system available.
• Proven, market-leading systems offer high reliability with minimal servicing.
• Integrated systems for alignment and bonding - no separate Mask or Bond-aligner required.
• Economic, high-volume production – manual and automated-load systems available.
• Small footprint with high throughput.
• Easy to install: only Power, Nitrogen, Compressed Air and Process gas requirements.
• Excellent technical process support.
• Worldwide customer base: AWB systems in operation across Europe, USA and Asia.

Align immediately prior to Bonding:

In-situ alignment = high throughput
In-situ = more possibilities

ALIGN and BOND – ONE SYSTEM DOES IT ALL!
AML ALIGNER WAFER BONDER – AWB SYSTEM: TECHNICAL SPECIFICATION

• The AWB systems offer fully-automated bonding processes, with manual intervention only required for loading of the wafers. The AML ROCK system provides for auto-wafer loading requirements.
• All bonding parameters and process recipes are controlled and stored.
• The system can also be networked and remotely interrogated, or controlled by AML via an internet connection.

Wafer sizes: 2”, 3”, 4”, 6” & 8”
Also chips & odd-shaped substrates <3” (but without optical alignment).

Alignment: Manual and Auto-alignment capability.
In-situ alignment offers a multitude of advantages over other bonders (where alignment is made outside the bond chamber). Image capture is available for deeper structures with widely spaced alignment marks.
Alignment accuracy: 1μm.

In-situ system: Enables visual confirmation immediately before the bonding process that the desired alignment is still being achieved.

Alignment can be carried out hot or cold: This facility eliminates alignment inaccuracies due to thermal expansion and any mismatch between wafers, machine parts and platens.

Platen Manipulator:
• Enables in-situ alignment of wafers under vacuum & at elevated temperatures
• Contact Force: up to 40kN provided via motorised active force control
• Precise wafer parallelism adjustment

AML ALSO OFFERS AN APPLICATIONS DEVELOPMENT SERVICE:
• The BONDCENTRE offers bonding of customer-supplied test / demonstration wafers
• Development of customer-specific bonding processes
• Technology transfer of characterised processes

Optics: Twin Microscope–Camera system with through-the-lens illumination. Two CCD cameras provide side-by-side display of images with Visible, IR or NIR capabilities for through-wafer vision and alignment.

Bonding Environment: Vacuum, Process gas or Vapour. Fully-automated dry turbo pumping system. 10-6 mbar to 2 bar absolute pressure (UHV option also available).

Temperature: Both Upper and Lower Platens independently controlled in 1°C steps. Heating & Cooling rates are programmable. Max Temperature: 560°C. Wafers can be held at different temperatures with ∆T 350°C.

Anodic Bonding: Full-size platen electrodes for improved bond uniformity. Constant-current or voltage operation, for improved process control and reduced stress. 0-2.5 kV DC, up to 40 mA.

Motorised Platen movement: X, Y, Θ and Z.

Additional Options:
• Auto-alignment
• RAD tool for activated, low temperature bonding
• NIR imaging (for heavily doped wafers or alignment at higher temperatures)
• Water and formic acid Vapour Delivery system
• Triple-stack bonding tool
• In-situ UV adhesive curing

Platform – Models:
• AWB–04: 2” to 6” bonding. Fully auto-process, with manual wafer loading
• AWB–08: 6” to 8” bonding. Fully auto-process, with manual wafer loading
• ROCK platform for higher volume production, auto-loading etc

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