EV Group
Solutions for R&D
**Introduction**

As a technology and market leader in wafer processing solutions for semiconductor, MEMS and nanotechnology applications, EVG supports partners and customers to make their ideas a reality.

EVG’s track record of innovations in the field of micro- and nano-fabrication technologies is unique. We realize our vision of being the first in exploring new techniques and serving next-generation applications of micro- and nano-fabrication technologies through intensive R&D collaborations. On average, EVG participates in more than 10 European cooperative R&D projects and cooperates on several joint development programs with R&D institutes worldwide every year.

EV Group has been working with research facilities for more than 35 years, giving us insight into their unique requirements. Our dedicated R&D tools provide superior technology combined with maximum flexibility, enabling universities, research institutions and technology development partners to scale processes across multiple research projects and applications. What’s more, the R&D equipment integrates seamlessly with EVG’s core technology platforms, which span the entire manufacturing chain from R&D all the way to small-scale and high-volume production. Full software and recipe compatibility between R&D and full-scale production systems enables researchers to migrate their processes to volume-production environments.

**Benefits**

**Multiple Equipment Functionalities / Multi-Purpose Equipment**

- **EVG®620 / EVG®6200, EVG®610**
  - Lithography
  - Nanomprinting
  - Bond alignment

- **EVG®520, EVG®510**
  - Bonding
  - Hot embossing

- **EVG®101**
  - Spin coating
  - Spray coating

**Multiple Process Capabilities**

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**Process Services**

- Access to industrial equipment and processes
- Customer tailored evaluation programs
- Very small batches possible
- High success rate for sample processing
- Access to EVG’s service providers

**R&D Cooperation**

- Application and market expertise
- Industrial partner network
- Consulting and proof of concepts
- Upscaling processes
- Implementation of engineering concepts and solutions in equipment and tooling
- Industrial qualification of processes and equipment
**Multiple Use Systems for R&D or Pilot Line**

**Wafer Bonding**
- Anodic
- Adhesive
- Metal
- Thermo-compression

**Hot Embossing (HE)**
- Spin-on layers
- Polymer substrates
- Optical aligned HE
- Mechanical aligned HE

**UV Nanoimprint**
- SmartNIL®
- µ-contact printing
- Hard UV-NIL
- Soft UV-NIL

**Mask Alignment**
- Optical lithography
- First print
- Top and bottom side alignment
- SU8 mastering

**Process Services**

Wafer processing services on any EVG equipment including special processes such as
- Plasma activated direct bonding
- ComBond® - conductive bonding of Si and compound semiconductors
- High vacuum aligned bonding
- Temporary bonding and thermal, mechanical or laser debonding
- UV-NIL on large substrates
- Lens molding
- Master stamp and working stamp fabrication for SmartNIL®

Customer tailored evaluation programs
- NIL stamps and materials
- Bonding processes
- Bonding adhesives
- Resist processing
- Debonding processes
Micro-contact printing -
- Soft UV-NIL
- Hard UV-NIL

Nanoimprinting Lithography

EVG®620 / EVG®6200
- Top side alignment accuracy up to ± 0.5 µm / 3σ (± 0.1 µm in R&D)
- Bottom side alignment accuracy up to ± 1.0 µm / 3σ
- Substrate size from pieces to 150 mm (100 mm to 200 mm in EVG®6200)

Exposure Results
80 µm SU-8 resist features with sidewall angles approaching 90°. Courtesy of DALSA Corporation.

SEM image 100 µm tall SU-8 structures

Nanoimprint Lithography (NIL)

EVG®620 / EVG®720
- Nanoimprint lithography enables simple replication of various kind of structures, shapes and sizes
- Nanoscale structures can be achieved without sophisticated and expensive optics
- EVG®620 covers all common imprinting techniques including proprietary SmartNIL® technology
- EVG®720 is the dedicated SmartNIL® system for advanced process development and pre-commercial upscaling

Structure Replication
Nanostructures
Microstructures

Bonding

EVG®501 / EVG®510 / EVG®520IS Bonders for R&D
Wafer Bonding
- Anodic
- Adhesive
- Eutectic
- Transient liquid phase
- Thermo-compression

Features
- Substrates up to 200 mm
- Forces up to 100 kN
- Temperatures up to 550°C
- Vacuum down to 1.10⁻⁶ mbar
- Other options: anodic, UV curing, 650°C heaters

Interface Analysis
Hybrid Bonding of a daisy chain with 4.4 µm pads
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Hot Embossing (HE)

EVG®500 Bonder series with hot embossing and de-embossing tooling
- Simultaneous replication of micro- and nanostructures
- Imprinting into bulk polymer materials or glass
- Suitable for spin-on thermoplastics
- Low residual stress
- High replication accuracy down to 50 nm
- High aspect ratio features

Micro- and Nano Channels
100 µm wide hot embossed microfluidic channels
Meander test structures (200 nm)
Emerging Technologies - Shaping the Future

Being the first in exploring new techniques and serving next-generation applications of micro- and nano-fabrication technologies enables our customers to successfully commercialize their new product ideas.

Nanotechnology for Various Applications

EVG process technologies like nanoimprinting, hot embossing, micro-contact printing as well as adhesive bonding enable the production of device structures with feature sizes from 100 micrometers to 10 nanometers. Application areas are bio- and medical devices, sensors, MEMS and photonic structures.

Bonding «Anything on Anything» (EVG® ComBond®)

The EVG ComBond platform combines several technology breakthroughs to enable the formation of bond interfaces between heterogeneous materials at room temperature while achieving excellent bonding strength and electrical conductivity. The novel oxide-free bonding technique is particularly beneficial for silicon photonics, high-vacuum MEMS packaging and compound semiconductor and other advanced engineered substrates for “beyond CMOS” applications such as high-mobility transistors, high-performance/low-power logic and radio frequency (RF) devices. The EVG580 ComBond masters the crucial surface preparation steps that are needed to ensure contamination- and oxide-free bonds at room temperature.

Topography Coating

EVG has developed spray-coating technologies and equipment for topography coating, which is an essential process in 3D integration and wafer-level packaging applications. Examples are conformal coating of high aspect ratio structures like TSVs, conformal via lining for dicing streets and MEMS-cavity coatings.
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