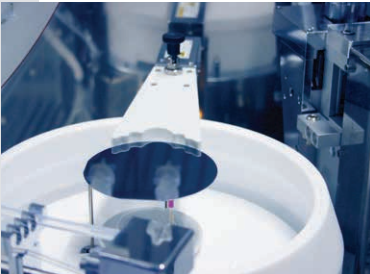




EV GROUP® | Products // Lithography // Resist Processing Systems

EVG® 100 Series





Introduction

The EVG100 series of resist processing systems establishes new standards in quality and flexibility for photoresist coating and developing. Designed to support a wide range of process parameters and customer requirements, the EVG100 series includes Spin and Spray Coat, Develop, Bake and Chill modules to suit individual production requirements. An extensive range of materials - such as positive and negative resists, polyimides, double-sided coating of thin-resist layers, high-viscosity resists, and edge protection coatings - can be processed on the EVG100 series. EVG resist processing systems provide a high degree of versatility. The systems can handle and process wafers from two inches to 300 mm in diameter, as well as rectangle, square or even irregular shaped substrate sizes with no or very minimal tooling time. Additional features such as wafer-edge handling or thin-wafer handling are available. EVG also offers systems for larger substrate sizes (e.g., for display manufacturing). As with all EVG processing systems, the equipment can be configured for R&D environments or for high-volume production.

Resist Processing Solutions for R&D

Successful and fast progress in research and development is closely related to a strong infrastructure, including high-quality process equipment. Over many years, EVG has established itself as a strong partner for universities and research organizations. Dedicated equipment developments and process support prove this commitment on a daily basis.

The EVG100 series is designed to support a wide variety of requirements while providing optimal process control. This allows the development of new devices or processes on an industrial level, which not only requires high flexibility but also controlled and repeatable processing. While the importance of resist processing to enable certain process flows is often underestimated and just considered a commodity for standard lithography processes, in many cases it is key to enabling downstream processes. For example, patterning on high-topography wafers, LIGA (lithography, electroforming, molding), temporary bonding, nanoimprint lithography (NIL) and adhesive bonding rely on advanced coating capabilities and process know-how. EVG has built up many years of spin and spray coating experience for demanding applications and incorporates these learnings into the EVG100 series, where our process know-how can be leveraged to support our R&D customers.

User-friendly processing

Critical to semi-automated process equipment is the need for user-friendly operation and multi-user interfaces. As a result, EVG's coaters and developers are highly professional systems with the ease of use that enables even a beginner to operate them while fulfilling the most demanding process needs. The user interface software provides user guidance through clear instructions and animation, security queries, multi-language support and individual user account settings. In addition, an industry standard PC with implemented web interface can be used to allow remote access for easy and fast support, including log file analysis.

All-in-one or optimized to your needs - spin, spray and additional features in a single system

EVG has built up many years of spin and spray coating experience for demanding applications and incorporates these learnings into the EVG100 series. Proprietary resist coating technologies, such as OmniSpray, revolutionary NanoSpray and NanoFill are implemented in the EVG100 series of resist processing systems and establish new standards in quality and flexibility for photoresist coating and developing. Designed to support a wide range of process parameters and customer requirements, an extensive range of materials - such as positive and negative resists, polyimides, double-sided coating of thin-resist layers, high-viscosity resists, and edge-protection coatings - can be processed on the EVG100 series.

Customized solutions

EVG's customer-focused approach includes customized solutions for dedicated process needs. Understanding special requirements and having the flexibility to adapt our systems accordingly are among the unique core competencies that EVG brings to the marketplace.



EVG*101 Advanced Resist Processing System

- Flexible single chamber design for R&D and small-scale production
- Semi-automated from two inches up to 300 mm
- No or very short tooling time when changing substrate size or shape
- Recipe-based automated coating and developing for best repeatability
- Reliable system design with minimized footprint
- Easy process transfer from research to production utilizing proven modular design
- Spin and spray coating in one chamber
- Recipe-controlled syringe system for R&D and sensitive resists (e.g. BCB)
- Optional ISO 3 (according to ISO 14644) mini-environment



EVG*120 Automated Resist Processing System

- Fully automated two-chamber resist processing system from two inches up to 200 mm
- Up to 10 additional plates, such as hot plates, chill plates and vapor prime
- Versatile combination of multi-functional modules for spin and spray coating, developing, bake and chill
- Compact design for highest productivity with minimal footprint
- Hot swapping robot handling for highest throughput
- Smart scheduling software optimizes handling times in linear or parallel processing mode
- Recipe-controlled syringe system for R&D and sensitive resists (e.g. BCB)
- Optional ISO 3 (according to ISO 14644) mini-environment and fab-automation integration (SECS/GEM)



EVG*150 Automated Resist Processing System

- Fully automated resist processing system for up to 300 mm substrates
- Up to 6 process modules including bake, chill, vapor prime modules
- XT version for up to 8 modules available
- Hot swapping robot handling for high-volume manufacturing
- Fully customizable modular design of spin and spray coating, developing, bake and chill modules
- Ergo load cassette stations, SMIF loadports, FOUF load ports
- Smart scheduling software optimizes handling times in linear or parallel processing mode
- Optional ISO 3 (according to ISO 14644) mini-environment and fab-automation integration (SECS/GEM)



HERCULES® Lithography Track System

- Fully automated lithography track system based on modular design for mask alignment and exposure with integrated pre- and post-processing
- Hot swapping robot handling for high throughput
- Up to 8 wet-processing modules plus up to 24 additional bake, chill and vapor prime plates
- Mask alignment and exposure based on EVG IQ Aligner or EVG6200
- Exposure with lamp houses up to 5 kW
- Ergo load cassette stations, SMIF loadports, FOUF load ports
- Chemistry handling in separate cabinet

Options

Spin / Spray Coat Module

Simulation-based low-turbulence coat module design effectively supports resist-saving high-uniformity results. Up to eight dispense lines allow versatile process set-up with different resists and solvents. Additional functions such as solvent-based pre-wetting, edge-bead removal and sealed park position with nozzle wash function support advanced resist coating and production requirements. Optional CoverSpin technology improves coating uniformity and avoids edge effects independent of the substrate shape. Proprietary OmniSpray technology provides excellent uniformity results on challenging topographies. The ultrasonic atomization nozzle guarantees controlled and narrow droplet size distribution independent of N₂ flow. Fully recipe-controlled spray nozzle parameters available in rotation or x-y spray system provide high flexibility and repeatability. The optionally available heated chuck system can further extend the application range. The spin and spray module option reinforces the combination of spin and spray coating.

NanoSpray™ / NanoFill™ Coat Module

EVG's patented NanoSpray is a unique coating technique under vacuum conditions. This multi-step process enables uniform resist coverage of sidewalls and via-bottom for high-aspect TSVs of up to 1:20. NanoFill technology allows complete, void-free filling of vias with flat surfaces. These novel coating processes enable applications like in-via lithography, fast and cost-efficient deposition of organic low-k dielectrics, and easy-to-remove in-via protective coatings.

Develop Module

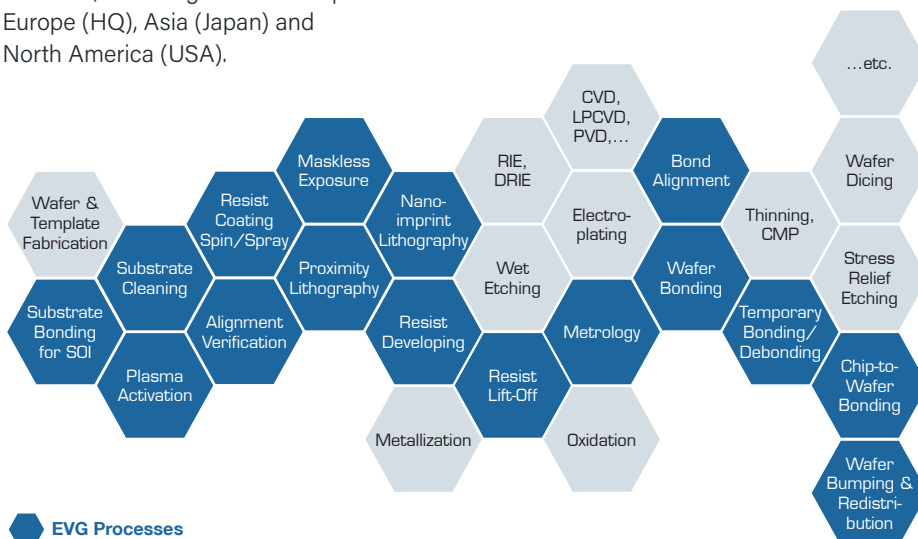
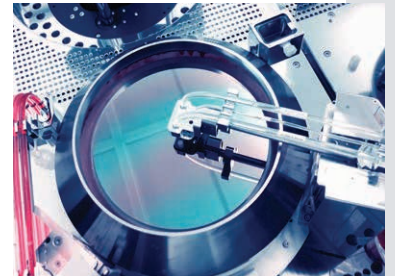
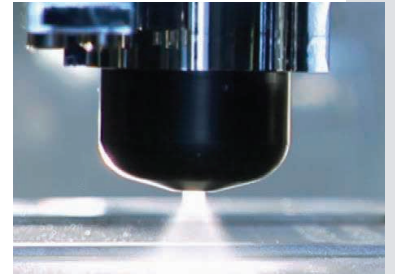
All resist developing processes can be combined into one module with up to six different fluid lines. For optimized developing on topography, the use of up to two spray nozzles can be added. The megasonic-enhanced development option provides excellent results for thick-resist applications, such as high aspect ratio structures.

Bake / Chill Module

Each bake / chill module can be configured with up to five hot or chill plates. The module can handle temperature ranges of 0 - 250°C with uniformity of $\pm 0.5\%$ at 100°C. N₂ purge and water-cooled chill plates enhance the process control capabilities together with high-solvent hot plates, which are optionally available for thick resist applications.

Software and Support

The Windows-based, graphical user interface is designed with a strong focus on user-friendliness, and easily navigates the operator through each process step. Multi-language support, individual user account settings and integrated error logging / reporting and recovery can simplify the user's daily operation. All EVG systems can also communicate remotely. Thus, our service includes field-proven, real-time remote diagnostics and troubleshooting via secured connection, phone or email. EVG's experienced process engineers are ready to support you anytime thanks to our de-centralized worldwide support structure, including cleanroom space on three different continents: Europe (HQ), Asia (Japan) and North America (USA).

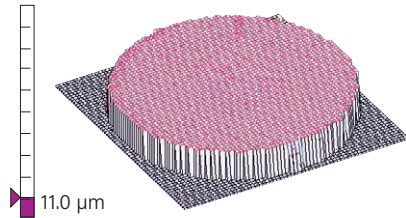


 EVG Processes

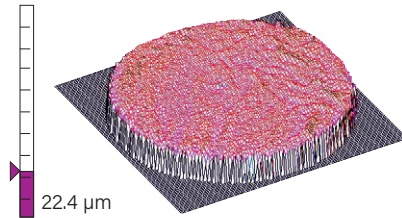
Application Range and Process Results

The EVG100 series is designed to provide flexibility of process variations covering an extensive range of materials. At the same time, these systems are establishing new benchmarks in advanced coating processes to meet emerging market requirements. All EVG lithography equipment platforms are 300-mm ready, can be fully integrated into its HERCULES lithography track systems and are complemented by its metrology tools for top-to-bottom side alignment verification.

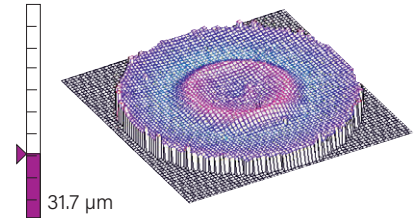
High-uniformity coating for lithography or temporary bonding



AZ 9260
Positive tone photoresist

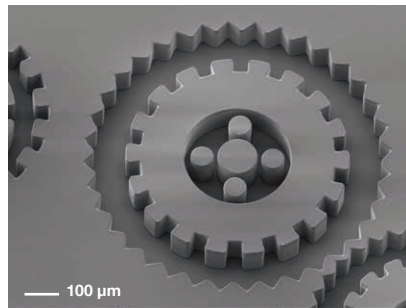


TOK PMER P-LA900PM
Positive tone photoresist

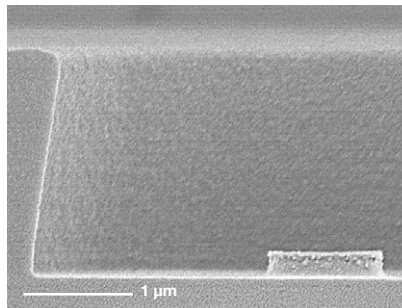


JSR THB 126N
Negative tone photoresist

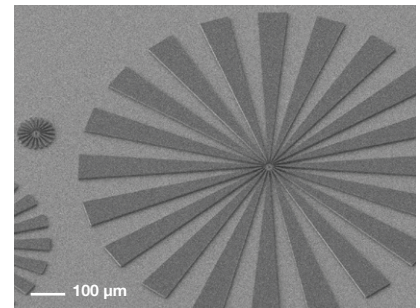
Superior thick-resist processing for deep etching, passivation, electroplating, lens molding and adhesive bonding



Micro-patterned gears for LIGA processing
Source: EVG

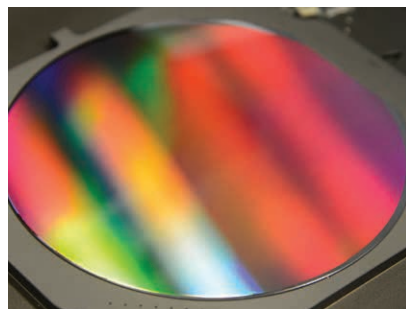


Negative sidewall with a metal-compatible lift-off resist coating; metal pad in the middle of the structure
Source: EVG

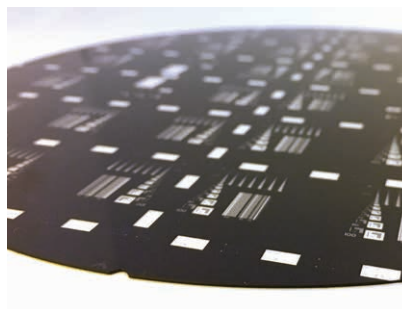


High-resolution thick film processing showing a Siemens star pattern
Source: EVG

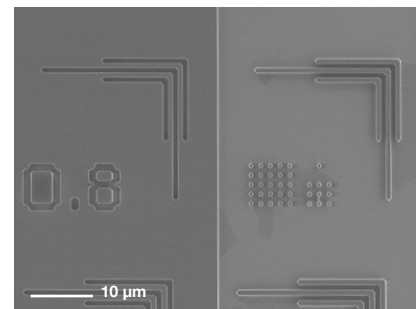
Coating for high-precision thin-layer processing, including nanoparticles, colored, e-beam and nanoimprint resists



Fully populated 6" Si substrate imprinted on EVG®720
Source: EVG

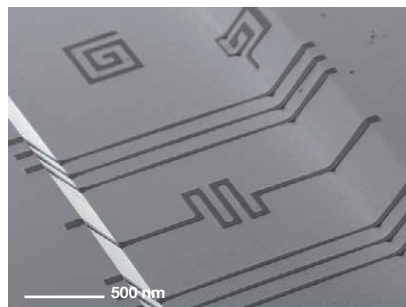


20 µm thick black resist spin-coated double layer on 8" substrate exposed on EVG®6200 NT
Source: EVG

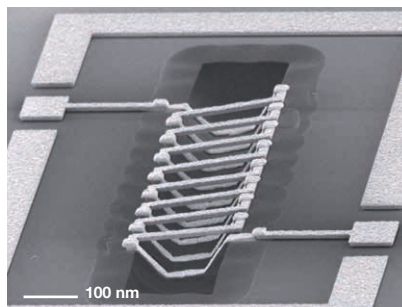


High-precision 1 µm thin-layer processing with 0.8 µm L/S structures
Source: EVG

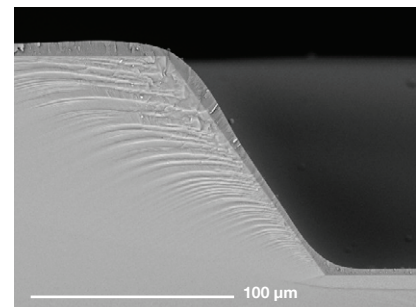
Spray coating for excellent coating uniformity on high-topography, fragile and irregularly shaped substrates



Patterned, spray-coated resist layer in anisotropically etched cavity
Courtesy of TU-Delft DIMES



High-Q-3D solenoid inductors for RF ICs. Metal structures created by utilizing spray coating
Courtesy of SIMIT



SEM cross section of spray coated cavity
Source: EVG



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