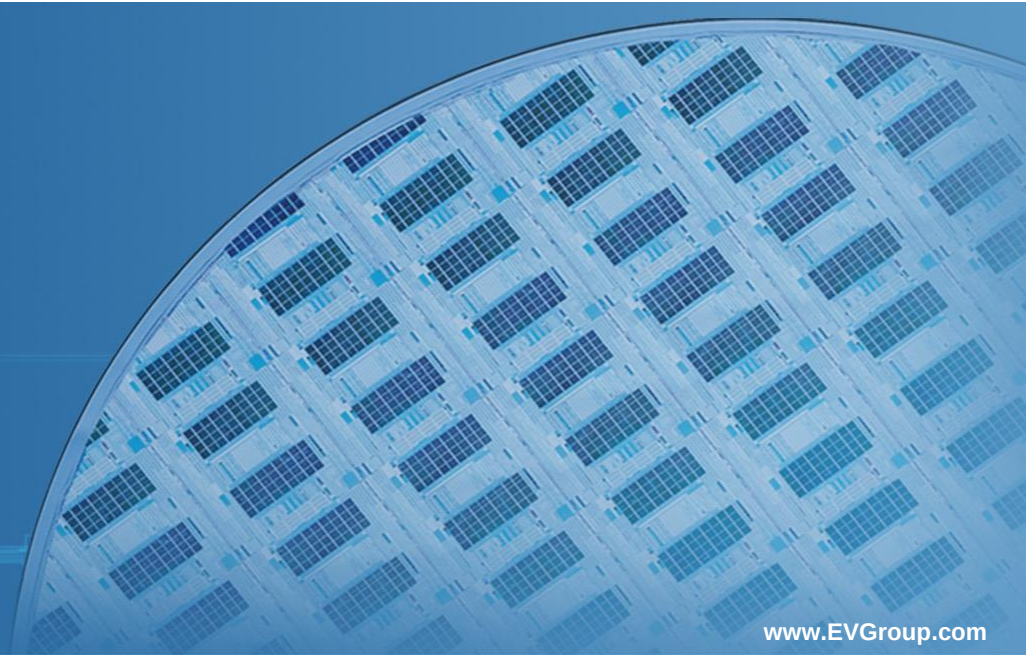
May 11, 2020 – EPIC Online Technology Meeting on Biosensors

Manufacturing Technologies for Next-Gen Biosensors

Dr. Bernd Dielacher
Business Development Manager



EV Group | At A Glance

Leading supplier of wafer processing equipment for the MEMS, nanotechnology and semiconductor markets

Founded in 1980 by DI Erich and Aya Maria Thallner. More than 1000 employees worldwide

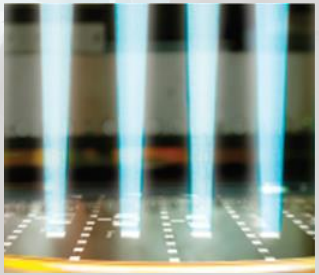
Headquarters in Austria, with fully owned subsidiaries in the USA, Japan, South Korea, China and Taiwan

Recent Developments

GEMINI® FB
Hybrid Bonding

EVG®850 DB
Laser Debonding

BONDSCALE™
Fusion Bonding



EVG® MLE™
Maskless Exposure Technology

EVG® HERCULES® NIL
SmartNIL® UV-NIL
Up to 300 mm

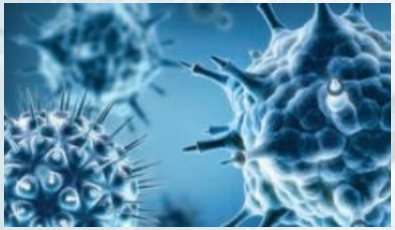
EVGs Impact on Biosensors and Life Science

Fitness

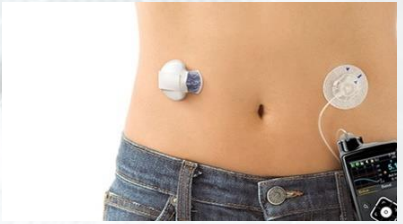
Source: Cemtrex

Healthcare

Biomedical Analytics



Implants

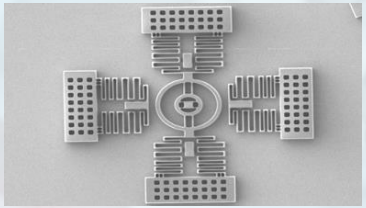


Source: Medtronic

Personal Wellness Monitoring — Mission Critical Applications

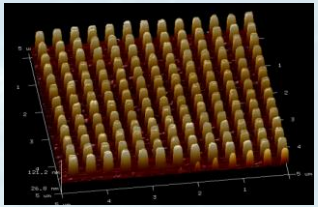
EVG Contributions

MEMS



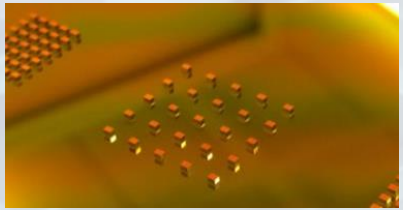
Wafer Level Optics

Nanoimprint



Microfluidics

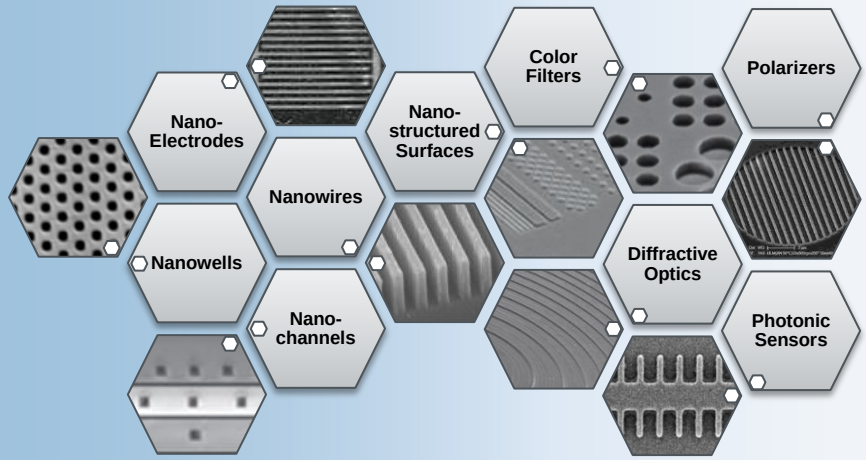
PIC&CMOS Integration



Proven Technologies — Enabling Developments

Nanostructures for Biosensing

Nanostructures and Applications

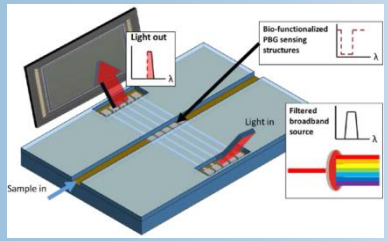


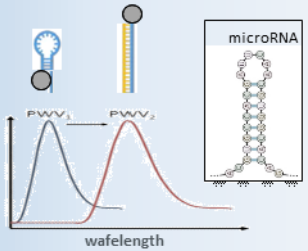
Benefits

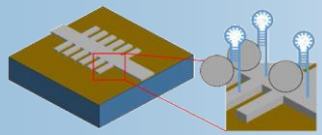
- Enhanced electrical sensing
- Enhanced optical readout
- Functionalization
- Surface modification
- New functionalities

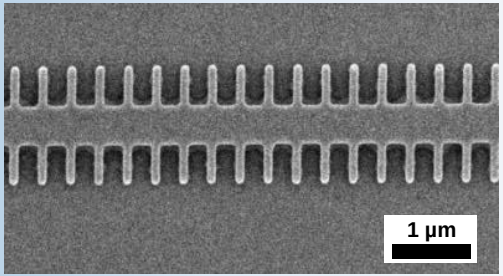
Example: Photonic Bandgap Sensor

An advanced nanophotonic device for fast and early diagnosis of cardiovascular diseases and cancer









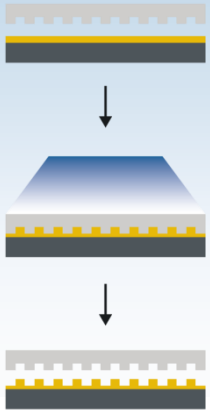
Gratings manufactured with UV-Nanoimprint Lithography (SmartNIL®)

Courtesy of Phocnosis and Saphely

UV-Nanoimprint Lithography | Smart NIL®

Enabling wafer-level nanostructured surfaces

UV – NIL

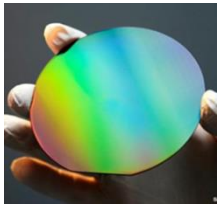


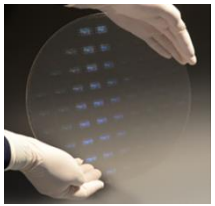
- Volume-proven wafer level imprinting technology
- Proprietary SmartNIL® technology
- Leading-edge wafer-level-optics capabilities
- Innovative processing for Bio-MEMS
- Resolution down to 40 nm
- Imprinting over topographies

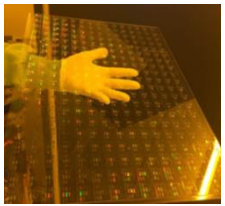
Technology

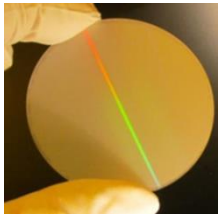
Full-area imprint in UV-curing resin using working stamp technology

Manufacturing Readiness









EVG® HERCULES® NIL 300 mm 2019

Fully modular and integrated HVM UV-NIL System

EVG®7200LA 2016

Panel Size Nanoimprint Lithography System

EVG® HERCULES® NIL 2015

Fully integrated HVM UV-NIL System

EVG®7200 2014

Fully automated UV-NIL System 200mm

EVG®720 2013

Fully automated UV-NIL System 150mm

EVG®620 1997

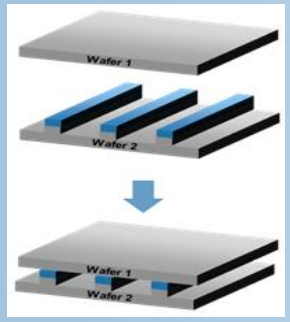
Semi automated UV-NIL

Biosensor / Microfluidic Integration

Adhesive Bonding

- Room-temperature bonding with UV-curing adhesives
- Unaffected by topography
- High tolerance for particle contamination
- Heterogeneous integration
- Adhesive layer transfer for selective deposition
- Compatible with a wide range of substrate materials

Selective Deposition of Ultrathin Adhesive Layers



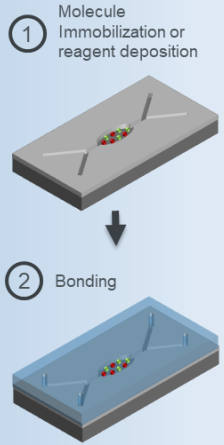
Ultra-thin adhesive layer transferred onto heightened structures on device wafer

+

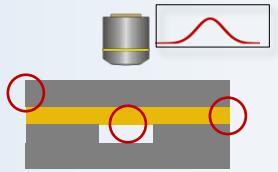
High accuracy aligned UV-bonding

Benefits

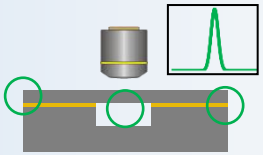
- Encapsulation of biological content at room temperature



- No contamination of microfluidic channels
- Thin cap layers
- Ultrathin adhesive layer



Conventional Adhesive Bonding

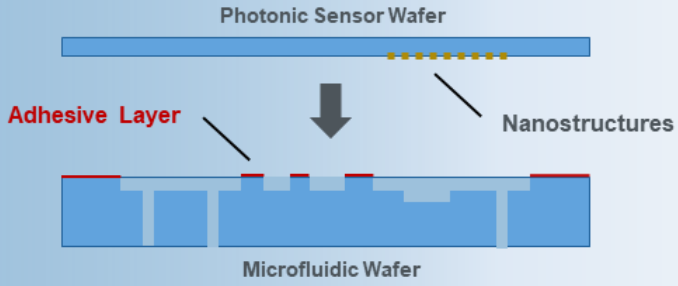


Adhesive Transfer Bonding

Adhesive Layer Transfer Bonding

Advanced wafer-level integration of next-generation microfluidic devices

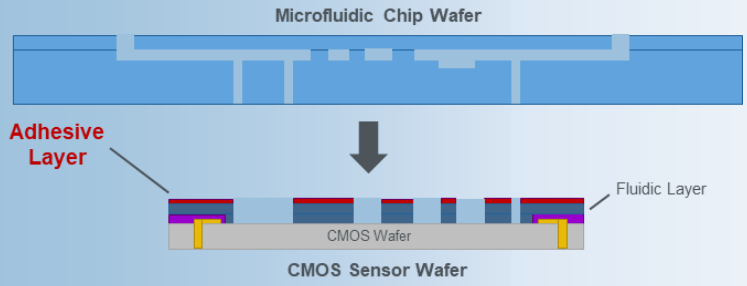
Microfluidic / Nanostructure Integration



- Novel nanostructure-based sensing principles
- Surface modification / functionalization
- Optical elements

Applications: Photonic biosensors, cell cultures, organ-on-chip, RNA / DNA sequencing, point-of-care cancer diagnosis and disease/virus detection

Microfluidic / CMOS & PIC Integration



- Additional functionality and on-chip data processing
- Signal enhancement
- Point-of-care diagnostics

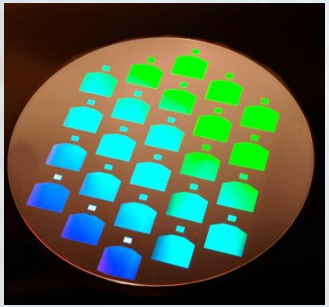
Applications: Image sensing, bio-sensing, illumination, electrical neuron stimulation, micro-heating, multifunctional lab-on-chip

EV Group | Semiconductor Manufacturing for Photonic Devices

NILPhotonics® Competence Center – A smart way to collaborate for success

Establish decisive manufacturing steps in close collaboration with process and equipment experts

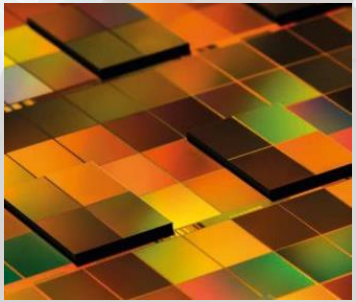
Bridging the gap between photonics R&D and volume manufacturing



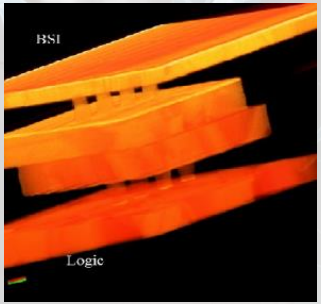
Nanoimprint & S&R Mastering

Wafer Level Optics & Photonics Packaging

Advanced Resist Processing



Heterogeneous Integration



3D Integration & Hybrid Bonding

Thank you for your attention.

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