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inno · Innovative Technologies - New Applications

What's driving wearables? - Why the US has an edge in the innovation ecosystem

Karen Lightman

Wearables are seemingly everywhere. Whether it's the wearables of the near future, like smart glasses, or the even nearer future - smartwatches - or the wearables most widely available today - activity monitors, there can be no argument that the next great wave of consumer electronics will be worn on the human body: on the wrist, over the eyes, tattooed on the skin, or in the ear. That's where we are heading - and we are moving there fast.

While other regions of the world are leading innovation in telecommunications, energy, automotive or biomedicine, US companies of all sizes are having the biggest impact on wearables. But why is that the case—and can we expect it to continue?

The innovation-ecosystem in the US supports entrepreneurs with big ideas. That's been true for now-massive companies such as Google and Apple, and it's true for a slew of emerging companies playing in the wearables space. MIT, Berkeley, Stanford and Carnegie Mellon are fertile incubators for spin-off companies that benefit from academic resources during the development phase. Budding engineers can create new products without having to risk the farm for testing out new ideas. What's more, academic spin-offs in the US can often retain the rights to IP developed in university labs. The ability to retain IP can make entrepreneurial types more willing to make the leap from the lab to commercialization. It may also increase the perceived value of a company to potential investors.

Once a US spinoff begins the commercialization process, they look not to government organizations for funding but to VCs, angel investors, the IPO (which is far from dead in emerging technologies!) and crowdfunding.

While tech startups may not typically benefit from government funding, the US government has had a hand in resurrecting the initial public offering (IPO) for what Livingston Securities Chairman and CEO Scott Livingston calls "next-generation technologies."

"After the dot com bust, the US government put in place a number of new rules and regulations that were very important, but had the unintended consequence of pricing smaller companies out of the IPO process, which is key to capital formation for emerging technology companies. The passage of the JOBS Act in April 2012 reduced the regulatory burden on smaller IPO candidates, and the IPO market has responded with two straight strong years."

He pointed out that the number of IPOs in 2012, the year that President Obama signed the Jumpstart Our Business Startups (JOBS) Act into law—with the goal of streamlining access to capital for companies of all sizes—was the highest number since 2006. "And by September 2013," said Livingston, "the number of IPOs had already surpassed all of 2012."

While we have not yet seen a wearables company achieve an IPO just yet, there is a good chance that we will see one within the next few years.

Crowdfunding in Wearables

Crowdfunding seems to have worked particularly well in wearables, where it has brought individual investors and entrepreneurs together, sometimes at breakneck speed. Just look at Pebble. As the most successful Kickstarter project to date, Pebble raised more than $10.2 million for its smartwatches—although its target was only $100K. Back in 2012 Oculus VR set a Kickstarter goal of $250K for its Oculus Rift developer kit, a virtual reality headset. The company raised more than $2 million and was recently purchased by Facebook for $2 billion.

US funding sources are diverse, and with crowdfunding in particular, they can be incredibly fast as well. That's not typically the case in Europe, where innovators often grapple for government funding. Jumping through bureaucratic hoops takes time. It can also dampen the entrepreneurial spirit for emerging ➲

UP by Jawbone, a VC-funded company based in San Francisco.

Photo credit: Jawbone.

| Focus: Micro and Nano Industry in the USA|

Content

Editorial

Focus: Micro and Nano Industry in the USA

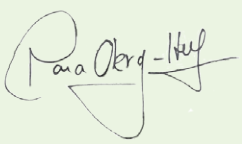
Welcome to the second international issue of »inno«. Last year, we started with a focus on the Dutch micro- and nanosystems industry. This summer, our international issue is dedicated to the micro and nano industry in the USA.

Surveys showed that transatlantic networking becomes more and more important for European enterprises to find the right partners to stay successful in the long term: some companies would like to acquire new international investors or to find the right distributor. Others are planning to establish a subsidiary or to step into new target markets. Whichever motivation the enterprises have - the IVAM Microtechnology Network tries to help its members to cross barriers that may complicate their activities abroad by providing country-specific information, organizing delegation tours and initiating business-to-business contacts at conferences and trade shows worldwide.

In this issue, you will find technical articles from IVAM members and network partners located in the USA like MEMS Industry Group, HARTING, Specialty Coating Systems or Invenios. Invenios introduces a new laser based ambient (room) temperature bonding process, Specialty Coating Systems explains the benefits of a new antimicrobial technology that combines the characteristics of Parylene with antimicrobial properties to effectively eliminate harmful microorganisms on coated medical devices. HARTING illustrates how molded Interconnect Devices (MID) enable the production of miniaturized medical devices which deliver higher functionality while offering lower costs.

Furthermore you will find several products news from European companies (see page 11ff.) that introduce products and services that are especially well-suited for the American market or that have caused a lot of interest at US trade fairs during the last year. I hope you enjoy reading these interesting contributions.

Best regards



Mona Okroy-Hellweg

Lumo Back is a wearable posture and activity sensor made by Lumo BodyTech.

Photo credit: Lumo Body Tech.

consumer technologies such as wearables. But it must be said that Europe has far surpassed US achievements in areas like sustainable energy, automotive design and biomedical engineering—and these are programs that often require more infrastructure and can afford longer design-to-delivery windows.

While government funding is also an important part of the Asian innovation engine, it's not wearables start-ups that are receiving the funding. Rather, look to the giants of the consumer-electronics industry in Asia, companies like Sony, Samsung and LG, to influence wearables. With such paradigms in place, entrepreneurs in many parts of Asia who want to design the next smartwatch may not get the funding to do so. China could prove to be something of an exception. With its booming entrepreneurialism in the consumer electronics industry (as well as the wealth generated by its rising "creative class"), we can expect to see wearables not just manufactured in China, but designed there, too.

Things have been looking pretty rosy in the US for wearables-makers, especially in fitness/activity wristband applications. Body Media, a Pittsburgh-based startup that spun out of Carnegie Mellon, was purchased by Jawbone, a VC-funded company based in San Francisco that makes UP wristbands. BASIS Science, a privately held company located in San Francisco, was acquired by Intel in March 2014 for its Basis bands. Completing the power-triad of wristband developers, another San Francisco-based company, FitBit, sells both fitness/activity wristbands—Flex—and a cute little wireless activity tracker, Zip, which fits in a pocket or a bra.

Diverging from wristbands into other types of body-worn devices, Lumo BodyTech, a Stanford spin-off, offers two posture-saving applications: Lumo Back and Lumo Lift. And how did the company first get started? That's right. It was Kickstarter back in 2012. The company now has VC investors.

As executive director of a global trade association focused on micro-electromechanical systems (MEMS) and sensors, I care deeply about wearables because they would not exist without core enabling technologies such as accelerometers, gyros and magnetometers. And like many other industry types, I am eagerly anticipating "flexible electronics"—MEMS-based technologies with the potential to transform not just wearables but all kinds of electronic products.

I particularly have my eye on MC10, a Cambridge, Mass. start-up with origins at the University of Illinois, Urbana-Champaign. MC10's technology platform features a "bendable, stretchable, body-compatible electronic system" called the Biostamp—➲

Imprint

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One of the many applications of MC10's Biostamp is a skin-friendly cosmetic sticker that tells you when to apply sunscreen.

Photo credit: MC10.

a soft, sensing sticker that can be placed anywhere on the body to measure for a variety of physiological parameters. MC10 is targeting wearable applications in the sports & fitness, consumer health and regulated medical industries. The company launched its first commercial product, the Reebok CHECKLIGHT head impact indicator last year, and will be launching the first of its Biostamp applications in 2015. It is unequivocally true that technology innovation takes place all over the world, but when it comes to wearables and to some of the technology components and platforms that make wearables what they are, it is US-based companies that are largely leading the way.

MEMS Industry Group, Pittsburgh, United States
http://www.memsindustrygroup.org

Author:
Karen Lightman, MEMS Industry Group

As executive director of MEMS Industry Group (MIG), the largest industry trade association commercializing MEMS and sensors, Karen Lightman has a unique vantage point of the wearables market. She works with both companies developing component-level technologies that are used to make wearables and with companies that create wearable products for consumers.

Ms. Lightman began her career at MIG in 2001 and was promoted to executive director in 2013. As executive director, Ms. Lightman spearheads strategic growth, oversees business operations and marketing functions, plays a critical role in content programming, and is instrumental in establishing and maintaining partnerships with other international organizations to advance the MEMS and sensors' industry.

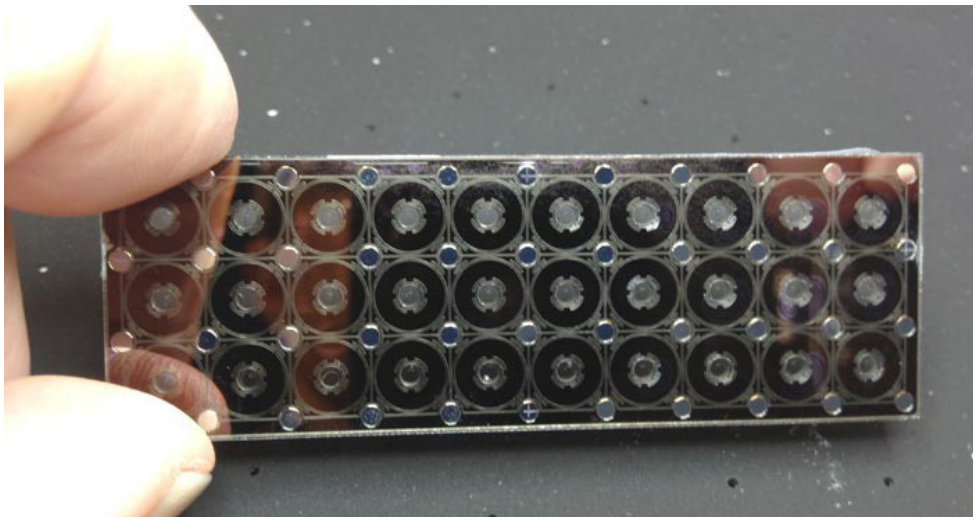
Ms. Lightman holds a BA from the University of Vermont and an MS in Public Policy from Carnegie Mellon University.

A new laser based ambient (room) temperature bonding process

Andreas Freitag

Invenios, an advanced technology micro-fabrication foundry specializing in microfluidics, MEMS, and 3D microstructures now offers the addition of silicon and metal substrates to the range of materials utilizing the firm's innovative Ambient Temperature Bonding (ATB) micro-system production process for the permanent bonding of substrates, such as silicon-to-glass, metal-to-glass, and glass-to-glass at room temperatures without the use of electrostatics, heat or adhesives. The company's technology is a generational leap from current substrate bonding solutions.

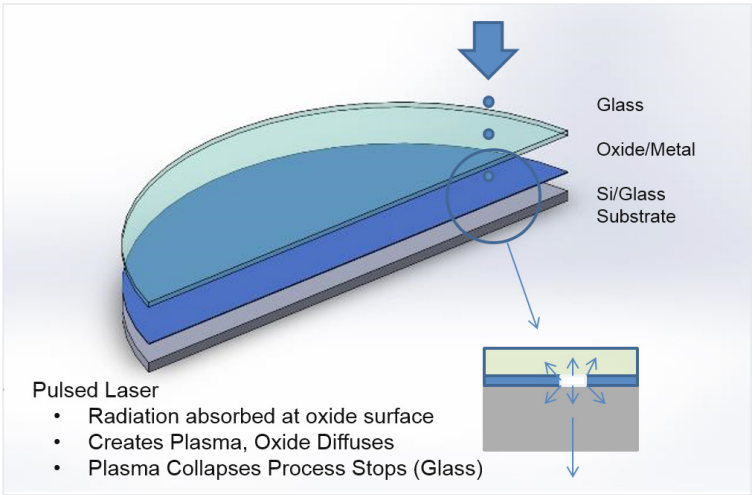
Using a laser with appropriate wavelength - which depends on the materials to be combined - a thin film absorbing layer is evaporated in a very small spot. During the process the substrates are clamped in a fixture with transparent quartz window and blocking bottom plate. This setup enables a high bond yield even with low demands on the surface smoothness and cleanliness. The evaporation energy of the laser is sufficient to start a diffusion bonding of the two materials and in addition the absorbing layer is fully diffusing into the main materials. The heat impacted zone is within one micron of the bond joint. Furthermore the writing speed is in the range of several mm per second.



Example of 3x10 liquid lens array on a microscope slide format. Source: Invenios

Avoid unwanted and damaging bonding effects

By this technology it is possible to combine two or more substrates in a single step. The laser process is also compatible with a wide range of surface coatings like for instance AR coatings. This technology enables Invenios to permanently encase a micro-system at room temperature avoiding the undesirable side effects and restrictions of other micro bonding techniques such as anodic bonding, diffusion bonding and adhesive bonding. The unwanted and damaging side effects of these other bonding methods include ion propagation to the glass surface, warping, loss of clarity, adhesive contamination and heat damage to the specimen, or the exclusion of encapsulated media, like biological agents of functional fluids, none of which occur with the new technology from Invenios.



Laser based ambient (room) temperature bonding process. Source: Invenios

FOTURAN - a "green material"

Invenios' cost-effective Ambient Temperature Bonding (ATB) method employs, but is not restricted to, the company's photo-structurable, optical-quality glass FOTURAN. This lithium-aluminum-silicate glass, which contains traces of noble metals, can be directly exposed with UV-light at certain wavelengths through a photomask. Alternatively, the exposure of the glass material can be also done by a UV laser. By controlling the depth of focus and numerical aperture of the UV-laser optics, sub 10 micron features can be created. In order to critically expose a larger volume - e.g. a large diameter hole - optics with large depth of focus are used. By means of a computer-controlled multi-axis positioning system, a path of laser pulses can be written into the glass and by linking such paths, complex 3D volumes of exposed material can be created. In a subsequent annealing step only the exposed parts crystallize and become an opaque glass ceramic, which can be etched selectively in a hydrofluoric wet etching bath with ultrasonic support. Such structures can have an aspect ratio of up to 30:1 in combination with steep walls with a wall angle of only 1 to 2 degrees. For the purpose of production, FOTURAN can be processed in high volume using masks, however, without the use of photoresist, making FOTURAN a "green material".

Optically clear micro-fluidic devices

Besides this special glass material, multiple substrates in combination with advanced laser technology are used to create optically clear micro-fluidic devices without the use ➲

of electrostatic charges, heat or adhesives for bonding. High aspect ratio micro-system structures can be easily created in complete electrical, mechanical or biological functionalized systems without fear of damaging or contaminating the surface modification/functionalization or other contents.

Because the bonding occurs at room temperature, many new applications for sealed micro-systems are now possible. One of the main product developments based on this technology is a new liquid lens system.

Complex optical instruments

For centuries scientists have combined lenses of very different optical powers, from diverging lenses to highly converging ones, to design and manufacture complex optical instruments. Until now the optical properties of all these lenses, either made from glass or plastic and typically requiring months to be produced, were always fixed. Optilux hermetic lenses fabricated at the wafer scale incorporating Liquid Lens Technology are "dynamic" and can be reconfigured on demand with just a variation of voltage. The lens can adapt rapidly and continuously from diverging to converging and be modeled to support all key optical functions, starting with Auto-Focus and Optical Image Stabilization.

The technology uses the principle of "electrowetting" and a combination of transparent and optically defect-free liquids to create a lens and change its characteristics in real time. Liquids have been used for 40 years in optical systems for high-end products such as goggles or camcorders but Optilux's innovation is to have created a real-time programmable platform that offers to change the shape of the liquids in a very fast, repeatable, precise and controlled way.

The main advantages of this technology are a large range of optical variations, high robustness for over 30 million cycles without any performance degradation, shock resistance shown by the excellent response curves measured before and after shock tests, speed and significantly lower power consumption (10 times lower than VCM, piezos or motors).

Semiconductor and MEMS fabrication

The company has developed state-of-the-art laser machining capabilities dedicated to the micro-structuring of a variety of materials used in semiconductor and MEMS fabrication. Eliminating virtually all of the damaging side effects of current bonding procedures, Ambient Temperature Bonding technology leverages the unique properties of optical quality FOTURAN photo-structurable glass in tandem with other substrates to produce high quality, robust and inert sealed micro-systems.

Invenios Europe GmbH, DE
Invenios, Santa Barbara, USA
http://invenios.com

New antimicrobial technology for medical devices

Dr. Rakesh Kumar

microRESIST antimicrobial technology combines the benefits of Parylene with antimicrobial properties to effectively eliminate harmful microorganisms on coated medical devices. This technology completely encapsulates the surface of a device, regardless of size or complexity, with a pinhole-free, micron-level coating that has both antimicrobial and biocompatible properties.

The rise of healthcare-associated infections

Pathogens that cause healthcare-associated infections pose an ongoing and increasing challenge to healthcare facilities. A health-care-associated infection (HAI), as defined by the US Center for Disease Control and Prevention (CDC), is a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or toxin(s) that was not present on admission to the acute care facility. In short, an HAI is an infection that developed as a result of receiving medical care, not as a result of the original illness. Common HAIs include central line-associated bloodstream infection, catheter-associated urinary tract infection, surgical site infection and ventilator-associated pneumonia.

The frequency of certain pathogens in HAIs was highlighted in a study conducted by the national Healthcare Safety Network (NHSN), which found that ten most common pathogens accounted for 84 % of infections (see Figure 1). Healthcare-associated infections are a challenging issue for healthcare facilities around the world. According to the Safe Care Campaign (www.safecarecampaign.org/facts.html, accessed June 9, 2014), HAIs result in more deaths than AIDS, auto accidents and breast cancer combined in the US. As a result of this global issue, medical device manufacturers are looking to antimicrobial coatings that are biocompatible, biostable, inert, non-toxic and can meet compliance guidelines. This has led to an increased interest in antimicrobial protection for devices in continuous contact with patients (catheters and other medical devices).

10 Most Common Pathogens

- Coagulase-negative staphylococci (15.3%)
- Staphylococcus aureus (14.5%)
- Enterococcus species (12.1%)
- Candida species (10.7%)
- Escherichia coli (9.6%)
- Pseudomonas aeruginosa (7.9%)
- Klebsiella pneumoniae (5.8%)
- Enterobacter species (4.8%)
- Acinetobacter baumannii (2.7%)
- Klebsiella oxytoca (1.1%)

Figure 1; Source: Specialty Coating Systems

Antimicrobial technology built on benefits of Parylene

The innovative antimicrobial technology offers an alternative to traditional silver ion and antibiotic technologies. This significant breakthrough combines the benefits of naturally biocompatible Parylene with antimicrobial properties to effectively eliminate harmful microorganisms on coated medical devices. It completely encapsulates the surface of a device, regardless of size or complexity, with a pinhole-free, micron-level coating that has both antimicrobial and biocompatible properties.

Parylene is an ultra-thin, pinhole-free coating applied at the molecular level in a gas deposition process. The molecular "growth" of Parylene coating ensures a uniform, conformal coating at the thickness - usually measured in microns - specified by the manufacturer. Because it is applied in a vapor phase deposition process, the coating penetrates into every crevice, regardless of how seemingly inaccessible. Parylenes N, C and Parylene HT have been widely used in medical applications for decades, providing excellent barrier properties against body fluids as well as moisture, chemicals and common gases. The coating also possesses excellent dry-film lubricity characteristics, making it a common choice for devices requiring surface properties that let them slide easily within the body. Parylenes N, C and Parylene HT comply with the biological testing requirements of ISO-10993 and are certified to comply with the biological testing requirements for USP Class VI Plastics.

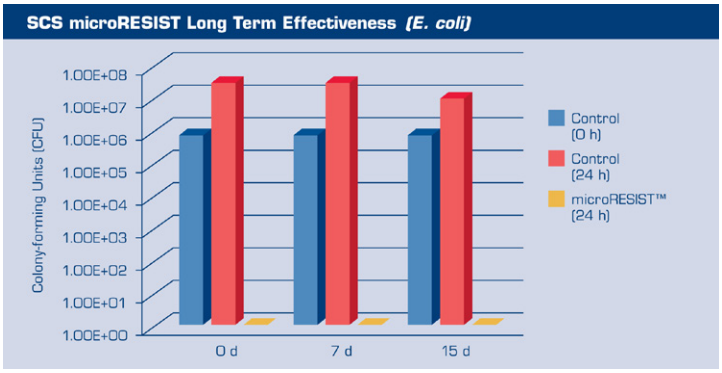
microRESIST Antimicrobial Parylene Technology

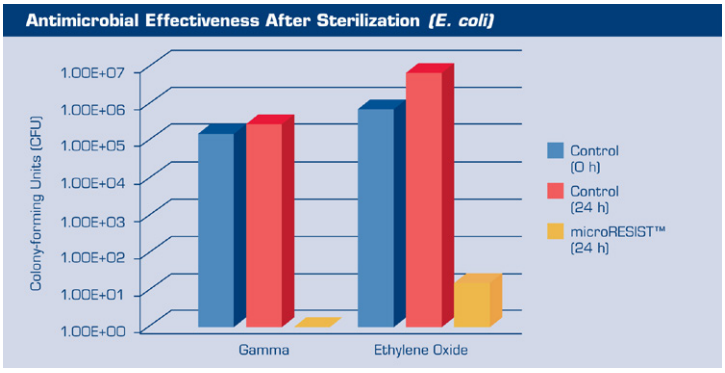
The technology adds a new level of protection to Parylene conformal coatings by incorporating an organic compound into the basic Parylene formulation, adding advanced antimicrobial properties, which have been demonstrated to be highly effective in eliminating harmful microorganisms. This technology is non-toxic, safe and environment-friendly.

Samples coated with the antimicrobial Parylene technology were tested for antimicrobial activity according to JIS Z 2801. To determine the microbial log reduction, films containing SCS microRESIST were inoculated with microorganisms, then incubated for 24 hours. All protected samples demonstrated greater than 5 Log reduction after 24 hours.

Sets of coated samples were immersed in Phosphate Buffered Saline (PBS) at 37°C for 7 days and 15 days, respectively, then inoculated with E. coli and tested per JIS Z 2801 to determine the microbial reduction. A non-PBS immersed sample (0 days) was used as a control. All coated samples achieved greater than 5 Log reduction.

Samples protected with the antimicrobial Parylene technology were also subjected to biocompatibility testing per ISO 10993. The test samples successfully met the requirements ➲





for cytotoxicity, sensitization, hemolysis (PPT), partial thromboplastin time (PTT) and 12 week implantation.

Along with the antimicrobial and biocompatibility properties being tested, the treated samples were tested for the ability to withstand the most common sterilization processes. Two sets of SCS microRESIST treated samples were sterilized; one set using gamma radiation, dose range between 10-15kGy (1.0 to 1.5 Mrad), the other using Ethylene Oxide (EtO). Samples were then tested for effectiveness against E. coli according to JIS Z 2801. For both sterilization methods, SCS technology achieved greater than 4 Log reductions against E. coli bacteria.

The coefficient of friction of Parylene coated surfaces (without antimicrobial properties) and SCS microRESIST coated surfaces were also tested, in accordance with ASTM D 1894-08 at room temperature. Results indicate there is no statistical difference between the samples.

The applied technology fills both the gap of antimicrobial attributes for Parylene itself and also offers an alternative to the limited reach of silver ion and antibiotic technologies. While it can protect any device that comes in contact with, or is placed into the body, from a variety of microorganisms, some common applications include urinary and central-line catheters, ventilators, general elastomers (seals, O-rings, tub-ing), and urological tools, to name only a few.

The CDC notes the use of antimicrobial-impregnated catheters as one of their top recommendations for preventing catheter-associated urinary tract infections, an HAI that has experienced 3% growth between the years 2009 and 2012.
Source : Specialty Coating Systems

According to the National and State Healthcare-associated Infections Progress Report, (http://www.cdc.gov/hai/progress-report/index.html, accessed March 26, 2014), catheter-associated urinary tract infections saw a 3 % increase between 2009 and 2012. As HAIs continue to pose a challenge to hospitals and healthcare facilities, the CDC has noted the use of antimicrobial/antiseptic-impregnated catheters as one of their top recommendations for preventing both catheter-associated urinary tract infections and central line-associated bloodstream infections (http://www.cdc.gov/HAI/pdfs/hai/top-cdc-recs-factsheet.pdf, June 9, 2014). microRESIST provides manufacturers an alternative technology in the fight against healthcare-associated infections, one that enables their devices to effectively eliminate and protect against harmful microorganisms.

Specialty Coating Systems, Indianapolis, USA
www.scscoatings.com

Dream big in small sizes

Greg Whiteside

Molded Interconnect Devices (MID) enable the production of miniaturized medical devices which deliver higher functionality while offering lower costs. HARTING is one of most experienced and competent providers of precision 3D MID components. This technology enables customers to advance the miniaturization of their components and systems.

Cost cutting pressure in the health care sector is generating a rising demand for devices and equipment that permit remote and decentralized patient diagnostics. Mobile medical devices for blood sugar measuring, blood pressure monitoring, and oxygen measuring can be equipped with communication features which provide physicians and health care personnel with a continuous flow of information. In addition, compact hand-held devices contribute to improving diagnostic routines for general practitioners. Improving patients' quality of life is a priority of the development engineers in the health care market.

Miniaturization technologies

There are many miniaturization technologies currently available. They include integrated circuits (IC), sensor chips, data recording SOCs (Systems on a Chip), and microcontrollers. But it is only new production techniques, such as the injection molding of circuit carriers (MID – Molded Interconnect Devices) that enable the miniaturization of the devices and the implementation of new functionality into the devices.

MID's are injection molded plastic parts with integrated electrical circuits. These circuits can be arranged on the 3D surface as required by the design engineer The 3D MID production processes enable the integration of IC chips and small flat components (SMDs) onto the injection molded housings. Moreover, this method allows the creation of gaps and recesses, channels and apertures for sensors, contact elements, and other devices. This provides developers with improved flexibility in designing specific components, while realizing cost-efficient production processes at the same time.

Advantages of 3D component manufacturing

MID technology allows the production of integrated components with very compact size, and can be developed to precise dimensions. In addition, the latest thermoplastic materials can be utilized and are capable of withstanding thermal stress. Moreover, construction modifications are easy to implement by way of laser direct structuring. HARTING Mitronics utilizes two 3D MID production techniques:

Two-Step Injection Molding (2K) – This involves the use of two plastic materials, low tooling costs and flexibility for design and construction of the MID. The assembly of IC chips and SMDs is usually performed by a soldering of which one can be metalized in order to create the circuit paths, while the second material remains passive. In most instances the minimum widths and gaps between the circuit paths are around 400 µm. The two-step (2K) technique enables the production of large unit volumes at low costs.

Laser Direct Structuring (LDS)

Laser Direct Structuring (LDS) – The LDS technique utilizes a laser beam which activates the metal additives of a special polymer, which subsequently enables the plating of the circuit paths. This technique creates circuit paths and gaps of 150 µm. This LDS technique is characterized by low tooling costs and flexibility for design and construction of the MID.

Source: HARTING

The assembly of IC chips and SMDs is usually performed by a soldering technique. Flip-chip assembly as well as the use of a conductive adhesive are also options. Wire bonding permits the placement of the components in a multitude of arrays. Flip-chip methods are used to achieve extremely compact component sizes. In the case of SMDs the assembly and/or the connection between the electrical contact surfaces and the housing is done by electro conductive adhesive, reflow soldering, or vapor phase solder techniques.

The mounting of a completed 3D MID component can be achieved by one of the techniques described above. 3D MID components can be added to PCBs just like any other SMD part, allowing for improved manufacturing flexibility and cost savings.

HARTING, Inc. of North America
http://harting-usa.com
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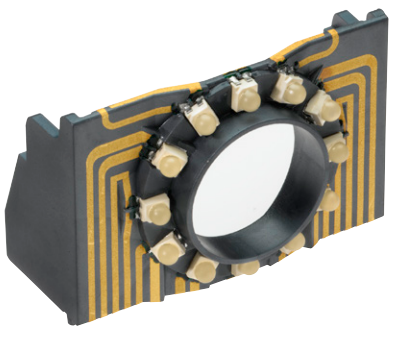
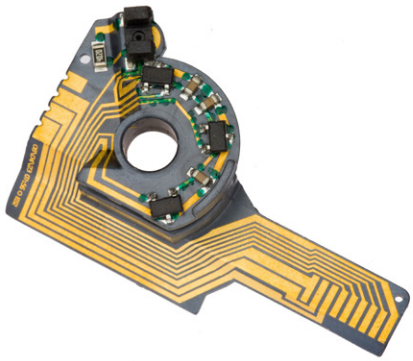
(Phone +1.847.249.0460)

Little 3D helpers
Source : HARTING



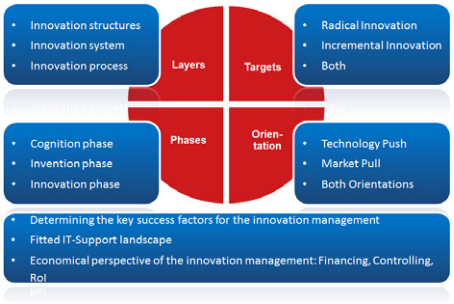


Company and product news

Call for participation: establish / improve SME's innovation management

Based on proven methods and more than a decade of research and method application, a new initiative to improve the innovation management of small and medium-sized enterprises (SME's) will be started. The foundation of the Technical and Market Based Innovation Management Method (TAIM) lies in proven methods like StageGate and PRINCE2 on the one hand and on results of PROMITIS and CORONA research projects on the other hand. It delivers improved innovativeness for SME's by applying a holistic approach to innovation management through combining established methods with ideas of young talents and the experience of innovation management experts. The kick-off program for SME's uses expert workshops for detailing the requirements, pinning down weaknesses in the current practices and defining KPI's for solutions. Based on the findings, a team of young specifically selected experts from different network partners and universities will be created. It will address the weaknesses and collaborate with the senior experts to define suitable measures for improvement. The areas of application for the program are: ideas for new products, establishing holistic innovation management inside an entity, (re)positioning an entity within the innovation system or (for international entities) defining and establishing access to German innovation and supply chains.

Interested companies are invited to contact ISW Business School Freiburg, Dr. Carsten Hutt (carsten.hutt@isw-freiburg.de, T. +49 (0)761 380 999 0) or camLine GmbH until August 15, 2014



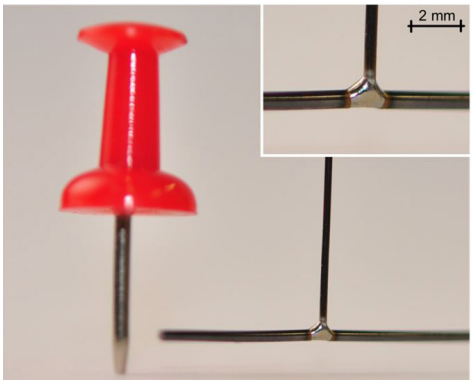
Source: camLine

camLine GmbH, Dr. Dirk Ortloff , Email: dirk.ortloff@camline.com, www.camline.com

Micro welding of shape memory alloy rods by laser rod end melting

"Knowledge for application" – according to this guiding principle, the BIAS - Bremen Institute of Applied Beam Technology is the R&D partner in the fields of „material processing and handling systems" and „optical metrology and optoelectronic systems". It is known that transferring processes from macro range to micro range is accompanied by increasing influence of so-called "size effects". For example, forces due to surface tension become more significant than gravitational forces as an object's size decreases. This characteristic is used to increase gap bridging in laser micro welding. In general, the gap between the joining partners should not exceed 5 % of workpiece thickness if welding without filler material is desired. In the micro range, where dimensions of workpieces are smaller than 1 mm, this would result in positioning tolerances in the range of several micrometers, which would require considerable technical effort. BIAS has taken this challenge and applied the laser rod end melting process to the welding of thin shape-memory alloy rods with diameters of 0.5 mm and 0.7 mm.

The rods are aligned perpendicular to each other and the vertical rod overlaps the horizontal rod by a certain length. This "overlap" length is then processed by laser beam irradiation which causes the rod end to melt. The laser and the melt both move upward along the vertical rod's axis and the melt acts as filler material which allows bridging large gaps between the joining partners. The result is shown in Fig. 2 with rods of a shape memory alloy. Shape-memory alloys have applications in industries including aerospace, automotive, robotics, and biomedical. Therefore, this new welding technology has great potential for industrial use.

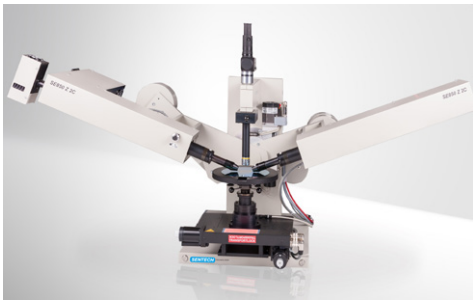


Micro laser welding of memory alloys. Diameter of horizontal rod 0.7 mm, vertical rod 0.5 mm.
Source: BIAS

BIAS - Bremen Institute of Applied Beam Technology, Heiko Brüning, Email: bruening@bias.de, www.bias.de

Spectroscopic ellipsometer for measuring all 16 Mueller Matrix elements

SENTECH Instruments is a leading supplier of plasma process technology equipment for etching, deposition and thin film metrology instruments based on spectroscopic ellipsometry. SENTECH's dedication to a broad application range for spectroscopic ellipsometers gave rise to the new 2C-option for Mueller Matrix Measurements. This smart option enables SENTECH spectroscopic ellipsometers to measure all 16 Mueller Matrix elements with an accuracy of +/- 0.005. Hence, a spectroscopic ellipsometer with 2C-option is perfectly suited for analysing anisoptropic samples, depolarizing samples and structured samples. This innovative option for measuring the Mueller Matrix was firstly used by the (PTB) in Braunschweig, which is the national institute for natural and engineering sciences and the highest technical authority for metrology and physical safety engineering in Germany. At the beginning of 2014, Dr Bernd Bodermann, head of the department for Ultra-high Resolution Microscopy, purchased a SENresearch with 2C-option for analyzing optical properties of various anisotropic materials and textured samples. Interviewing him on the new ellipsometer he lauds: "The system works very reliably and perfectly meets our requirements in all fields of metrology. The analysis of artificial optical materials, such as plasmonic structures and metamaterials is enabled for the first time by spectroscopic ellipsometry. In addition, measuring accuracy is enhanced by measuring spectroscopic and entirely polarimetric quantities." The 2C-option extends the capabilities of a SENresearch, which include measuring refractive index, absorption coefficient, and film thickness by the Step Scan Analyzer (SSA) principle. The motorized goniometer allows independent movements of analyzer and compensator to feature angle-dependent scattering measurements of e.g. periodic structures. Furthermore, operating SENresearch spectroscopic ellipsometers is extremely user friendly. The entire ellipsometric measurement can be performed by just one click and the results are displayed in a few seconds. Hence, the new 2C-option is a powerful tool for Mueller Matrix measurements to study new optical materials and patterned samples.



Source: SENTECH Instruments GmbH

SENTECH Instruments GmbH, Email: info@sentech.de, www.sentech.de

Company and product news

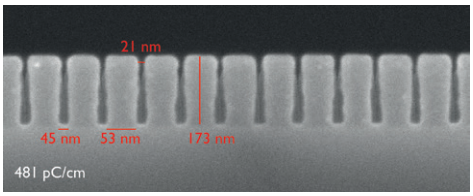
High-resolution, highly sensitive & plasma etch-resistant positive e-beam resist CSAR 62

The strive for more and more powerful computers is correlated with the demand for increasingly smaller structures in the manufacture of integrated circuits. A technology which today already is able to realise extremely small resolutions in the nanometre range is electron beam lithography. This technology however requires high-performance electron beam resists. The company Allresist GmbH is specialized in the production of such high-tech resists and was honored with the Brandenburg Innovation Award 2014 for the successful development of e-beam resist CSAR 62.

The new product CSAR 62 is a high-technology resist for electron beam lithography which allows the implementation of high-end applications in microelectronics, e.g. for the aerospace industry or high-performance computers. With the new resist which has properties comparable to ZEP 520, structures of 10 nm are manufactured for highly integrated circuits. CSAR 62 is characterized by excellent resolution, good sensitivity, and possesses an outstanding plasma etch resistance. In contrast to ZEP 520, CSAR 62 is immediately available and at a considerably lower price. The resolution of a 180 nm thick film is 10 nm and the sensitivity is 65 µC/cm². Plasma etch rates in CF4 + O2 plasma are in a range of 99 nm/min.

E-beam resist CSAR 62 is in addition suitable for many other applications: lift-off structures (10 nm resolution) can be generated at a 2-fold higher dose for small trenches with defined undercut. CSAR 62 can furthermore also be used in two-layer systems and for mask blanks.

Allresist GmbH, Email: info@allresist.de, www.allresist.de



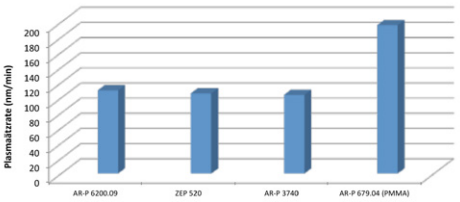


Fig. 1 AR-P 6200.09: Undercut CSAR 62 structures; resolution: 21 nm; Process parameters: Si 4" wafer; 173 nm; 150 °C, 60 s, hot plate; Raith Pioneer, 30 kV; dose: 130 µC/cm², AR 600-546, 60 s, 22 °C
Fig. 2: Comparison of plasma etch rates in CF4 + O2: CSAR 62 and ZEP 520. Source: Allresist GmbH

attoFPSensor – attocube's nanoprecise interferometer

The high sensitivity, ultra-precise interferometric displacement sensor attoFPS enables displacement detection and vibration measurements in the sub-nanometer range. Its sophisticated working principle allows the simultaneous detection of position variations of up to three targets at distances up to 1 m. Due to the elaborated three-axis design, angular variations and tilt effects can be measured and detected most precisely.

In contrast to conventional laser interferometry systems, the attoFPSensor is an all fiber-based interferometer, reducing the physical dimensions of the sensor head to the millimeter range. Due to its most resistant material characteristics the attoFPSensor can also be used under extreme conditions at operating temperatures between -250°C and +150° C.

Despite its exceptional sensitivity, the sensor is capable of tracking target velocities of up to 2 m/s – with no degradation in resolution or accuracy. Vibration measurements for components can be realized with up to 1MHz bandwidth.

attocube systems AG, Verena Kuemmerling, Email: verena.kuemmerling@attocube.com, www.attocube.com

attocube FPSensor: three channel real time interferometric sensor, displayed with two fiber based sensor heads (12mm and 4mm in diameter).
Source: attocube

Condensation monitoring by microsensors

Condensation associated with the risk of electrochemical and chemical migration plays an increasing role in the field of reliability of electronic components. The trends towards minimization of conductive track widths and spacing, and higher density in electric elements are increasingly faced with the negative influences of micro-condensation.

Semiconductor-based microsensors are able to detect the actual state of condensation continuously. They could be placed on different parts of electronic devices to allow also a locally resolved monitoring of microclimate. The new micro condensation sensor system BTF measures the condensation directly and provides calibrated analog (0-1V) or digital (I2C) output signals for surface temperature (-10...+85°C) and water mass up to 15 µg/mm² resp. more based on customer-specific designs. The sensor is suitable for measurements under field conditions. Simultaneously you can get the signals of multiple, spatial allocated sensors to examine whether and how much condensation at which temperature and at which location occurres. The condensation has been tested in automobiles on different printed circuit boards at several places in a transmission tunnel, on the airbag sensor fuse box, in a HiFi control unit and under different climatic conditions by means of the condensation sensor for example.

Tests in climate chambers had taken place under the point of view to recognize a condensation in use of standard ISO/DIS 16750-4 test. According to this test a temperature and humidity profile was defined to generate a dewing effect and the condensation sensor gave the signal that a condensation had really taken place. The sensor system allows first time quantitative measurement of condensate and describes the situation of equilibrium of condensation/evaporation qualitatively too. This sensor system is a tool for reliability tests and to support R&D and production of highly integrated printed circuit board, materials and components.

CiS Forschungsinstitut für Mikrosensorik und Photovoltaik GmbH,
Andreas Albrecht, Email: info@cismst.de, www.cismst.de

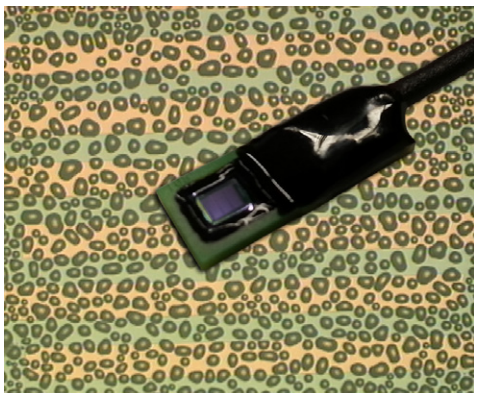
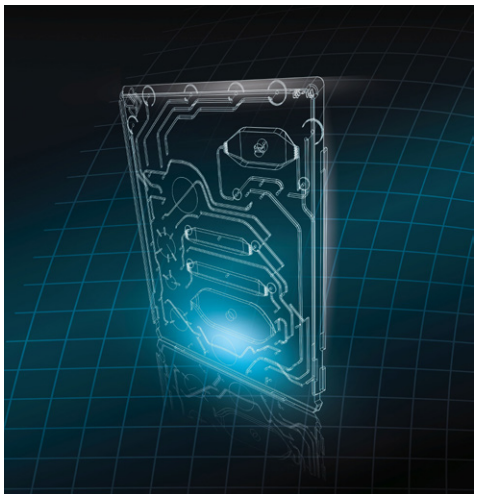


Photo montage (CiS): Condensation sensor BTF and water droplets on sensitive interdigital electrodes
Source: CiS Forschungsinstitut für Mikrosensorik und Photovoltaik GmbH

Company and product news

Micro details in lab-on-chips out of injection-molding



Source: CG.TEC Injection

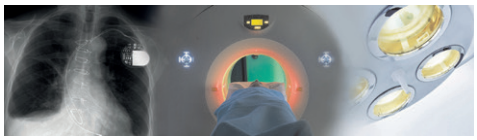
CG.Tec Injection has been producing lab-on-a-chip systems out of injection-molding since 2006. Recently, the company has developed a polymer-based lab-on-a-Chip with 7µm microstructures for a radiopharmacy application.

Precision injection-molding companies usually target dimensions with a tolerance of 20-30µm. Achieving details bellow 10µm requires a different industrialization scheme. First of all, the design for manufacture plays an important role, having to choose a feasible layout with the highest success chances. To achieve 7µm microstructures the tooling and the injection process combine the latest technics available. The mold can bear features with dimensions from a few millimeters down to a couple of microns. The injection process creates conditions for appropriate cavity filling and ultimate part stability. Once ejected, the part is then handled automatically in clean-room conditions to avoid contamination. Thanks to these recent progresses droplet generation may be monitored on injected cartridges as radii are eliminated. These new capabilities will probably boost microfluidic applications. Lab-on-a-chip systems with 7µm microstructures can be produced in 1-2 minutes out of injection, whereas hot-embossing may release 2 parts per hour. This high-throughput, combined with a lower material consumption, makes the consumables affordable.

Since its foundation in 1997, CG.Tec keeps working on the most challenging projects both in precision mold-making and injection-molding. The company, which is certified ISO 13 485, will take part in the Lab-on-a-chip world congress conference in San Diego in September.

CG.TEC Injection, Claire Flipo, Email: c.flipo@cgtec.eu, www.cgtec.eu

(Opto-) electronic systems for sophisticated medical devices

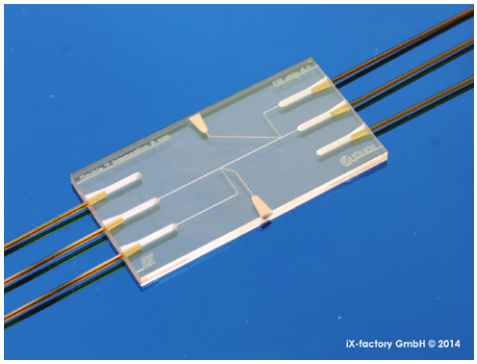


Source: AEMtec

AEMtec is a member of exceet Group S.E., an international technology group with a strong presence in medical implantable applications and box building. The company develops and produces (opto-) electronic systems for sophisticated medical devices (from class 1 to class 3). The high-precision assemblies are embedded, for example, in implantable drug delivery systems, hearing aid systems, medical imaging devices, dental appliances, X-ray technology, blood gas analysis and cochlear implants. High-end packaging and assembly technologies such as COB (Au and Al wire, die placement up to +-2 µm (3s), FC die attach (solder bump, ICA, NCA, ACA, copper pillar), SMT (passive, CSP) on multilayer and different kinds of substrates meets the requirements of the customer. AEMtec handles almost all kinds of substrate (rigid, ridged flex, flex, ceramics, glass wafer) and produces finest structures. For the layout of opto-electronic systems, AEMtec offers active and passive optical alignment. For the validation of highly complex optical assembly groups, AEMtec provides specially developed high-precision testing equipment. An integral part AEMtec's engineering team is a group whose task is to develop product-specific test systems. As a full service innovation & product outsourcing partner AEMtec supports projects form the initial idea to development, (volume) production up to complex tests, industrialization and qualification. Certifications: ISO 9001, ISO 13485, ISO 14001.

AEMtec GmbH, Bianca Penner, Email: Bianca.Penner@aemtec.com, www.aemtec.com

Micro and nanotechnologies as key technologies – there is no limit to the application areas



Chip for multidimensional electrophoretic separations (Forschungszentrum Jülich, Germany)
Source: iX-factory

In recent years, the iX-factory supported well-known research institutes and universities from different branches in significant developments. One example is the enzyme reactor chip which iX-factory fabricated under the EU Research Project BIOINTENSE for the determination of the oxygen content of bioreactive substances at different sections. Specifically for the fabrication of the enzyme reactor chip, iX-factory developed the anodic bonding process at temperatures below 150°C. Here the bonding process is made possible, when sensors with high temperature sensitivity are integrated. Not only the application of multidisciplinary technologies is challenging, but also a smooth integration of the chip into the system. iX-factory does not only develop customized chips, but also offers the perfect connection to the environment.

Another example is a promising tool for bioanalytical areas like proteomics or metabolomics, which was developed together with the research institute Jülich. iX-factory fabricated the microfluidic glass chip for multidimensional electrophoretic separations coupled to mass spectrometry based on the capillary-hybrid chip approach. The inlets are precisely micro powder blasted to assure the perfect fit to the capillaries. Capillaries are fixed using epoxy glue. Not only in the bioanalytical field, but also for medical diagnostics, micro and nanotechnologies are key enabling technologies. Under the AIF project, the University of Applied Sciences Hamm-Lippstadt succeeded in shortening the detection time of acute leukemia to 30 minutes through a chip-based method. Using wet etching, iX-factory assured the cell-optimized size of the channels. Micro powder blasting is used for the definition of the inlets in order to ensure a non-leaking connection.

iX-factory is continuously going forward to discover new application areas and aims to support its customers with fabrication of customized solutions for their success.

iX-factory, Email: info@iX-factory.de, www.iX-factory.com

Company and product news

MicroProf 200 continues FRT's proven multi-sensor technology

In daily industrial practice, diverse applications and requirements call for flexible solutions. The MicroProf 200 fulfils such requirements and consistently continues FRT's proven multi-sensor technology offering maximum customer benefits. The FRT multi-sensor technology offers the opportunity to combine different measurement principles in one tool resulting in the utmost flexibility: a high resolution color camera guarantees the fast location and definition of the region to be measured. For the measurement of topography and film thickness, the MicroProf® 200 can be equipped with various sensors. Here, both area sensors and point sensors can be used, which can be fully integrated in the system and positioned and combined in numerous ways. The option to upgrade the system with additional sensors also prepares users for future measuring tasks. So do individual and exchangeable sample holders.

The MicroProf 200 can be equipped for sample inspection from both sides. Components such as wafers, optical lenses, gaskets and others can be characterized for thickness, roughness and contour by simultaneously measuring top and bottom of the sample. With the MicroProf 200 instrument software, users can set up 2D or 3D measurements of components and analyze and export the resulting data. The software, which is developed by FRT, enables users to define both manual measurements and automated measurement sequences. Measurements taken at multiple positions of individual components as well as several similar samples placed in a holder on the measuring stage can be analyzed in a single run. The measurement recipes can be created without any programming skills through the standardized and user-friendly interface. In combination with a handling robot the throughput can be further increased. The evaluation of the measurement data is based on current norms.

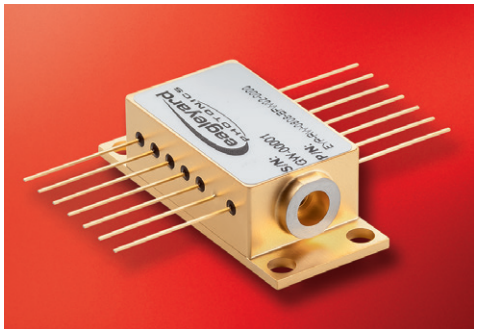
Source: FRT, Fries Research & Technology GmbH

FRT, Fries Research & Technology GmbH, Christina Abholte, Email: abholte@frt-gmbh.com, www.frt-gmbh.com

800 mW Single-Transverse-Mode Semiconductor Laser - the ideal Laser Source for Diffractive Optical Elements

eagleyard Photonics, a leading supplier of high-power laser diodes releases its new Fabry-Perot Laser at 808 nm with hermetic butterfly housing ideally suited for measurement of 3D surfaces by CCD sensors. Metrology has thrived at the interface between science and manufacturing. Aerospace, automotive industry, medicine and semiconductors rely on metrology to translate theoretical science into real mass-production.

eagleyard's high-power 808 nm Fabry-Perot laser diode is the ideal laser source for diffractive optical element (DOE) based sensors in the area of surface measurements and inspections. The single transverse mode and the excellent beam characteristic of the laser enables the generation of pin sharp patterns. RoHS compliant and hermetically sealed butterfly packages with beam collimation optics are perfectly suited for the integration into industrial sensors. The wavelength of 808 nm and the pulse mode operation with pulse lengths up to 10 ms are aligned to the characteristics of CCD sensors. Diffractive optical elements (DOE) are able to generate a variety of beam patterns that can be used by CCD sensors for the measurement of 3D surfaces. Especially automotive test equipment manufacturers will benefit from this outstanding package.



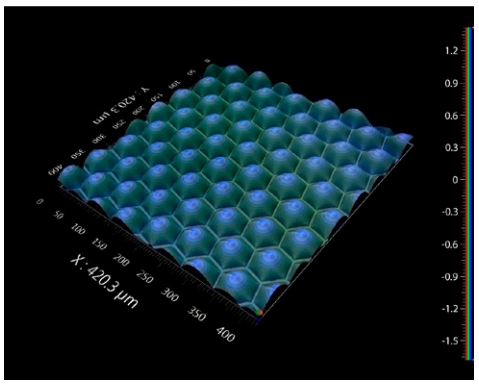
Source: eagleyard Photonics GmbH

eagleyard Photonics, Sandra Chudek, Email: sandra.chudek@eagleyard.com, www.eagleyard.com

Collimator surfaces now available from CDA

CDA, specialist for the manufacture of complex, microfunctional and cost-effective optical microstructures in plastics, has now released collimator surfaces for diffraction-limited and general illumination applications. Different collimator surfaces can be generated for a spectral range covering the near UV/violet to NIR, and comprising either a refractive and/or a diffractive surface. Continuous refractive elements are diffraction-limited and are intrinsically broadband and dispersive, depending on the plastics used. A maximum sag limits NA, depending on the diameter of the lens, with values as high as 0.75 for small microlenses. Alternatively, segmented, Fresnel-like lenses can be generated with a higher NA, although this type of optics is not diffraction-limited. Instead, a diffractive optical element (DOE) can be generated, also providing diffraction-limited performance at the design wavelength, albeit with less efficiency. This type of structure is more wavelength-sensitive, although a relatively good broadband behavior can be designed into the diffractive at the expense of diffraction-limited performance. For minimally apodizing structures, the NA can be as high as 0.5.

Either type of optics can be tailored to provide specific collimation properties dependent on the application, including improving the light capture from LEDs and bundling light into camera pixels. For more exacting applications, either continuous refractive or diffractive surfaces are required – for optics diameters above 2mm, the space savings provided by a diffractive surface can be dramatic. Arbitrary aspheres are also relatively easy to realize using a diffractive surface, and by combining refractive and diffractive optical surfaces, small bandwidth achromats and athermalized lenses can be realized. Lastly, in all cases, CDA's technology ensures exceptionally high repeatability for arrays of elements forming an extended surface. These new structures can be incorporated in a further recent development at CDA, i.e. in the manufacture of double-sided structures and stacks in plastics. Such structures can comprise any combination of functionality from CDA's two principal micro-technology platforms, namely refractive micro-optical elements and arrays, DOEs and optical diffusors for optics, and microfluidic structures and surface structuring for analytical lab-on-a-chip applications.



A regular refractive lens array with high reproducibility and high NA.

Source: CDA GmbH

CDA GmbH, Dr. Nicolaus Hettler, Email: Nicolaus.Hettler@cda.de, www.cda-microworld.com

Company and product news

Versatile mass flow controller with ultra fast settling time

The Swiss sensor manufacturer Sensirion presents its new digital mass flow controller, suitable for diverse applications in the industrial and medical technology sectors. The new SFC5000 provides extremely high accuracy, repeatability and reliability at a very attractive price. The SFC5000 Series with its long-term stability enables precise control over a wide control range of 1000:1. Its ultra-fast settling time is 50 milliseconds. The excellent performance of the mass flow controller is based on Sensirion's innovative CMOSens Technology, which combines the high-precision sensor element and the analog and digital signal processing circuitry on a single tiny CMOS silicon chip. The sensor signal is converted into a fully calibrated and temperature compensated digital signal directly on the chip. The new mass flow controller features both analog and digital interfaces, enabling new features such as optional multigas, gas recognition and self-test capability. The mass flow controller operates from a standard supply voltage of 14–24 VDC. It can be used with input pressures up to 10 bar (145 psi), and it is resistant to electromagnetic interference (EMI). Due to exceptionally fast reaction time of the flow chip combined with fast control algorithm and valve, inlet pressure fluctuations can be regulated in real time providing stable output flow profile. It features a vacuum-tight stainless steel package of the flow chip which is mounted on a sturdy aluminum or stainless steel flow body. The new SFC5000 is available with various connection options. All this makes the product ideal for controlling and monitoring mass flow in many different applications such as plasma etching and deposition, process automation, analytical instrumentation, medical anesthesia/ventilation equipment and other areas.

Liquid flow sensor SLQ-QT500
Source: Sensirion AG

SENSIRION – the sensor company, Email: info@sensirion.com, www.sensirion.com

PTF Pfuller sucessfully expands to the USA

Germany-based PTF Pfuller GmbH & Co. KG has chosen Sturtevant for its first U.S. location, with plans to ramp up from its initial sales operation to a manufacturing and distribution center within 5 years. PTF German Precision Technology Inc., the established U.S. division, started with a small sales staff in August 2013. PTF is a manufacturer of high-precision components and assemblies for semiconductor, food, medical technology, laser and aerospace industries. CEO Oliver F. Zintl spent two years working with the Racine County Economic Development Corporation after an initial meeting at the USA Investment Center organized by SelectUSA and CS Germany at Hannover Messe 2011. PTF cited the tremendous work of Racine County and Milwaukee 7 (a regional economic development organization), as well as the central location, access to existing customers in the region, and the quality of the Gateway Technical College which offers the potential for a nearby source of talent for the company. Zintl: "Today it is very important to be global, to be where our customers are. They need guidance more than ever because the projects we handle for them are getting more and more complex."

Source: PTF Pfuller GmbH & Co. KG

PTF Pfuller GmbH & Co. KG , Heike Sommer, Email: h.sommer@precision-ptf.com, www.precision-ptf.com

The Modular Device Library – Flexible and Reliable Flow in Research and Production

Built around its neMESYS family of high-precision syringe pumps, cetoni GmbH continues to complement its available range of fluid manipulation modules that cover processes from picoliters to 2000 bar. Customers from R&D to small scale production, from food and drug discovery to environmental testing and the oil industry will find the right components for their (continuous) flow-process needs.

The comprehensive software package QmixELEMENTS allows for full automation of a complete fluidic system, whether it runs a purely-cetoni based system or an expanded existing infrastructure. For more individual integration tasks, cetoni offers both hardware and software add-ons: the pumps' built-in interface allows for the simple connection of pressure or temperature sensors and the operation of valves; the Qmix IO module provides user-programmable digital and analog out- and input channels.

cetoni's modular approach allows the user to harness the exceptional pulsation-free and fast-responding flow, be it for the generation of uniform droplets or compartments or to achieve stable laminar flows. Fluid and probe handling, targeted illumination, and suspension mixing are complemented by heated syringes, low-flow check valves, etc. With its mechanical, electronic, and software engineering capabilities, cetoni offers an inclusive device library that caters for all your needed flow functionalities – made in Germany.

Source: cetoni

cetoni GmbH, Franz M Schaper, Email: franz.schaper@cetoni.de, www.cetoni.de

ΣYSTEMS INTEGRATION shows efficiency improvements through automation in microfluidics

Around 60 international experts on microfluidics took the opportunity to network and share the latest trends at IVAM's established symposium ΣYSTEMS INTEGRATION. Held on June 17, 2014 in Almelo, the Netherlands and hosted by WWINN BV, its key topic was 'Automation in the production and application of microfluidic devices in chemistry and biology'. Microfluidic components are already in use in analytics, medical diagnostics or chemical manufacturing with great success. Even so, microfluidic hardware always requires automated control technology. ΣYSTEMS INTEGRATION is an annual conference focused on the processing and integration of micro-components. Next year, it will be held at VTT, Finland's largest research facility, and will focus on '3D printing'.

Dr. Thomas R. Dietrich (IVAM) and Gerard Huiberts (WWINN)
Source: IVAM

IVAM, Orkide Karasu, Email: ok@ivam.de, www.ivam.de

Company and product news

3D surface measurement technology for efficient engines popular in the USA

The NanoFocus µsurf cylinder is an optical 3D surface measuring system for high-resolution, non-destructive measurement of engine cylinder walls. Source: NanoFocus

Participation at the SAE World Congress in spring in Detroit ended with highly positive resonance for NanoFocus AG, developer and manufacturer of optical 3D surface measurement technology. Energy efficiency and innovative manufacturing processes are global topics in the automobile industry.

When developing low-emission engines, using optimized nano- and micro-structured functional surfaces, it has been proven that the friction and, therefore, the resulting fuel consumption can be significantly reduced. To optimize surfaces with regard to durability and friction reduction, the optical 3D measurement systems from NanoFocus, which are precise to the nanometer, deliver the relevant parameters. One of the focal points is the evaluation of the cylinder working surface in the tribological system between the working surface, piston and piston ring. The measurement system µsurf cylinder is a specialized branch solution from NanoFocus for the non-destructive 3D inspection of surfaces of cylinder walls. „Our tried and tested branch solution µsurf cylinder is used by premium automobile manufacturers worldwide," explains Dr. Chris Wichern, Managing Director of NanoFocus, Inc. µsurf cylinder was developed in cooperation with key users in the automobile industry and has been continuously optimized since it was introduced to the market in 2006. In addition, NanoFocus offers reliable measuring processes for a variety of other automotive applications. These range from coating appearance measurements, connecting rod inspections and gearbox seal checks to vehicle electronics.

NanoFocus AG, Claudia Delto, Email: presse@nanofocus.de, www.nanofocus.de

Market-leading optical components for customized applications

As one of the leading suppliers of optical components, FISBA OPTIK develops and manufactures FAC lenses, the FISBA Beam Twister and complete systems for laser applications. The optics specialist offers everything from individual products to ready-to-use solutions for a wide range of automated and customer-specific applications.

FAC lenses made by FISBA appeal with their above-average collimation quality and transmission. Individual solutions adapted to customers' systems ensure optimum results, while also guaranteeing consistently high quality in large series.

The FISBA Beam Twister (FBT) is used for generating a nearly symmetrical beam profile of laser diode bars. The new, improved device offers up to 3% greater coupling efficiency and hence more durability in service. Using the appropriate focusing optics, the laser output can be coupled with an efficiency of over 85% from a 400 µm fiber, or of over 75% from a 200 µm fiber. On request, it is possible to produce customer-specific adaptations of pitch, fill factor, wavelength etc.

In the FISBA RGBeam lighting module three wavelengths are precisely coupled and the light appears in a spot either directly or via a fiber. The FISBA RGBeam is used in life sciences, the automotive industry and in production and measuring technology.

FISBA OPTIK, Birgit Rauch, Email: birgit.rauch@fisba.com, www.fisba.com

IVAM trade shows and events

Medical Manufacturing Asia 2014
September 9-11, 2014, Singapore, SG
Manufacturing Processes For Medical Technology
www.ivam.de

MEDTEC China 2014
September 25-26, 2014, Shanghai, CN
Exhibition of Design & Manufacturing Technology for Medical Device Manufacturers in China
www.ivam.de

IVAM Focus Group Meeting "Medical"
October 2, 2014, Berlin, DE
www.ivam.de/focusgroups

LaserForum 2014
October 16, 2014, Bochum, DE
www.ivam.de/laserforum

IVAM Focus Group Meeting "Marketing"
October 28, 2014, Dortmund, DE
www.ivam.de/focusgroups

COMPAMED
November 12-14, 2014, Dusseldorf, DE
International leading trade fair for suppliers of medical manufacturing. IVAM will present the Product Market "High-tech for Medical Devices" as well as the "COMPAMED HIGH-TECH FORUM".
www.ivam.de

MSTextiles Forum
November 20, 2014, Aachen, DE
Smart Textiles & Wearable Sensorics
www.ivam.de

6th NRW Nano-Conference
December 1-2, 2014, Dortmund, DE
The accompanying exhibition is organized by IVAM.
www.nanokonferenz.de

MD&M West 2015
February 10-12, 2015, Anaheim CA, USA
IVAM organizes a joint booth at the focus area MicroNanoTechnology
www.ivam.de

HANNOVER MESSE
April 13-17, 2015, Hanover, DE
The world's largest industrial fair - IVAM will again present the Product Market "Micro, Nano & Materials".
www.ivam.de

MD&M West for the first time with focus area "MicroNanoTechnology"

On February 10-12, 2015, MD&M West, the world's largest trade show for design and manufacture in medical engineering, will take place in Anaheim, California, USA.

For the second time, IVAM is going to organize a joint booth to support its companies in opening up the US medical technology market. The IVAM joint booth will be marked as part of the MD&M West 2015 special exhibition area "MicroNanoTechnology" to provide more guidance to the visitors.

"Our exhibitors in 2014 were really satisfied with the quality of their leads. Particularly for European companies the MD&M West offers an excellent opportunity to step into the American market", reports Dr. Thomas R. Dietrich, CEO of IVAM. More than ten international companies already registered for the IVAM booth, as for example 2E mechatronic GmbH & Co. KG, AEMtec GmbH, eagleyard Photonics GmbH, nanosystec GmbH, PTF Pfüller GmbH & Co.KG, Sony DADC Austria AG, PrintoCent VTT, Ginolis Oy or the VTT Technical Research Centre of Finland.

Key issues of the exhibition are manufacturing & production machinery, contract R&D and medical grade materials as well as functional coatings, smart textiles, e-health applications and innovative monitoring solutions. Live demonstrations of products and technologies and the co-located MD&M West Conference with speakers from international medical device manufacturers are further highlights.

As booths are limited, interested businesses are encouraged to contact IVAM at their earliest convenience. Contact Ms. Orkide Karasu (ok@ivam.de or +49 231 9742 7086).

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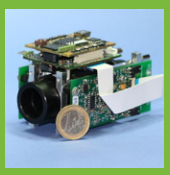

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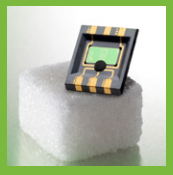

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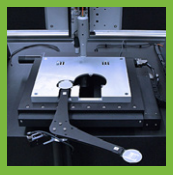

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