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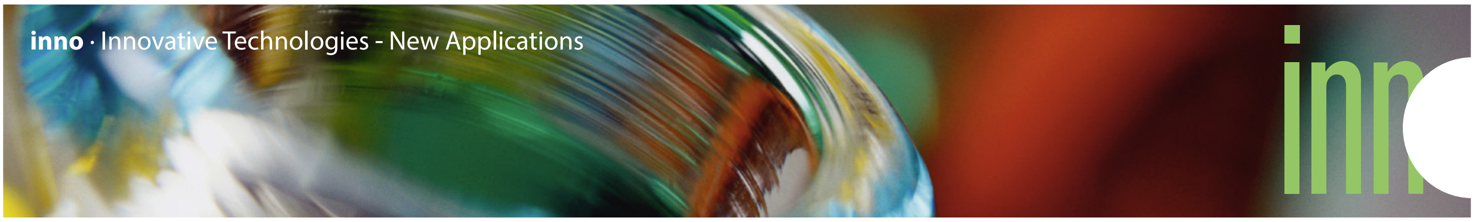


|Focus: Photonics|

Aliens, drugs and germs: Ultrasensitive biosensing chip for new essay applications

Tom Horner

A photonic biosensing chip developed by LioniX International and a consortium of Dutch partners has achieved a 100-times improvement in sensitivity over other photonic chips. Understandably it has investors and the public excited about applications in pressing problems like covid-19 sensing. But the applications extend way beyond the pandemic, to different biosensing fields, drug development and even space exploration.

A very brief history of photonic biosensors

Until recently, the most sensitive photonic biosensors were built using bulk optical components. They were fragile and difficult to manufacture in volume, reducing their applications. After ten years of integrated photonic innovation, chip-based sensors have achieved a level of sensitivity at or beyond that of their bulky counterparts.

To achieve the required 100-fold increase in sensitivity, LioniX International has addressed fundamental limitations in chip-based refractive index sensors. To understand the innovative step, it's useful to look at the working of the leading chip-based photonic sensing components.

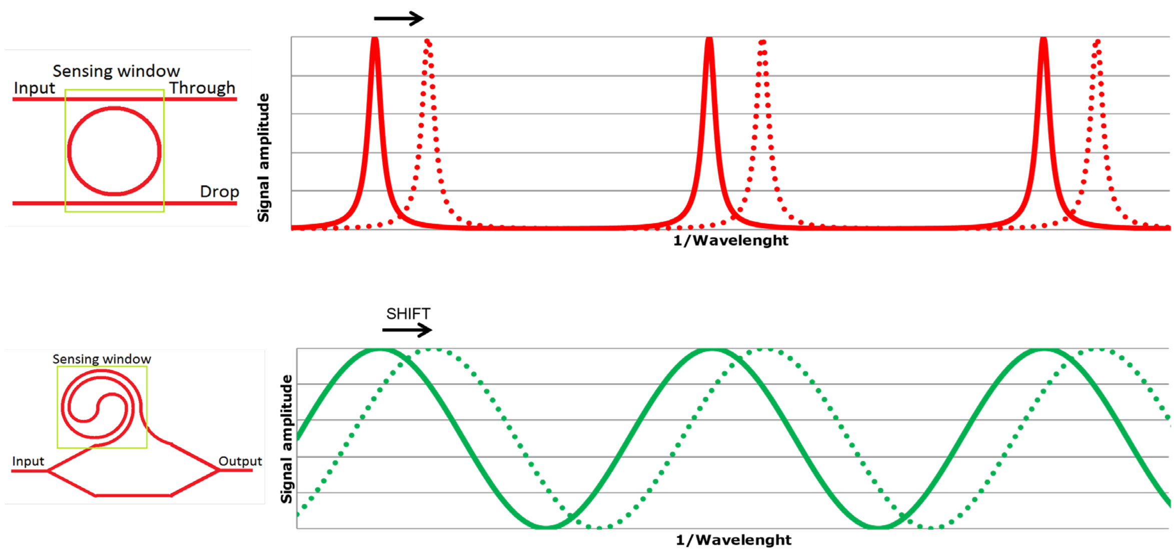
The science behind the sensitivity

Refractive index biosensors detect interactions at the sensor surface between a biochemically active layer and one or more target molecules. The refractive index changes that result from this binding cause a readable shift in the characteristic output peaks of the sensor.

Because of the reliance on biochemical binding, it pays to maximize the length of sensor component that is biochemically active, thus optimizing the chances of a binding event taking place. This is where limitations with the micro ring resonator (MRR) components, typically used in refractive index biosensing, have hampered progress. To overcome these issues, LioniX International pioneered the use of another optical component – the asymmetric Mach Zehnder interferometer (aMZI).

Both components have characteristic amplitude peaks that shift as a result of binding events. With its narrower peaks, the MRR offers theoretically greater sensitivity to such shifts. These narrow peaks however are also more sensitive to noise in the sensor readout laser. To make matters worse, the peak spacing is inversely proportional to component size. ➲

Content



Schematic and characteristic amplitude peaks for MRR (top) and aMZI (bottom) sensing components

Source: LioniX International

Editorial

Focus: Photonics

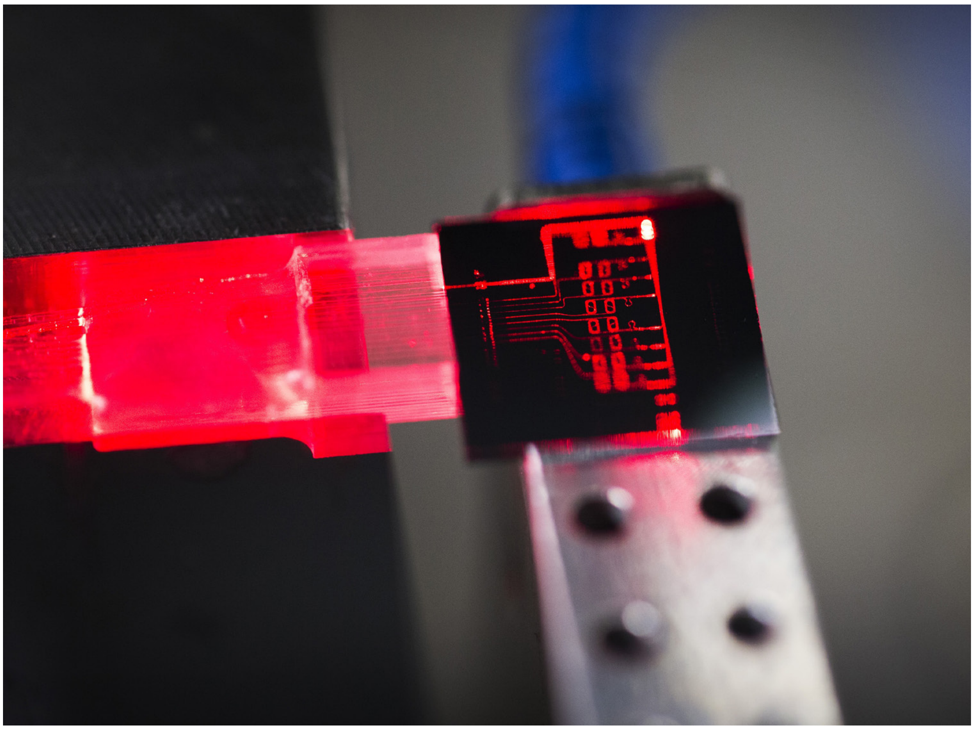
Many photonic applications, such as photonic sensors in cameras or radar systems, have become indispensable in everyday life. Digitalization and the rapid developments of quantum technologies are also making photonics increasingly important in the high-tech sector.

Since 2013, IVAM has regularly organized the Laser Forum, together with the Laser Centre Hannover, the Chair of Laser Manufacturing Technology at the Ruhr University Bochum, and the Fraunhofer Institute for Laser Technology.

The Laser Forum was founded to offer the opportunity to comprehensively present different trend topics, future markets, and sectors for optical technologies independently of industry trade fairs. With more than 60 members from the field of lasers & photonics, photonics is one of the core topics at IVAM, next to medical technology and microfluidics, among others. To enable the many IVAM members from the field of lasers and photonics to exchange information within IVAM, the Focus Group Photonics was founded this year. After the successful Kick-off meeting, the 2nd meeting will take place on October 12 between 2:00 pm and 4:00 pm (CEST). There, Yole will give an insight into the market of the photonics industry and will show where it is heading. This issue of »inno« also provides a very good insight into the wide range of activities of our members in the field of photonics. I wish you an inspiring read.

Best regards

Dr. Jana Schwarze



A closeup of the integrated photonic sensor chip developed at LioniX International

So attempts to improve signal to noise ratio by increasing the biochemically active length of the component are doomed to have no effect.

Not so for the aMZI sensor. Component length and peak spacing are, very usefully, decoupled. So despite theoretically lower sensitivity (through its broader peaks), the aMZI sensing waveguide can be made many times longer than the equivalent in an MRR. The result is a sensing platform that reliably detects tiny changes in refractive index (down to 2 x 10-8 refractive index units).

Wider applications

In drug fragment screening, this technology offers lower costs in the screening of precursor molecules for drug development. Here, a low-cost biosensor used in parallel could screen thousands of newly generated small molecules to identify promising candidates for development based on their biochemical affinities.

Chip-based biosensing has also long been destined for space. In 2013, LioniX International began the development of an immunoassay micro-array with integrated sensing to look for biomolecules on mars.

Whatever the application - size, sensitivity, cost and robustness are all improved with this chip-based solution. The challenge is now to develop ways of integrating the promising sensor chips with relevant biochemical and fluidic environments required in specific applications.

LioniX International, Enschede, Netherlands
http://lionix-int.com

Partners: Surfix BV, Qurin Diagnostics BV, regional development agency Oost NL and industry accelerator PhotonDelta.

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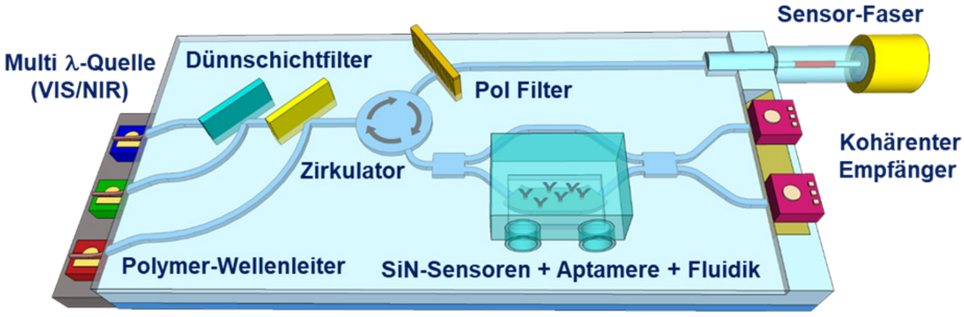
A hybrid photonic integration platform

Maik Gerngroß
Crispin Zawadzki

The alliance „PolyChrome Berlin" brings together partners from science and industry in the Berlin-Brandenburg region and has qualified for funding from the German Federal Ministry of Education and Research (BMBF). The long-standing IVAM member Allresist specialized in the development of customer-specific photoresists is contributing its expertise to this RUBIN project.

Starting in spring 2022, the involved partners will receive 9.2 million Euros in the course of the next three years as part of the „RUBIN – Regional Entrepreneurial Alliances for Innovation" funding program. The Fraunhofer Heinrich Hertz Institute (HHI) is significantly involved in the research project with its „Photonic Components" department. PolyChrome Berlin is one of eleven projects funded in the call for proposals, and competed against a total of 53 applicants.



Polymeric waveguide material for the NIR range; polymeric waveguide material for the VIS range; micro-fluidic material; SiN/SiO waveguide material, aptamers
Source: Allresist

Unlock new applications in sensing and analytics

As part of the project, PolyChrome Berlin develops a hybrid photonic integration platform. The innovative platform will be able to guide and deflect light, as well as generate and detect it. With this platform, the research team accesses a wide wavelength range from 400 nm to 1650 nm, spanning the spectrum from infrared to visible light. The team also works on an interplay of polymer- and silicon nitride-based optical waveguides. This novel approach, combined with the platform's hybrid integration capabilities, will enable PolyChrome Berlin to unlock new applications in sensing and analytics that can be implemented cost-effectively.

„When we talk about the platform, you have to imagine chips of the size of a one-cent coin," explained Arne Schleunitz, coordinator of the PolyChrome project and technical managing director of micro resist technology GmbH. „The tiny platform will be equipped with optical waveguides made of polymer or SiN material and other functional elements, such as optical fibers. In addition, biological scavenger molecules (aptamers) can be added to the chip's surface for applications in medicine."

„In the predecessor project "PolyPhotonics Berlin", we developed miniaturized hybrid optical components for applications in telecommunications," reported Crispin Zawadzki, deputy group leader „Hybrid PICs" at the Fraunhofer HHI and chairman of the association PolyPhotonics Berlin e.V. "Based on this success, we are now expanding our research into the visible light range to create new applications in the fields of analytics and sensing. We are very pleased to continue our work with the partners we already know from PolyPhotonics Berlin e.V. and at the same time add new members to the team."

Six demonstrators from three areas

The capability of the PolyChrome platform will be shown with six demonstrators from three areas.

- The first area is the use of fiber-based sensor technology in the application field of fiber optic networks. Here, optical fibers can be used as sensors to monitor the environment, for example road traffic.
- The second area involves visible light sources, so-called multi-lambda sources. These target products in the consumer sector such as RGB sources, or can be used as light sources in medicine or research.
- The third area is the use of SiN sensors. SiN sensors allow fast, cost-effective and specific measurement of a wide range of chemical and biological substances. With this method, it is possible to test waters for pollutants within minutes or examine the body for vitamin insufficiencies.

The „Hybrid PICs" research group of the „Photonic Components" department at Fraunhofer HHI brings together various components and thus provides the basis for the hybrid integration platform. The researchers will contribute their many years of experience in the manufacturing of photonic components and technology platforms.

12 partners cover the entire value chain

With their core competencies, the 12 partners cover the entire value chain required for establishing the technology platform and implementing its commercial application. In addition to Fraunhofer HHI, the research project includes ADVA Optical Networking SE, Allresist GmbH, Chembio GmbH, Eagleyard Photonics GmbH, ficonTECService GmbH, Fraunhofer IZI-BB, Laser Zentrum Hannover e.V., micro resist technology GmbH, OSRAM Opto Semiconductors GmbH, Scienion AG and VPIphotonics GmbH.

ALLRESIST GmbH, Strausberg, DE
https://www.allresist.de

Manufacturing microoptics - a micro molding perspective

Rick Brown

The extremely tight tolerances that are characteristic of microoptic applications - coupled with the demands for expertise in tool construction, material selection, validation, automated assembly, and packaging - require that OEMs understand the specific contingencies of micro molding, and also embrace the requirement to design parts with micro molding in mind.

Microoptics are typically tiny lenses, beam-splitters, prisms, light-pipes, and other optical components in the range of 20 microns to 1 mm in size, or larger optical components with micron features. They allow manufacturers to continue the industry-wide drive towards miniaturization in applications where light is involved, while at the same time reducing manufacturing costs, and are used today in an array of applications such as sensors, medical diagnostics, DataCom applications, wearables and medical diagnostic devices, and emerging technologies such as augmented reality glasses and contact lenses.

From a molding perspective, micro-optics require a unique processing knowledge, and micro molders must have experience of processing very small parts, with unique requirements when it comes to handling and packaging. In addition, the micro molding process itself is under serious pressure with microoptics applications, and often “off-the-shelf” molding machines will not reach the grade. Molding technologies need to stretch the envelope to attain the small scale necessary for microoptics parts, and also achieves the absolute flatness required (the surface relief feature depth of diffractive optical elements (DOEs) being in the range of a few hundred nanometers to a few micrometers and refractive micro lens arrays less than 100 microns).

Design for micro molding

The use of micro injection molding for micro-optic manufacture requires the optimization of design, mastering, tooling, and production steps, meaning a close interaction between supplier and product developer is vital. Considerations in respect of Design for Manufacturability (DfM) and Design for Micro Molding (DfMM) are also key. A good micro molder must be able to guide customers towards a design that can be produced and scaled up to production. This implies a partnership with the customer, allowing the opportunity to impart specialist expertise and knowledge early in the design cycle, and indeed throughout all development stages. The overall microoptic manufacturing sector is characterized by high costs and high risks, with few qualified and reliable micro molders available that can manufacture to the level of accuracy required, in the timeframe required, and at a sensible and competitive cost.

There are numerous challenges when attempting to manufacture microoptic devices and components which demands that OEMs choose to partner with companies with a proven track record and years of experience manufacturing to the tightest tolerances and the most exacting standards achievable. It is extremely important to review the in-house metrology tools that are available to be able to validate and assess the unique lens profile and surface finish requirements that characterize microoptics parts and components.

Molding and post-production

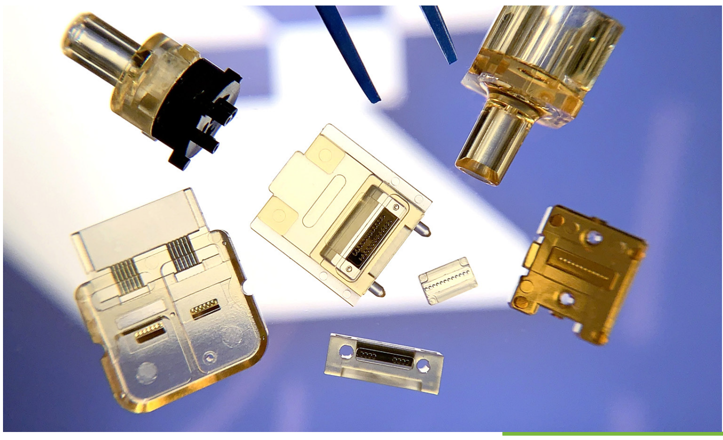
The demands associated with running micro-sized optical couplers, integrating lenses into housings, replicating lens profiles within a quarter wave, and lens surface finishes within 50 angstroms requires that molders have a dedicated tooling expert on staff to advise on and optimize DfMM and tooling for any OEM light transmission requirements.

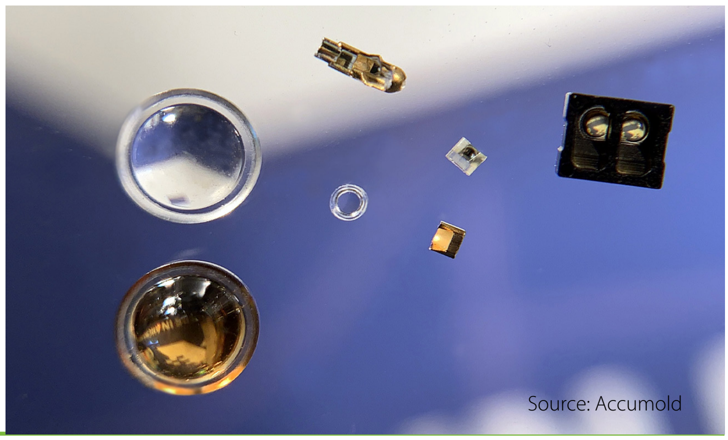
But tooling challenges and validation are only two considerations, also of key importance is molding process parameter control and post-molding handling and assembly. Precise control of the shot size or volume of resin injected into the mold on each cycle is vital for the maintenance of accuracy and repeatability of microoptics shot to shot and run to run.

Once molded, however, it is important to use a fully automated and hands-free assembly process, overcoming the basic logistical issues surrounding the removal of such tiny and delicate components while also ensuring that orientation is maintained, and parts are not contaminated by touching. In microoptics applications, complex assembly operations can often be avoided through the use of over-molding, and a micro molder with the understanding of what is possible in the molding process and has the skills necessary to overmold is often vital. The fewer assembly steps the better, but when post-production assembly is required, and if the volumes are high enough, dedicated molding and assembly work cells can be built to do the assembly all the way from molding to final packaging.

Typically, microoptics cannot be bulk packaged, and so many packaging methods need to be available, the most common being custom thermoform trays and tape and reel. For low volume projects it is possible to hand load the trays, but high volumes require automation for inspection and placement into packaging.

Accumold, Ankeny IA, United States
https://www.accu-mold.com



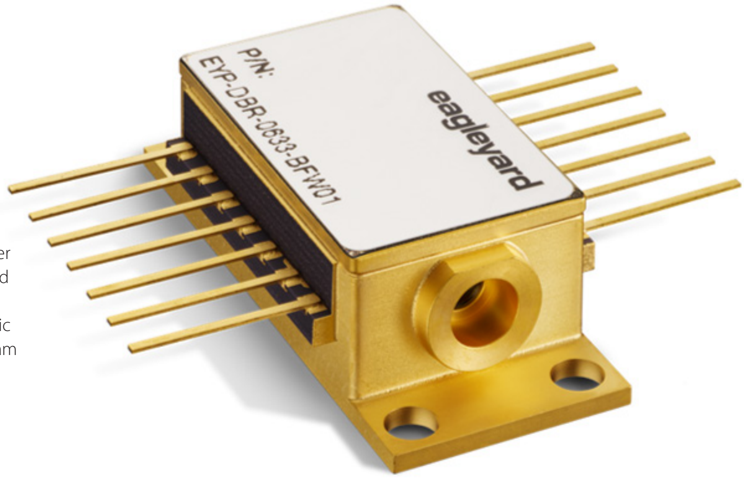


Source: Accumold

High Power Laser Diodes enabling advanced non-invasive Biosensing

Herwig Stange
Michael Kneier

Though Hollywood might create rather threatening scenarios about getting control over the human mind, in reality, high power laser diodes enable way more beneficial applications to interfere with the human brain. Berlin based eagleyard Photonics GmbH, a member of TOPTICA Group, headquartered in Munich, is deeply involved in the worldwide race of sensing human neuro activities and utilizes the results for diagnostics or, even more advanced for any thinkable kind of action control, such as movement of artificial replacements. The highly efficient and very compact laser diodes in the near IR spectrum are specially designed to meet the innovative requirements in that area.



High Power DFB Laser diode with integrated monitor diode, thermistor, thermoelectric cooler (TEC) and beam collimation
Source: eagleyard Photonics GmbH

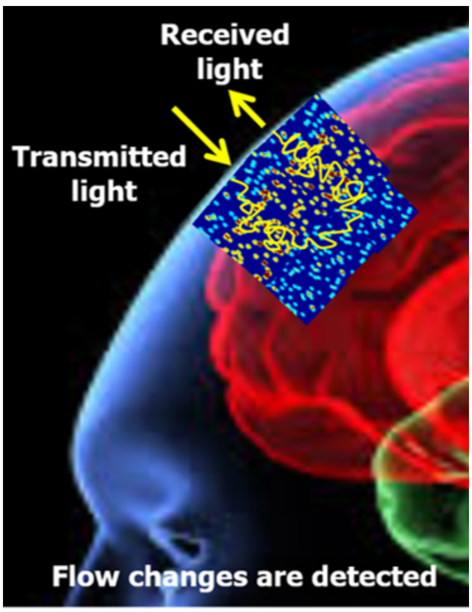
Key players currently involved in bringing non-invasive solutions to the market are following different measurement principles when integrating laser diodes into their instruments for the welfare of patients.

Laser Doppler Flowmetry

Laser Doppler Flowmetry is a technique by which the blood flow in human tissue can be measured. Light of a highly coherent laser (780 nm) applied to the tissue is transmitted and scattered in the sampling volume. Moving objects such as red blood cells lead to a frequency shift of the reflected light due to the Doppler shift whereas static objects like the surrounding tissue reflects the light unshifted. The Doppler shift is related to the number of moving blood cells and their velocity. It can be detected by analyzing the returning light collected by a fiber close to the laser source. It is a broadly applicable technique enabling the non-invasive measurement of blood flow. Not only, but especially for newborns and children, this methodology enables gentle diagnostics refraining from invasive methods or surgery.

Functional near-infrared spectroscopy

Functional near-infrared spectroscopy (fNIRS) uses near-infrared spectroscopy for the measurement of neural activity in the brain. There is an optical window in the range from 700 to 900 nm in which tissue and skin are nearly transparent. In that range it is possible to distinguish deoxyhemoglobin (no oxygen bound) and oxyhemoglobin due to the different absorption of light. Below 810 nm deoxy hemoglobin has a stronger absorption than oxy hemoglobin whereas the relation is vice versa above that point. By using two or more lasers with different wavelengths, it is possible to observe the changes in the hemoglobin concentrations.



Principle of human brain blood flow measurement by means of laser light. Source: Ornim Website

A light detector placed on the skull receives the back-scattered light. By pulse mode operation of the lasers and time-of-flight measurements, different photon path-lengths can be resolved. Thus, time and spatially resolved measurement of brain activities are achievable.

Optically pumped magnetometers

Another class of instruments dealing with the magnetic flux instead of the flow are Optically pumped magnetometers (OPMs). These are highly sensitive devices for the measurement of magnetic fields. They are important for mapping brain activity by measuring such magnetic fields induced by the electrical currents of the neuronal activity of the brain.

In optically pumped magnetometers, gaseous alkali atoms such as cesium or rubidium are used as probes for the magnetic field. Laser light is able to transfer the atoms into a certain spin status by which the spins precess collectively with the Larmor frequency. By laser-spectroscopic techniques the spin status and thus the flux of the magnetic field can be measured.➲

Example of human brain interface helmet by Kernel / USA
Source: http://www.kernel.com

Now OPMs reach the sensitivity of superconducting quantum interference devices (SQUIDs) which have been widely used in biomagnetism. But in contrast to this technology OPMs do not require cryogenic temperatures. Thus, OPMs can be much more compact enabling more far-reaching applications

First demonstrators of human brain interface by means of a very compact helmet have been recently shown by Californian company Kernel. And also the group of Prof. Soekadar at Charité Berlin is leading in the area of clinical Neuro-Technologies, developing brain controlled exoskeletons for their patients.

Laser diodes, emitting with a spectral range of 700 - 1.000nm with output power levels of 10's - 100mW, have become a key element to turn all these applications into reality. Although this might not draw so much of Hollywood's interest, for the people positively affected by the benefits it does matter.

eagleyard Photonics GmbH, Berlin
https://www.toptica-eagleyard.com

Exoskeleton application by Charité / Berlin. Source: Niels Peek/ Charité

Photonic Curing and it's wide range of application

Uwe Kriebisch

How to reduce process time and improve parts quality by using photonic curing processes? Photonic curing is well known for soldering applications but has also advantage on new applications which are linked to coating and Lift-Off applications.

Merconics and NovaCentrix have enjoyed a strong partnership for many years, combining expertise in different markets, and the possibilities of using photonic curing to improve product quality and reduce process times.

	Screen	Dispensing	Photonic Printing
Resolution (µm)	~ 50	~ 100	< 25
Viscosity (cps)	10k – 300k	1k – 300k	1k – 1M
Dry film thickness (µm)	3 - 150	20 - 150	3 – 3000
Aspect ratio	0.5	0.5	> 1
Variable print thickness	No	Yes	Yes
PCBs/hour	~ 250	~ 100	~ 2500
Non-contact	No	Yes	Yes

Possible applications

Photonic curing uses a special high energy flash lamp, capable of curing, drying, and annealing surface coatings on temperature-sensitive substrates. It is also possible to cure metal inks to build up conductive traces on these same materials. With the ability to cure a wide range of different layers on optical components, one also sees advantages with process times being reduced. In addition to layer curing processes, printing is yet another application with this technology.

Which materials have been demonstrated?

Various materials processed on the PulseForge system:

- a-Si films
- Semiconductors for PV applications (CdTe, CIGS, perovskites, etc.),
- IGZO for displays
- PZT ceramics
- ITO processing
- Copper and Silver Inks
- All different kind of solder paste

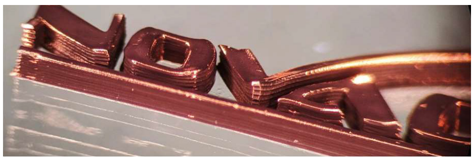
PulseForge Lift-Off

The newly developed PulseForge Lift-Off process is having a huge advantage besides the current technology using a scanning laser beam to initiate the debonding process. With one pulse you can already delaminate a huge area which will reduce the stress within the device and will improve the processing time significantly.

PulseForge Printing

It is an emerging application from NovaCentrix for patterning high aspect ratio prints of a wide variety of functional inks or other materials and components in a rapid and non-contact technique. The printing is achieved using high power pulsed light and an engraved print plate.

Existing copper and silver high viscosity inks can achieve high aspect ratio pattern (~1) in a single print or super high aspect ratio pattern (>2) with multiple aligned printing. This can also achieve super thick prints (> 1.5 mm). Current best print resolution is < 25 µm pattern width with < 50 µm pitch. Aligned printing at such fine resolution requires sophisticated overlay techniques.

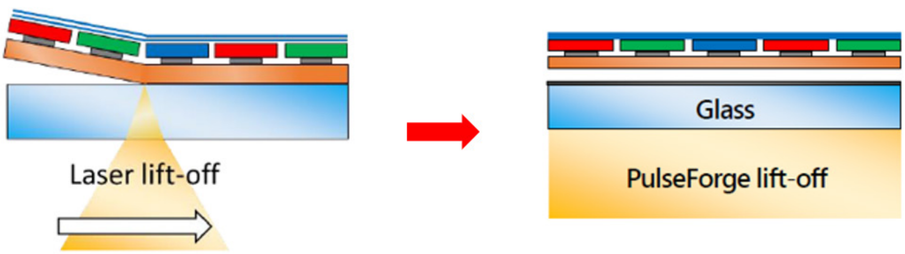


Think about the process between traditional screen printing and dispense printing process. PulseForge Printing has an advantage over the current technologies of screen printing and dispenses printing technologies in mass production – namely it can produce thick and high aspect ratio patterns compared with screen and can be much faster and finer resolution than dispense.

With the mentioned application in this article merconics is working within the area of automotive, aerospace, consumer electronics, health monitoring, medical, solar, batteries and more just to mention the wide area of usage. The advantage of this application is always where you are working on sensors built on low meltpoint substrates. Besides this it can be used in all ways of soldering on flexible materials like batteries.

merconics GmbH & Co. KG, Bergkirchen
https://www.merconics.com

Sources: merconics.



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Micro-marking with the ultrashort pulse laser

Dr. Christian Freitag,
Daniel Förster

Typically, markings with character widths of several 10 µm are possible with lasers. When using specialized processing optics, however, the focus diameter can be reduced to a few µm. Thus, markings with character widths of minimum 1 µm can be produced that are barely visible to the human eye. These are used, for example, in measurement applications or as security features.

Laser marking: a common application

A wide variety of materials can be marked reliably and quickly. Nanosecond lasers are often used for this application. Ultrashort pulse lasers are used for more specialized applications like black marking, for example. Typical focus diameters are 20 µm and larger. The focus diameter defines the minimum font widths with which marking can be done. Normally, character widths of 20 µm and larger are sufficient for most marking tasks. For special applications, however, it may be of interest to realize even smaller character widths. This is no longer feasible with conventional focusing optics, but specialized optics are needed.

Optics for micro marking

To realize even narrower type widths, a focus diameter of a few micrometers is required. If conventional convex lenses are used to produce such small diameters, the numerical aperture becomes extremely large. This results in the following problems: The distance from the lens to the workpiece becomes very small, making it difficult to install a protective glass in front of the lens. Another challenge is that the focal range in which the small focal diameters are achieved is only in the range of a few 10 µm. This places extreme demands on the positioning and flatness of the workpiece. This severely limits the range of applications for convex lenses to create smallest microstructures.

The solution is to use specialized optics to generate a Bessel beam. A Bessel beam has completely different properties, which allow small focus diameters of few micrometers over a focus range of several millimeters.

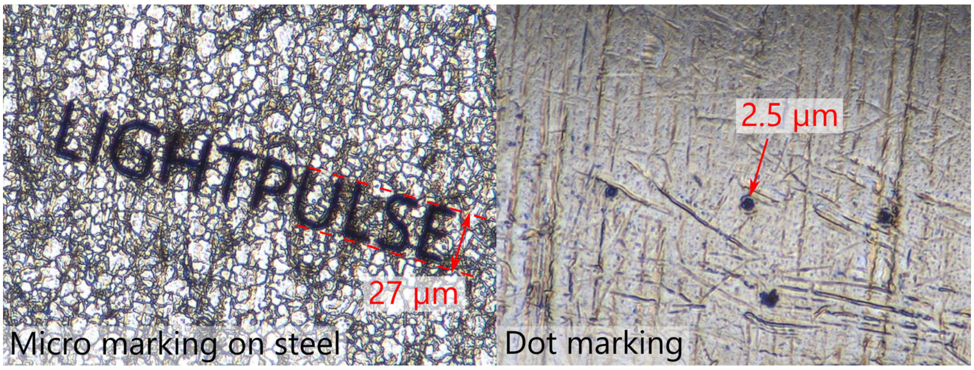


Figure 2: Micro-markings on steel. The size of the entire lettering is as large as the track width of conventional laser markings. Dot markings with a few µm diameter are also possible. Source: LightPulse LASER PRECISION

A disadvantage is the typically poor energy efficiency, which, however, is not a negative factor when producing structures and markings in the range of a few µm. High pulse energies cannot be implemented anyway when machining structures in the µm range if a high machining quality is to be achieved. Thus, the Bessel beam is optimally suited for micro marking.

Examples for micro marking

To demonstrate the precision that can be achieved with micro marking, the LightPulse lettering was marked on human hair. The marking can be seen in picture 1 on the left side. The positioning of the marking is also done with an accuracy of a few micrometers. The width of the lettering is on average 1.5 µm, a corresponding magnification can be seen on the right side of picture 1. The high machining quality also becomes clear in the enlargement. No thermal influence on the hair can be seen. This example clearly shows the possibilities of micro-marking with the ultrashort pulse laser.

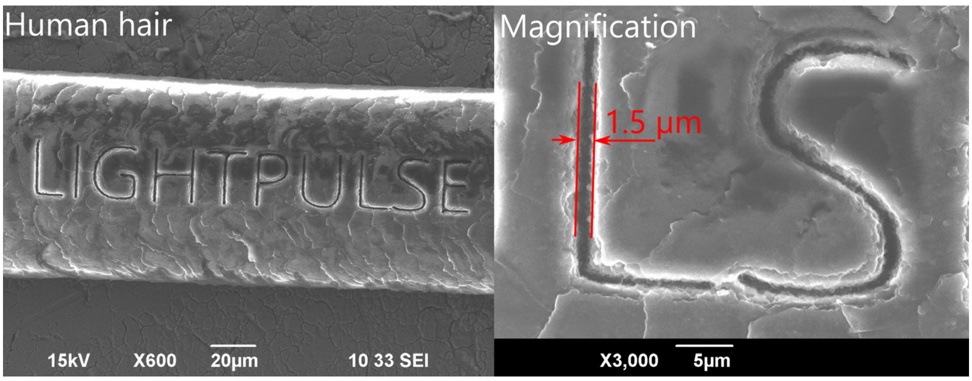


Figure 1: Micro-marking of the LightPulse lettering on a human hair. This demonstrates the precision that can be achieved. Source: LightPulse LASER PRECISION

The marking is precise and of high quality and is hardly visible to the human eye. Therefore, such markings are excellently suited as a safety feature. If the marking is applied to a spot on a component that is not subject to any frictional stress, the marking serves as proof of authenticity.

Figure 2 shows micro markings on a steel component. The lettering is again shown on the left. The overall size corresponds to typical lettering widths of conventional laser markings. This opens up completely new possibilities in terms of the achievable resolution. One possible application would be measurement applications, for example to test the quality of an optical imaging system. For this purpose, patterns such as the Siemens star are used, whose smallest contours can be made even more precise by means of micro marking. On the right side, dot-shaped markings with a diameter of 2.5 µm are shown. For example, such markings can be applied to components in order to precisely track their movement. In addition to such small markings, thin components (a few 10 µm) can also be pierced, which opens up even more applications for machining using a Bessel beam.

The ultrashort pulse laser in combination with processing optics specialized for micro marking is the ideal tool for processing components in the µm range. Structures with a size of a few micrometers can be produced in this way. The shown application examples demonstrate that the innovation potential of the ultrashort pulse laser is far from being entirely exploited.

LightPulse LASER PRECISION, Stuttgart, DE
www.light-pulse.de

Disruptive photonic packaging and test technologies

PhotonicLEAP, a European Horizon 2020 collaborative research project, has been awarded over 5 million Euros in funding from the European Commission to develop disruptive technologies that will drive down the cost of integrated photonic packaging and test processes. Photonic Integrated Circuit (PIC) technologies are the light-based equivalent of electronic circuits – a technology that is becoming increasingly important for existing markets in communications, medical devices, sensors and for emerging markets such as quantum computing and security.

However, existing PIC manufacturing processes, in particular packaging and test processes, are difficult to automate, with limited manufacturing capacity, and are costly, with packaging and testing typically accounting for over 75% of the total manufacturing cost. As a result, existing PIC manufacturing processes greatly impede the uptake of PIC technologies across many mass markets.

Reducing the costs of PIC production by over 10 times

To address this challenge, PhotonicLEAP will develop disruptive wafer-level PIC module integration, packaging and test technologies which will reduce the costs of PIC production by over 10 times, revolutionizing existing applications and creating completely new markets. PhotonicLEAP will use these disruptive technologies to produce a revolutionary Surface Mount Technology (SMT) PIC package, which for the first time incorporates multiple optical and electrical connections. The project will validate these technologies through state-of-the-art demonstrators, including a high-speed optical communication module and a medical device for cardio-vascular diagnostics. Furthermore, the technologies will be implemented by the flagship European PIC Packaging Pilot Line, PIXAPP, for future commercialization. PIXAPP has an extensive and growing user-base across multiple markets.

Functionalized thin glass interposer wafers

Fraunhofer IZM is contributing by developing and fabricating functionalized thin glass interposer wafers with up to 200 mm diameter, that will serve as a novel package base for embedding optical PICs and driver ICs, realizing wafer scalable optical, electrical and thermal coupling. Laser structured thin glass will consequentially be used also in closing individual photonic packages - to be used like SMT components as established in electronics.

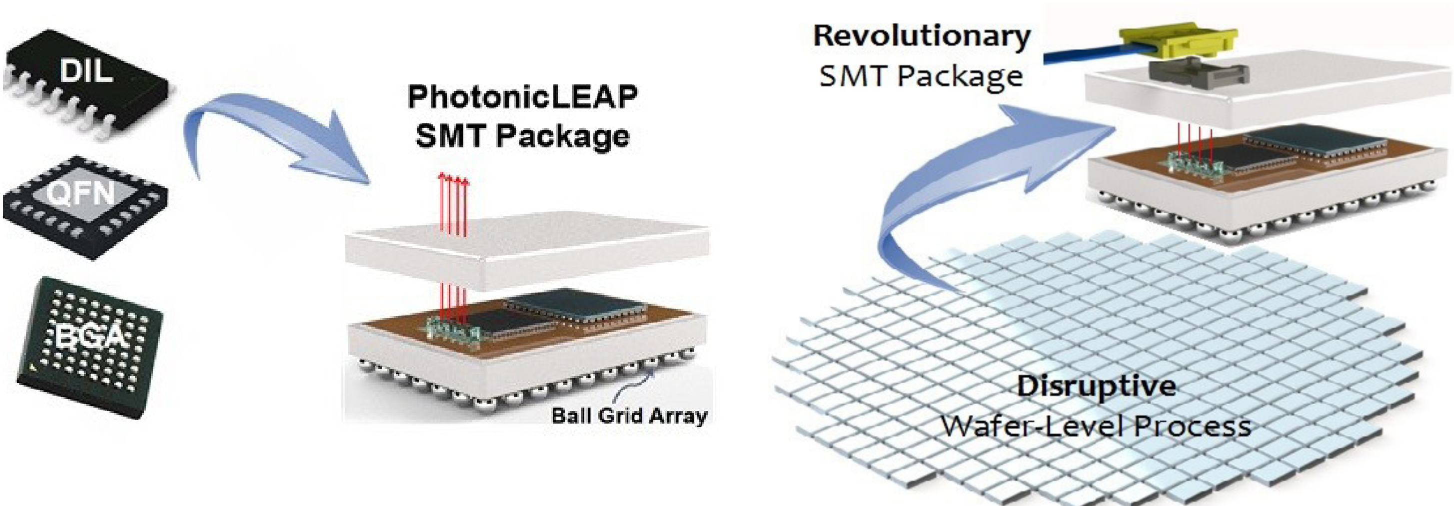
Disruptive photonic packaging and test technologies

Prof. Peter O'Brien, Head of Photonics Packaging and Systems Integration at Tyndall and PhotonicLEAP Coordinator, said 'We are delighted to receive this very significant funding from the European Commission which will enable us to develop truly disruptive photonic packaging and test technologies. The consortium brings a wealth of interdisciplinary skills and state-of-the-art infrastructure to deliver on our ambitious objectives. We are confident the photonic packaging and test technologies developed in PhotonicLEAP can make a real impact to increase the uptake of Integrated Photonics across Europe."

Partners of the project

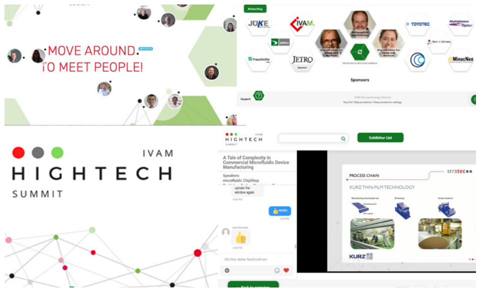
PhotonicLEAP will be delivered by a highly experienced consortium which consists of six leading research organizations and companies, including Tyndall National Institute, Fraunhofer (IZM & HHI), LPKF Laser & Electronic, ficonTEC Ireland, SUSS MicroOptics, Bosch, Eindhoven University of Technology – TU/e and Interuniversity Micro-Electronics Centrum – IMEC.

Fraunhofer Institute for Reliability and Microintegration IZM, Berlin
https://www.izm.fraunhofer.de



Sources: 2021 PhotonicLEAP

Industry meeting of the international microtechnology scene: IVAM Hightech Summit 2021 showed trends and future markets.



Source: IVAM

Microtechnology makes a massive contribution to the further development of smart sensor technologies, biotechnologies, robotics and alternative energy concepts as well as minimally invasive, miniaturized medical technology. At the virtual IVAM Hightech Summit 2021, more than 60 presentations and keynotes in nine technological sessions showed the great relevance of key technologies for industry, economy, climate protection and the health of the world population. Major topics this year included microfluidics, especially for biotechnological processes. The topic is currently receiving a lot of attention, certainly due to the groundbreaking developments in pandemic control, where microfluidics has massively advanced both vaccine development and testing procedures. Photonics, in which there are currently many important new developments - from new micro/nanostructuring methods, to use in lasers, to quantum technology - was also a much-noted topic and generated lively discussions. Integration on electronic chips also continues to advance. In addition, it was again confirmed that microtechnology plays a major role in current and future developments in medical technology.

Speakers from more than ten nations informed about technological processes, products, procedures and success stories. The Japanese JETRO presented innovative Japanese high-tech companies and an export program in its own session. They were highly satisfied with the contacts they had made. The other international partner networks are also keen to continue the joint event in the future. The participants also praised the conference‘s digital supporting program, which consisted of a networking area, product presentations and an accompanying exhibition. In particular, the good quality of the contacts made was emphasized several times. Some companies were able to directly acquire new customers. „With the IVAM Hightech Summit we want to continue to show which concepts and ideas the leading minds in the industry are currently working on and what can be successfully implemented in products. Whether we will implement this again virtually or as a live event next year - due to the large international field of participants - is under discussion. What is certain is that there will be the next IVAM Hightech Summit in 2022,“ explains IVAM Managing Director Dr. Thomas Dietrich.

IVAM Microtechnology Network, Dr. Thomas Dietrich, Email: info@ivam.de

AEMtec GmbH opens USA Tech Center in Boston

Source: AEMtec

On September 1, the Berlin-based AEMtec GmbH, a manufacturer of high-precision micro- and optoelectronic modules, opened the Engineering Tech Center within the Boston University Photonics Center. The new director of the Tech Center Robin Jerratsch, an experienced microelectronics and optics engineer, explains: „Our goal here in the BU Photonics Center is to form the focus of the most modern product development in the field of silicon photonics and microelectronics. Here we can better serve our US customers by offering rapid prototyping for product development programs that require wire bonding, flip-chip and precision placement in cleanroom environments.“ AEMtec CEO Jan Trommershausen also emphasizes the importance for the U.S. market, „The Tech Center offers our US-based customers the opportunity to validate their new product designs and then seamlessly transfer the product to our large production facility in Berlin. And where better to open a Tech Center than in the middle of Boston, which is known for its scientific and technological developments?“ AEMtec GmbH is a strategic partner for the manufacture of microelectronic and silicon photonic modules in the medical technology, industrial manufacturing, semiconductor and aerospace industries. Please direct questions to Info.USTechcenter@aemtec.com.

AEMtec GmbH, Rena Vignold-Heinze, Email: rena.vignold@aemtec.com, https://www.aemtec.com/

LIGENTEC and X-FAB collaboration creates Europe’s largest capacity foundry service for integrated photonic circuits

Source: LIGENTEC /X-FAB

LIGENTEC, pioneer in high-performance, low-loss, silicon nitride photonic solutions, and specialty semiconductor producer X-FAB Silicon Foundries have announced a strategic partnership resulting in the large-scale supply of integrated photonic devices. Photonic integrated circuits (PICs) are set to repeat the success story of electronic integrated circuits (ICs). Working with light instead of electrons, PICs will play a key role in tomorrow’s infrastructure for communication, biosensing and transportation. “Silicon nitride offers superior performance to manage the light in the chip circuitry, with unprecedented low propagation losses and high-power handling,” states Michael Zervas, co- founder of LIGENTEC. “While there is growing worldwide demand for silicon nitride PICs, the missing piece is a commercial volume foundry that can keep pace with the expected uptake.”LIGENTEC has implemented its proprietary, patented, low-loss silicon nitride process technology within X-FAB’s existing high-throughput foundry workflow. It means that LIGENTEC PICs are now commercially available in high volumes out of Europe, a key requisite enabling the secure and independent supply of the quantities foreseen in relation to sensors for self-driving cars, environment monitoring, quantum computers and an array of other applications.

X-FAB Silicon Foundries, http://www.xfab.com

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IVAM trade shows and events

IVAM Focus Group Photonics
October 12, 2021, Zoom-Meeting
Discuss the photonics industry market with other IVAM members.
https://www.ivam.de/events/ivam_focus_group_photonics_2

Mid-Week Coffee Break - October 2021
October 20, 2021, Zoom-Meeting
Virtual technology talk between IVAM Members:
Bartels MikrotechnikGmbH
https://www.ivam.de/events/mid_week_coffee_break_oktober_2021

5. Wearables Lunch Talk
October 27, 2021, Zoom-Meeting
Focus on „Smart Textiles“
https://www.ivam.de/events/wearables_lunch_talk_october27

Get to know IVAM
October 28, 2021, Zoom-Meeting
Information about the association and the benefits of membership
https://www.ivam.de/events/get_to_know_ivam_october_2021

Kick-off meeting of the project KoWeMi
November 11, 2021, Zoom-Meeting
mIQu Coordination office for professional training networks in the field of microtechnology
https://www.ivam.de/events/ivam_miqu_project_official_kickoff?lang=en

COMPAMED
November 15-18, 2021, 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“.
https://www.ivam.de/events/compamed_2021

W3 Fair+Convention
March 16-17, 2022, Wetzlar, DE
Networking fair for the optics, electronics and mechanics sectors
IVAM organizes a joint pavilion and trade fair forum at the special exhibition area “Microtechnologies for Optical Devices”
https://www.ivam.de/events/w3_fair_convention_2022

CMEF 2022
April 7-10, 2022, Shanghai, CN
Asia Pacific‘s leading medical industry platform. IVAM will organize a joint pavilion.
https://www.ivam.de/events/cmef_2022

MD&M West
April 12-14, 2022, Anaheim CA, USA
IVAM organizes a joint pavilion at the focus area MicroNanotech
https://www.ivam.de/events/md_m_west_2022

Medical Manufacturing Asia 2022
August 31 -September 2, 2022, Singapore, SG
Manufacturing Processes for Medical Technology Exhibition and Conference
https://www.ivam.de/events/medical_manufacturing_asia_2022

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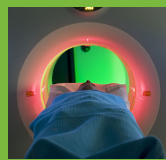

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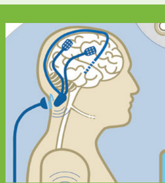

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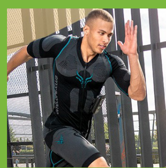

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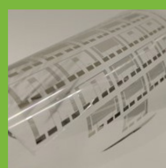

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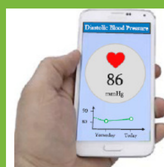

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