

## Ultrashort pulse lasers enable precise machining of nearly any material

Max Groenendijk

Lightmotif develops production solutions for micromachining based on the use of ultrashort pulse lasers, which enable precise machining of nearly any material. The focus of the company is on surface machining applications like micro-milling and micro-texturing, both on flat and on curved surfaces. The company offers advanced micromachining systems, supports customers in developing new processes and performs contract manufacturing.

### Micro-milling

Laser micro-milling using ultrashort pulse lasers makes it possible to machine accurately shaped structures with very small features into nearly any material. The process allows removal of extremely thin layers and is especially interesting for machining of very hard materials and delicate parts.

A typical application of micro-milling is machining of stamping or coining tools, which are often made of very hard materials like cemented tungsten carbide (hard metal). Figure 1 shows an example of a stamp tool that



Figure 1:  
A laser machined tungsten carbide stamp tool, used for the production of turning inserts.  
Source: Lightmotif

is used for the production of metal cutting tools (turning inserts). Such tools require accurate machining of small features, which is a perfect match for laser micro-milling. Laser machining can improve the tool lifetime and the process can be significantly faster and more cost effective compared to competing technologies like electrical discharge machining (EDM).

Laser micro-milling can also be used to machine small and complex features directly into cutting tools. This allows complex geometries / features to be created, which would be difficult or impossible to machine in this material using conventional methods, like for example chip breakers directly machined into the curved surface of a drill.

Another application of laser micro-milling is machining of small and complex shaped features into molds, like for example molds used

## | Focus: Micro and Nano Industry in the Netherlands |

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for the production polymer microfluidic chips.

### Micro-texturing

Micro-texturing is a new technology for applying surface textures with very fine features and a high depth resolution. The fine textures make it possible to change functional properties of surfaces, like reduction of friction or change of optical properties.

Different kinds of textures can be produced, from dimple textures that consist of individual micro-cavities, up to free-form textures that are milled into the surface layer by layer according to a given input model. Even textures on the nano scale can be produced by using Laser Induced Periodic Surface Structures (LIPSS).

There are various applications for laser micro-texturing:

- Decorative textures – Improving the look of parts by adding high definition / low relief textures or LIPSS / color effects to parts
- Tribology – Changing frictional properties, →

### Advantages of using ultrashort pulse lasers for micromachining:

- Machining of extremely small features of down to 10 µm or smaller
- Very high depth resolution (sub-micrometer)
- Works on nearly every material, including very hard materials
- Negligible heat effects: no melt, burrs or other damage
- Contact and force-free process

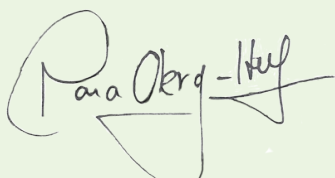
## Editorial

### Focus: Micro and Nano Industry in the Netherlands



Welcome to the annual international issue of »inno«. Time flies by: Six years ago, we started to dedicate each summer issue to a national market in which the IVAM members are resident or active. Our first international issue in 2013 focused on the Netherlands as well. IVAM is traditionally strong and well-connected with the Netherlands. From our office in Dortmund it is only a two-hour drive to the high-tech hotspot in Enschede, which is home to numerous technology companies, including some IVAM members, such as the expert in state-of-the-art ultrashort pulse laser micromachining systems, Lightmotif. Furthermore, in this issue laser machining expert Veldlaser, nano coating specialist Surfix and the provider of photochemical etching solutions, Etchform (as part of micrometal GmbH) give an insight into their technologies and product portfolios. The IVAM network partner from the Netherlands, MinacNed, invites again to the international MicroNano Conference in December. Please find more details on page seven!

Best regards



»inno«  
Innovative Technologies – New Applications

**Published by:**  
IVAM e.V.  
Joseph-von-Fraunhofer Straße 13  
D- 44227 Dortmund

**Editors:**  
Mona Okroy-Hellweg  
Iris Lehmann  
Dr. Thomas R. Dietrich  
Marco Walden

**Contact:**  
Mona Okroy-Hellweg  
Phone: +49 231 9742 7089  
Email: mo@ivam.de

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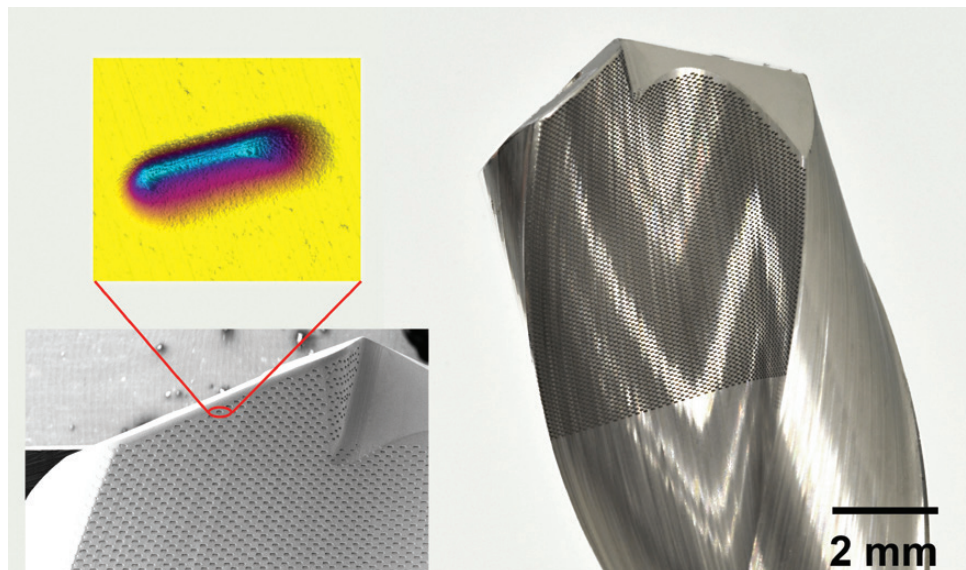


Figure 2: An example of a dimple texture applied to a tool: the curved flute surface of a drill is machined with a texture consisting of oblong shaped dimples with a non-symmetrical cross section. This drill was machined as demonstrator within the EU funded ADALAM project.

e.g., reducing friction on moving parts (seals, bearings) or creating soft-touch consumer or medical parts

- Wetting – Making surfaces super-hydrophobic (water repellent) or super-hydrophilic
- Optical properties – Altering the surface to reduce glare, change the absorption of light, or even act as a diffraction grating (using LIPSS)
- Biomedical – Surface properties can be tailored using micro and nano structures, for example to change the interaction between cells and a surface

Dimple textures can be used to reduce lubricated friction, where each individual dimple / pocket creates a hydrodynamic pressure and acts as a reservoir for the lubricant. The example below shows a dimple texture applied to the curved surface of the flute of a drill (figure 2). It is also possible to apply a micro-texture to the curved surface of an injection mold. This texture then can be transferred to the polymer

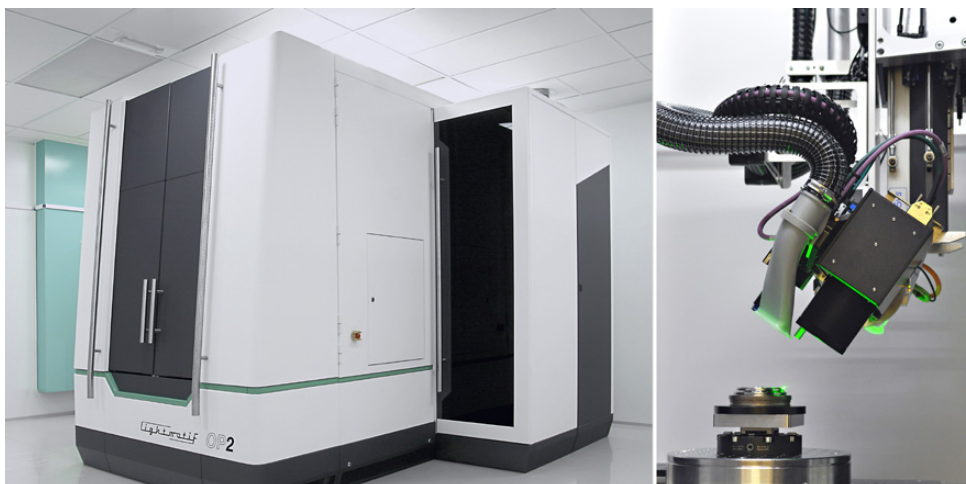
part directly during the injection molding process. This technique can be used to produce polymer parts with functional micro-textures, like soft-touch or super-hydrophobic surfaces.

### Machining systems

Since the launch of the company in 2008, Lightmotif invested heavily in research and development, which resulted in a flexible machine concept and control software specifically designed for laser micromachining. This system enables accurate machining and texturing on large and complex shaped parts. The systems are equipped with special CAM software to make the generation of laser machining programs easy. Highly accurate machines with up to 5 axes, combined with flexible control software and different automatic calibration systems, enable productive, accurate and repeatable results.

Lightmotif B.V., Enschede, NL  
[www.lightmotif.nl](http://www.lightmotif.nl)

Figure 3: The Lightmotif OP2, a high accuracy 5-axis laser micromachining system. Left: overview. Right: Texturing of a curved injection mold. Source: Lightmotif





## Nanocoatings with global impact

Micro- and nanotechnology are an integral part of sustainable solutions for major global challenges in health-care, food, and energy. A well-known example is the development of devices for point-of-care diagnostics and other lab-on-a-chip applications. To exploit the full potential of these devices and their components such as biosensors and microfluidics, accurate control of surface properties is a prerequisite.

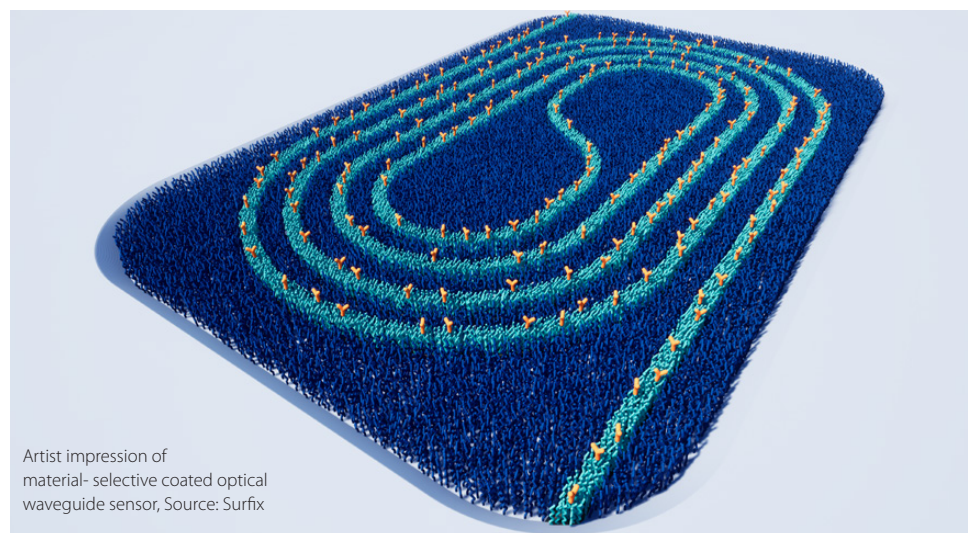
To this end, Surfix is developing nanocoatings that enhance the performance of micro- and nanodevices in life science applications.

### Small structures, large surfaces

Surface properties are an important aspect of micro- and nanodevices, which by definition have a large surface-to-volume ratio. Surface modification provides control over essential properties of materials and devices in biological applications, such as wettability, non-specific adsorption of biomolecules (biofouling), and specific biorecognition (biofunctionalization). For many applications, local control of these surface properties offers benefits over uniform coatings. For example, by creating patterns of hydrophobic and hydrophilic areas, liquids can be confined and directed. Local control of biomolecular surface interactions offers great opportunities for biosensing and emerging applications such as organ-on-a-chip. Surfix addresses these surface modification needs by developing custom uniform or patterned nanocoatings based on a portfolio of proprietary technologies.

### Nanocoatings for microfluidics

Glass and (thermoplastic) polymers are widely used for the fabrication of microfluidic chips. However, proteins tend to adsorb non-specifically to these materials, causing biofouling issues. Thermoplastics are suitable materials for high volume production of microfluidics by injection molding. However, common polymers such as COP/COC (cyclic olefin polymer/copolymer), PC (polycarbonate), and PMMA (polymethyl methacrylate) are hydrophobic, which hampers the capillary flow of aqueous biological liquids through the chan-



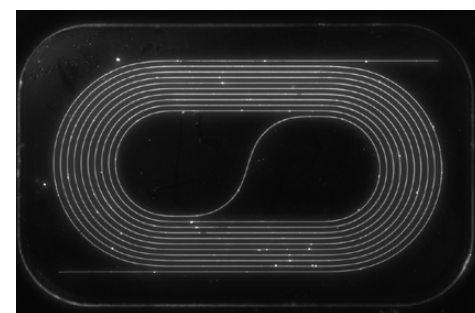
Artist impression of material-selective coated optical waveguide sensor, Source: Surfix

nels. These problems with non-specific adsorption and wettability can be overcome by applying a nanocoating to the channel wall that has both hydrophilic and antifouling properties. The possibility to create patterned nanocoatings yields local control over these surface properties, enabling advanced applications. For example, the flow of liquids can be controlled and directed by combining hydrophobic and hydrophilic nanocoatings in a single device. Application of coatings in microfluidic channels often interferes with the bonding of devices. A patterned nanocoating enables the local surface modification of the channel only, leaving the bonding surface uncoated. This improves the compatibility of the coating and bonding processes and the manufacturability of polymer microfluidic devices with enhanced surface properties.

### Nanocoatings for biosensors

To ensure that a biosensor detects the analyte of interest, a specific bioreceptor needs to be immobilized on the sensor surface. Surface modification is therefore a key step. Depending on the sensor technology and the application, the properties of the biofunctionalization coating, e.g. thickness, density of bioreceptors, have to be tuned to achieve the highest possible sensitivity

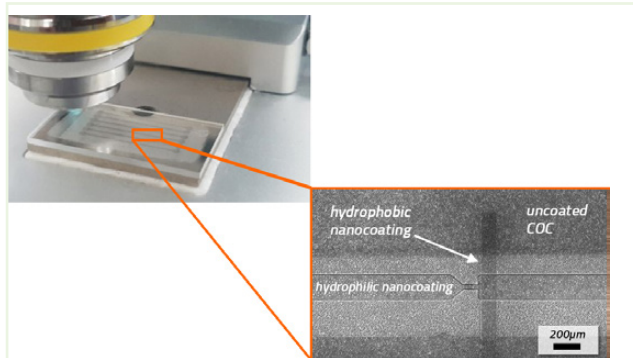
and selectivity. Moreover, in many cases detection does not take place on the whole sensor surface, but on a smaller sensing area. For example, in optical biosensors based on  $\text{Si}_3\text{N}_4/\text{SiO}_2$  waveguides, only analyte molecules binding to the  $\text{Si}_3\text{N}_4$  are detected, while this material makes up less than 1 % of the total sensor surface. Therefore, it makes sense to use a patterned material-selective nanocoating and immobilize the bioreceptor only on the  $\text{Si}_3\text{N}_4$ . At the same time, the surrounding  $\text{SiO}_2$  can be coated with an antifouling layer to prevent non-specific adsorption. In this way, the analyte is concentrated on the waveguide, thus enhancing the sensitivity and limit of detection



Optical waveguide sensor material-selectively coated with fluorescently labelled proteins Source: Lionix and Surfix

By bringing the right surface properties to the right location, the performance of microfluidics and biosensors can be improved and new applications for the next generation of micro- and nanodevices can be addressed.

Coated microfluidic chip. Source: Micronit and Surfix



Surfix BV, Wageningen, NL  
[www.surfix.nl](http://www.surfix.nl)



## Advanced photochemical etching solutions

Dr. Angel Lopez

Effective July 01, 2019 micrometal GmbH has acquired and taken over operations of the Dutch company Etchform BV. Together with HP Etch and Etchform, Micrometal is hereby expanding its technology portfolio to become the world's most comprehensive provider for etching solutions.

### Three etching companies for one customized solution

In less than two years, micrometal has expanded its technology portfolio to better meet customer needs for future market and development requirements. With HP Etch (acquisition in November 2017) and Etchform (acquisition in July 2019), Micrometal has succeeded in creating a unique etching technology triangle. In addition to Micrometal's continuous strip etching ("Reel-to-Reel Etching") for very high volume, ultra-high precision products, HP Etch offers high-precision products in smaller and mid-size batches ("Sheet Etching"). The acquisition of Etchform is rounding up our portfolio by offering customized solutions for precision parts in a wide range of difficult to etch materials, challenging designs and full service chain management.

### Focus on chemical etching

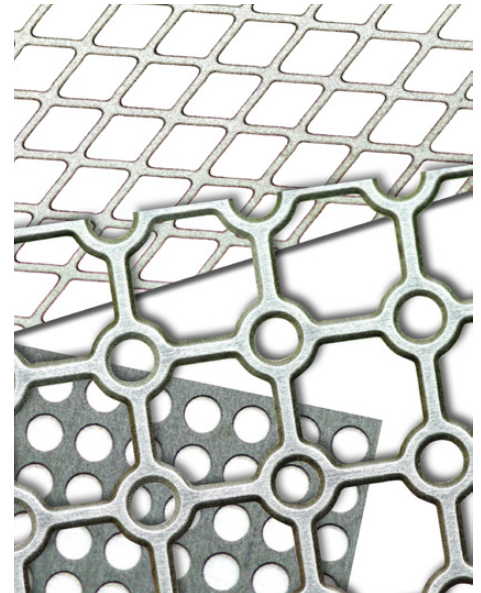
Titanium grids and implants, beryllium copper springs for geophones for seismic data acquisition, molybdenum solar connectors, stainless steel gaskets, dental brackets, shaver blades, medical lancets, filters for fuel injectors: these totally different applications have been chemically etched. Chemical etching can produce these products meeting demanding specifications. These can include: ultra-high precision, very thin material, unique physical features, unique surface textures, identification features, extreme consistency part-to-part, ease of integration into the final device. It is a daily responsibility to balance the combination of the above characteristics with the desired material while still

maintaining cost and production requirements. Photochemical etching, also referred to as photochemical machining or chemical milling, possesses the unique ability to meet all the above demands compared to other technologies such as stamping or laser machining. Photochemical etching also eliminates the need for certain post-processing, such as removal of burrs and thermal stresses, sharpening of blades, etc. The development of continuous "reel-to-reel" etching production has dramatically improved production capacity while reducing cost and improving consistency in quality. Dependable upon etching technology, parts can be manufactured in thicknesses as low as 0.003 mm (0.00012"), up to 1.5 mm (0.059").

### Focus on 3 etching features

Micrometal, based in Muellheim Germany, is at home in the world of ultra-tight tolerances, 3d geometries and high volumes. With its continuous reel-to-reel production, the German etching company can offer levels of precision, both in physical feature size and in dimensional tolerances, which were previously considered unachievable for volume-production components. Features are not limited to 2 dimensions, component designer can think in 3D benefiting from a design freedom, which was until now thought unrealistic.

HP Etch, based in Järfälla near Stockholm, is the expert for high precision etching of stencils, EMC-shielding products and parts in thin metallic materials. HP Etch serves the Scandinavian market, especially the medical, electronic, printing and energy sectors.



Titanium implant meshes  
Source: micrometal

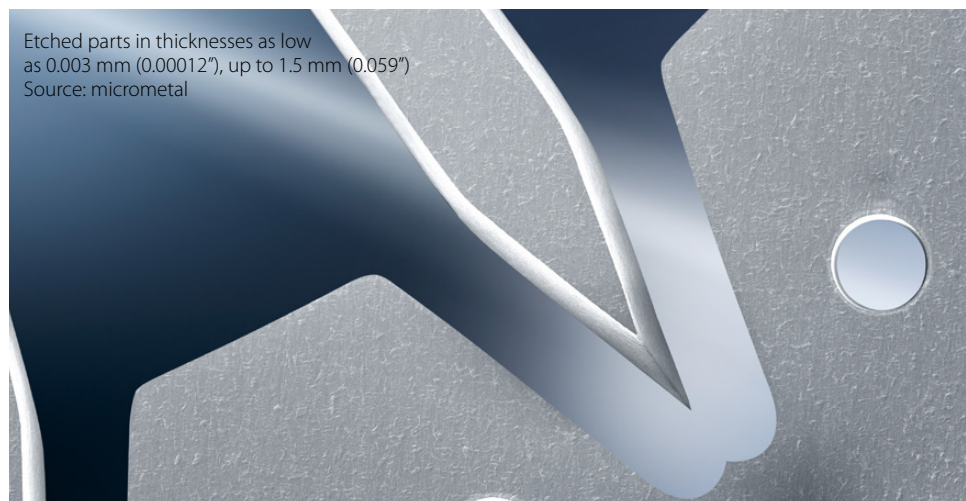
Additional focuses are parylene coating technology and bending/forming capabilities.

Etchform, the Hilversum based Dutch addition to this new etching triangle is the specialist when it comes to difficult to etch materials and chain management for secondary treatments. More and more applications require components made from a wide variety of metals. Etchform can etch gold, molybdenum, nickel, nitinol, titanium and special alloys. The Dutch etching partner is bringing its expertise in high-precision etching, even with extremely demanding materials, while still maintaining cost and production requirements. With the acquisition of Etchform, Micrometal and HP Etch can build on the wide cooperation network that the Dutch etching company has been developing for years.

### Conclusion

Photochemical etching provides a compelling solution to industry demands for high-precision metal components. The technology has evolved and improved dramatically in recent years. The new technology triangle formed by Micrometal, Etchform and HP Etch is now a full-range supplier for etching solutions ranging from small batches to high volumes.

Etched parts in thicknesses as low as 0.003 mm (0.00012"), up to 1.5 mm (0.059")  
Source: micrometal



micrometal GmbH, Müllheim  
Etchform BV, Hilversum  
[www.micrometal.de](http://www.micrometal.de)  
[www.etchform.nl](http://www.etchform.nl)



## Innovative use of laser micro machining to exceed borderlines

Tobias Bußkamp-Alda

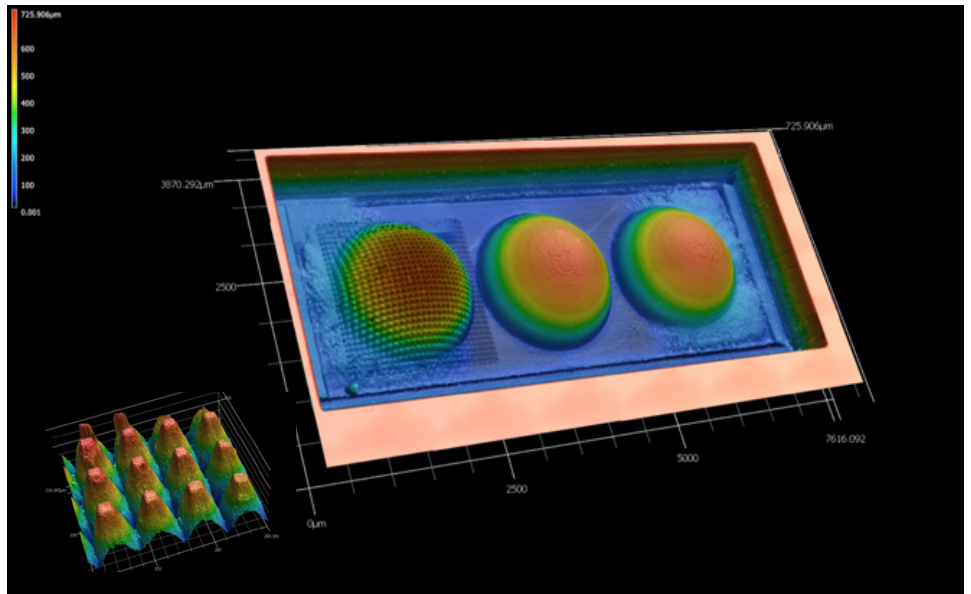
Nowadays the demands on the technical suppliers are increasing more and more. Innovative products are invented and designed, existing products become more efficient. For many of these tasks a small Dutch company with over 10 years in micromachining sector advises and supports its worldwide customers with the application of laser technology.

### Broadband laser machining

Laser machining offers a great spectrum of possibilities to support or replace the conventional mechanical machining. The disadvantage of limited tool sizes of mechanical machining is one of the biggest advantages of the laser machining. The laser beam is focused in a few micrometers and is used to drill, cut, weld or ablate very small features. Depending on wavelength and pulse duration nearly every material, metallic or non-metallic, could be machined. In materials where the emergence of a high temperature should be avoided, ultrafast lasers with a very short pulse duration (pulse duration  $< 10^{-12}$ s) are highly suitable to drill, mill and cut smallest features with highest quality. Since the heat-affect-zone (HAZ) can be kept very small using the right parameters, so the material/part does not heat up during the processing.

### Solution provider near the German border

The company Veldlaser was founded 1973 and specialized in measurement and control units for industrial purposes. Related to this, the first laser activities in welding were made in 1987. Henceforth, laser activities and experience grew until it became the



Lenses machined in silicon, the left one modified with microstructure  
Source: Veldlaser

main business of Veldlaser Innovations B.V. Nowadays Veldlaser looks back at more than 30 years of experience in the use of laser technology. More than 10 years of these, the company has been working with ultra-short-pulse-lasers. Veldlaser works for the medical-industry, space research and food sector and produces/offers small batch production of few pieces to mass production >100k piece/a year.

lowers the Veldlaser-team to respond to new requirements and to keep the machines up-to-date with the latest technical standards. The ISO-9000:2015 and ISO-13485:2016 certifications prove a high standard and enable cooperation with high tech companies and institutions such as SRON, Netherlands Institute for Space Research.

### Highly sensitive space camera for far infrared astronomy

Astronomers worldwide are eagerly looking forward to a space telescope that has a sensitive far infrared radiation camera containing a high amount of pixels. About half of all the energy from the universe reaches us via this radiation (wavelengths of 0.03 to 1 millimetres, the Terahertz frequency range). Measuring this radiation allows them to make far more accurate observations of the very cool and distant parts of the universe. Such a space telescope is needed because the earth's atmosphere hinders the infrared view of space. SRON, is working on extremely sensitive detectors for far infrared light, the so-called Kinetic Inductance Detectors (KIDs). The SRON researchers of the 'KID camera' had to overcome various challenges and

With an amount of almost 20 lasers of different types, Veldlaser Innovations B.V. offers services in welding, soldering, cutting, drilling engraving and micro-machining on a high, professional level. The laser-machines were developed and manufactured in-house. This aspect al-



Laser machined SST capillary Ø0,9mm  
Source: Veldlaser



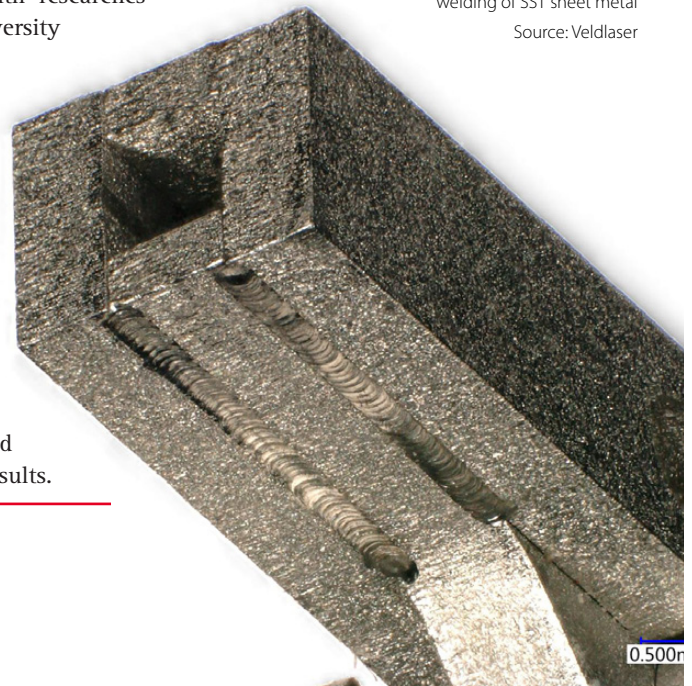
practical obstacles, being one of them how to couple the radiation efficiently to their detectors. To achieve this, planar antennas are being used in combination with precisely machined silicon lens arrays. Veldlaser developed a process to machine silicon with the highest precision and surface quality to focus the far-infrared radiation onto the antennas. For several years now, KIDS have been used in ground telescopes with excellent results. This outcome led NASA to use the technology for their projects.

**Micro structure on aspheric surfaces**

As light passes from air through an uncoated glass substrate or a lens some light will be reflected at each interface. This results in a loss of the total transmission of the incident light, which can be extremely detrimental in many applications. The way to reduce this loss is to cover the substrates with an anti-reflective (AR) coating. This is done depositing Parylene, a vapor deposited polymer, on top of the substrate or the

lens. However, this type of AR coating is narrow band. Together with researches from the Technical University of Delft (TUD), Veldlaser is developing a new solution, a broadband AR coating based on grooves machined on top of the lens. This new approach has also the advantage that it can be combined with the lens fabrication. Different groove designs are already manufactured and tested with impressive results.

**Veldlaser Innovations B.V.,**  
s'Heerenberg, NL  
[www.veldlaser.nl](http://www.veldlaser.nl)



Combination of cutting and welding of SST sheet metal  
Source: Veldlaser

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## SYSTEMS INTEGRATION 2019

The annual IVAM-conference "Systems Integration" will be held in England this year on October 9 at Microsystems (UK) under the title "Microfluidics in Industry and Life". Microsystems is one of the leading manufacturers of microfluidics using injection moulding techniques.

The event will demonstrate the importance of microfluidic products for automated processes in chemistry, biotechnology and medicine. Manufacturers and users will present and discuss new technologies and applications. The presentations will cover topics such as mobile diagnostics, chemical production in microreactors or organ-on-a-chip.

The afternoon before the conference there is the opportunity to visit the production facilities of Microsystems in Warrington.

The presentations are structured in three sessions:

- Technologies for Microfluidic Components Production
- Equipment with Microfluidic Components
- Applications for Microfluidic Components

The event is important to you if you are

- developer and manufacturer of microfluidic components and systems,
- user of microfluidic solutions,
- interested in the optimization of your chemical production processes by microreactors,
- developing mobile, diagnostic or

therapeutic devices,

- active in researching and developing new biotechnological processes.

### Microfluidics in industry and everyday life

Microfluidics plays an increasingly important role in industry and in applications for everyday life. Two examples:

1. The production of chemicals in microreactors is more efficient, controllable and sustainable than in conventional chemical plants.
2. Mobile diagnostic and therapeutic devices are not possible without microfluidic components that process small amounts of liquids.

To make this work, a lot of different additional components need to be in place: (micro) pumps, sensors, electronic hardware, control and analysis software and others.

### Technological possibilities and current applications

Different materials and production methods are well developed, e.g. injection molding of polymer materials, etching of glass and silicon, or mechanical structuring of

metal. Bonding techniques to close channel systems are essential. Surface modification is necessary to make the components hydrophilic or hydrophobic, biocompatible and smooth. In all these process steps, the requirements for tolerances and accuracy are very high.

The workshop will give an overview on technological possibilities and current applications.

It will also address unsolved issues and new research results. The speakers come from different industrial areas and are looking forward to a discussion with the participants about needs and requirements for new applications in new markets. The seminar will help to understand challenges and to find solutions. The networking options during breaks like lunch and dinner provide an ideal framework to start co-operations between the participants.

More information, the detailed program and registration form will be available at the IVAM website.

IVAM Microtechnology Network  
[www.ivam.com](http://www.ivam.com)  
[www.ivam.com/SystemsIntegration19](http://www.ivam.com/SystemsIntegration19)



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### SYSTEMS INTEGRATION

Systems Integration is a series of conferences that the IVAM Microtechnology Network has been conducting regularly since 2008 with varying partners and varying topics in different European countries.

It offers manufacturers and users the opportunity to exchange ideas about intelligent applications of micro-technical solutions. The emphasis is on the integration of different processes and products into systems. The previous events took place in Germany, Switzerland, the Netherlands and Finland.

Systems Integration  
 „Microfluidics in Industry and Life“

October 9, 2019, Manchester/Warrington, UK





## International MicroNanoConference 2019

The international MicroNanoConference 2019 focuses on Dutch and international businesses, universities and research centers. The conference offers an opportunity to bring these areas together to stimulate cooperation, knowledge and innovation.



The conference themes have been carefully selected and are in line with the social and economic challenges and missions determined by the Dutch government.

### Health & Life science

### Agro & Food

### Sustainability & Energy

### Manufacturing & Engineering

These topics are not only applicable to Dutch society, but worldwide.

By exchanging ideas and knowledge internationally, experts work together to turn global social and economic challenges into opportunities with the ultimate goal of realizing them.

On December 10 and 11, the international MicroNanoConference 2019 will take place at a new location: SuperNova Jaarbeurs Utrecht, the Netherlands. This year, 'interaction' is the focus to the following activities: challenges and polls, parallel sessions, plenary sessions, a lecture track on 'funding for start-ups', a trade show floor with a start-up corner, a pitch podium for exhibitors, start-ups and visitors, posters, workshops, a social dinner with evening program, poster- & start-up award and as closure of the two-day conference MinacNed's 15th anniversary drink - 'To the future and beyond'.

### Participation in the iMNC19 is possible as an exhibitor, presenter or visitor.

There is a choice of the following exhibitor packages:

- Table-top booth
- Table-top booth and workshop
- As a „Gold sponsor“: breakfast meeting / end of the day meeting and start-up sponsorship, offer your selected visitors (max. 25 people) a breakfast or end of the day session. A unique opportunity to present your company and to network with a select group that you have invited.

- Start-up booth

### Lecture and poster opportunities

The conference also offers an opportunity to give a lecture or to present a poster. Join the discussion on topics such as:

- Smart farming: how do you successfully grow a crop with as little waste as possible and which sensors are needed for this?
- How can production robots make any product to size without waste and for the best price? Which techniques do we need for improvement and further development?
- How can your technology or research area help you map, clean up and tackle the micro-plastics mountain in the world?
- How can organ-on-a-chip play an enabling role in setting up personalized Medicine? What does the path to you-on-a-chip look like and how to contribute to that?
- How can biosensors improve food safety?

### About MinacNed

MinacNed is a trade association with the aim of strengthening economic activity based on microsystems and nanotechnology. The members consist of research institutes, the manufacturing industry, suppliers, integrators and end-users of products and services that have been made possible with, by or are used with micro- and nanotechnology.

The core activity of MinacNed is to provide a platform for sustainable economic and social value creation, also to create an ecosystem for researchers, entrepreneurs and policy makers. The international MicroNanoConference is a part of this platform creation.



Anyone who is involved with micro nano or works in these areas can submit an abstract, either from the business community or from the academic side, such as universities or research centers. For submitting an abstract you can think of technologies, such as: photonics and light technologies, nano-, quantum- and digital technologies, advanced materials, chemical technologies, life science technologies, engineering-, manufacturing technologies or other connecting and promising technology which has not yet been mentioned above.

Abstract submission is open until Friday, September 6, 2019. The abstracts selected by the program committee will be announced on Thursday, October 10. The conference draws annually 350-400 visitors and has around 25-30 exhibitors. Contact person is Sharon Tammer, project manager MinacNed via [sharon@fhi.nl](mailto:sharon@fhi.nl).

MinacNed - Association for Microsystems and Nanotechnology  
Leusden, NL  
<https://fhi.nl/minacned>  
[www.micronanoconference.org](http://www.micronanoconference.org)





## Sensors are the key to tomorrow's digital hospital world!

The COMPAMED Innovation Forum on July 10 at the Helios Klinikum in Krefeld focused on high-tech solutions for hospitals. Under a new concept, this year's forum brought the manufacturers and developers of technical solutions directly into dialogue with the users of the end products.

### Medical devices must be designed for the real needs of doctors and nurses

Not sufficiently compact, not flexible enough, too valuable, not sensibly integrated into the operating procedures on the wards – the list of users' shortcomings with regard to medical technology products seems long. The first introductory discussion already showed that high-tech medical devices are far too often not developed in line with the real needs of specialist personnel.

Franziska Niederschelp from Helios Klinikum presented the digitization measures and progress within the Helios Group. Language assistance for doctor's letters and file management will be of particular importance in the future. The automated bundling and digital merging of patient data from medical devices, laboratories and the ward is another focus point.

Dr. Jens Ebnet, anesthesiologist and intensive and emergency medic, sensitized for the special requirements that medical technology faces in acute situations. Since there can be risks in terms of acceptance, also due to conflicts of conscience, it is necessary to include specialist medics sufficiently in the development of automated, data-processing medical devices. Using the example of his own development „Swordcath“, an intuitive system for blood catheterization, he also criticized regulatory hurdles and a lack of political support for SMEs.

Maren Geissler from the Helios Center for Research and Innovation in Wuppertal



presented the fact that there are quite some opportunities to support and financially promote innovative concepts and ideas.

### Sensors enable applications for improved patient care

The second session focused on technologies that can offer innovative possibilities for applications in diagnosis and therapy. CSEM from Switzerland has developed an optical method to reliably control blood pressure. The application is possible by means of the light of smartphone camera via app. Eike Kottkamp from InnoME explained the advantages of disposable sensor products: in applications where measurements do not have to be made in the high-precision range, disposable sensors can be attractive alternatives to complex and expensive sterilization processes and open up new fields of application, for example under wound dressings. Dr. Dirk Janasek from ISAS.e.V. presented an innovative procedure

for a reliable test for hemophilia. Michael Görtz from Fraunhofer IMS explained how sensor implants are able to continuously monitor blood pressure, intraocular pressure, intracranial pressure and support therapeutic measures. Dr. Heike Kreher from Micronit explained among other things, how a microfluidic chip can determine a subtype of leukemia, for example, by means of a rapid test and thus make a prompt therapy measure possible for the patient.

### Constant communication between users and manufacturers is essential

Another major aspect was the presentation and discussion of further developments of already marketable and – also in Krefeld – already successfully applied products. The range includes smart home emergency call systems from easier Life GmbH, the WLAN connection of medical devices, an in-house logistics system for the automatic preparation of medicine dosages for stationary patients, an infrared-based system for discrete room monitoring with regard to patients at risk of falling, innovative round trolleys for hospital staff and robotics systems for supporting paraplegics, but also nursing staff carrying heavy loads.

The lively and productive discussions between the presentations and at the end emphasized the enormous need for communication between users and manufacturers.





### NextGenBat: Basic research for mobile energy storage systems

In the new infrastructure project NextGenBat, six institutes are paving the way for the research and development of future battery systems. RWTH Aachen University, Forschungszentrum Jülich and the Fraunhofer Institute for Laser Technology ILT are involved in the project, which will particularly strengthen the federal state North Rhine-Westphalia as a high-tech location for energy storage development. It is already expected that the solid fuel battery will have a significant impact on electromobility over the next ten years. To successfully industrialize such technologies, production engineering is a key requirement. "The NextGenBat project will make it possible for us to invest now in the technologies of the future and to explore the path towards industrially manufacturing next-generation battery cells," explains Dr. Heiner Heimes, Institute for Production Engineering of E-Mobility Components PEM at RWTH Aachen University. "As production engineers, we can help transform material innovations into competitive products."

In the project, the six participating institutes are jointly developing pre-competitive research infrastructure within two years and with a budget of around €10 million. In it, individual process steps are created as module components on a pilot plant scale. With these decentralized solutions, the project participants shall pave the way for the entire value chain of the next battery generation, including all interfaces from the material synthesis of the active materials to the recycling of the cells.

Fraunhofer Institute for Laser Technology ILT, [www.ilt.fraunhofer.de](http://www.ilt.fraunhofer.de)



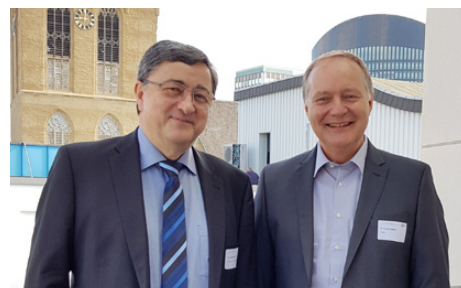
In battery technology, lasers already enable extremely precise and stable connections today: Laser bonding can be used, for example, to weld copper ribbons onto battery cells. Source: Fraunhofer ILT, Aachen.

### Artificial intelligence offers great opportunities and challenges for SMEs

The IVAM business forum „Artificial Intelligence - Machine Learning, Deep Learning - Benefits and Importance for companies“ brought leading experts together to illuminate the topic of artificial intelligence from many sides. The presenter of the event, Dr. Gottfried Dutiné, emphasized in his introductory words the significance of this technology for the future of Germany as a leading industrial nation. In his keynote Jörg Bienert, chairman of the German Bundesverband KI introduced the topic. The term was already defined in 1956. It was only in 2012 – enabled by the development of neural networks and fast computer services – that the breakthrough of the technology took place. Today, AI systems are already integrated into speech recognition, translation programs, logistics optimization or to control the movement sequences of robots.

Partners of the event were the Digital.HUB, the ruhr:Hub and the KI-Bundesverband as well as the Dortmunder Roundtable Startup - Mittelstand. This roundtable brings together highly innovative young companies with established medium-sized businesses in order to lead the competencies of both groups to successful joint projects. In this context, four young companies presented their services in the areas of machine learning, predictive maintenance, production optimization and deep learning for text analysis. Some of the speakers showed live demonstrations, which were used for discussion during the breaks. The participants were very satisfied with the selection and presentation of the topics. Some co-operative talks already started during the event. In his conclusion, Dr. Thomas Dietrich, managing director of IVAM, underlines the relevance of the debate about AI issues as follows: „The event showed us two things: Firstly, artificial intelligence is increasingly being used in more and more areas of our daily lives. For this reason alone, it is important to address the topic in a timely manner. On the other hand, integration is no longer a „witchcraft“; AI can also make a contribution to optimizing production and services for SMEs.

IVAM Microtechnology Network, Inga Goltermann, Email: [go@ivam.de](mailto:go@ivam.de), [www.ivam.com](http://www.ivam.com)



Dr. Gottfried Dutiné and Dr. Thomas Dietrich



Source: IVAM

### Top marks for plastic bottle recycling system

Plastic waste is a growing problem for our environment and society. EU regulations preventing recycled plastic previously used for non-food packaging from being used as food or drink packaging in its second life are one of the factors hindering recycling. The rules require recyclable plastic waste to be meticulously sorted into food and non-food packaging before it can be recycled for new food and drink packaging products – a process which is currently very rarely used, meaning that most food and drink packaging uses virgin plastics. The EU-funded POLYMARK project set out to boost the recycling of certain categories of plastic with an innovative marking and sensor-based sorting system which easily identifies plastic previously used for food and drink packaging. The project focused on polyethylene terephthalate (PET), a high-value thermoplastic polymer resin widely used in containers for liquids and foods, like mineral water bottles. Although it is easily recycled into materials such as carpet fibre, its reuse could be expanded thanks to a new system to identify plastics previously used in food and drink packaging. As a first step, scientists created a marking and identification system. During manufacture, plastics used for food and drink can be coated with a chemical marker, or the marker can be applied to the product label. The marker does not change the appearance of the packaging but can be detected using optical technology. Next, researchers developed a machine to detect the marked plastics. Plastic bottles and containers pass through a marker-detection unit before being separated into those that have been used for food and drink and those that have not. The detection system uses ultraviolet light and sensitive cameras that can pick up the fluorescent signal in the chemical marker. The containers identified as food and drink packaging can then be cleaned in normal recycling washing facilities – a process that also removes the marker. The technology has been developed and is market-ready. Project partners are now participating in a cross-industry platform seeking to harmonise the use of tracer and watermark technologies in the plastic-packaging value chain.

Fraunhofer Institute for Photonic Microsystems IPMS, [www.ipms.fraunhofer.de](http://www.ipms.fraunhofer.de)



Source: Brian Yurasits on Unsplash



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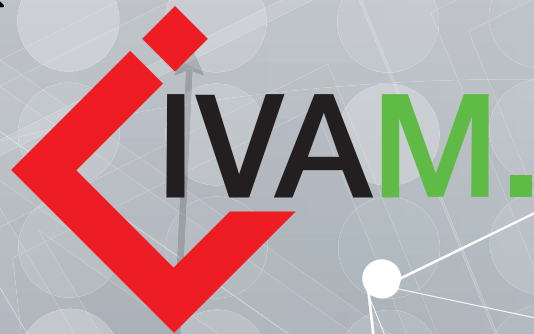


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