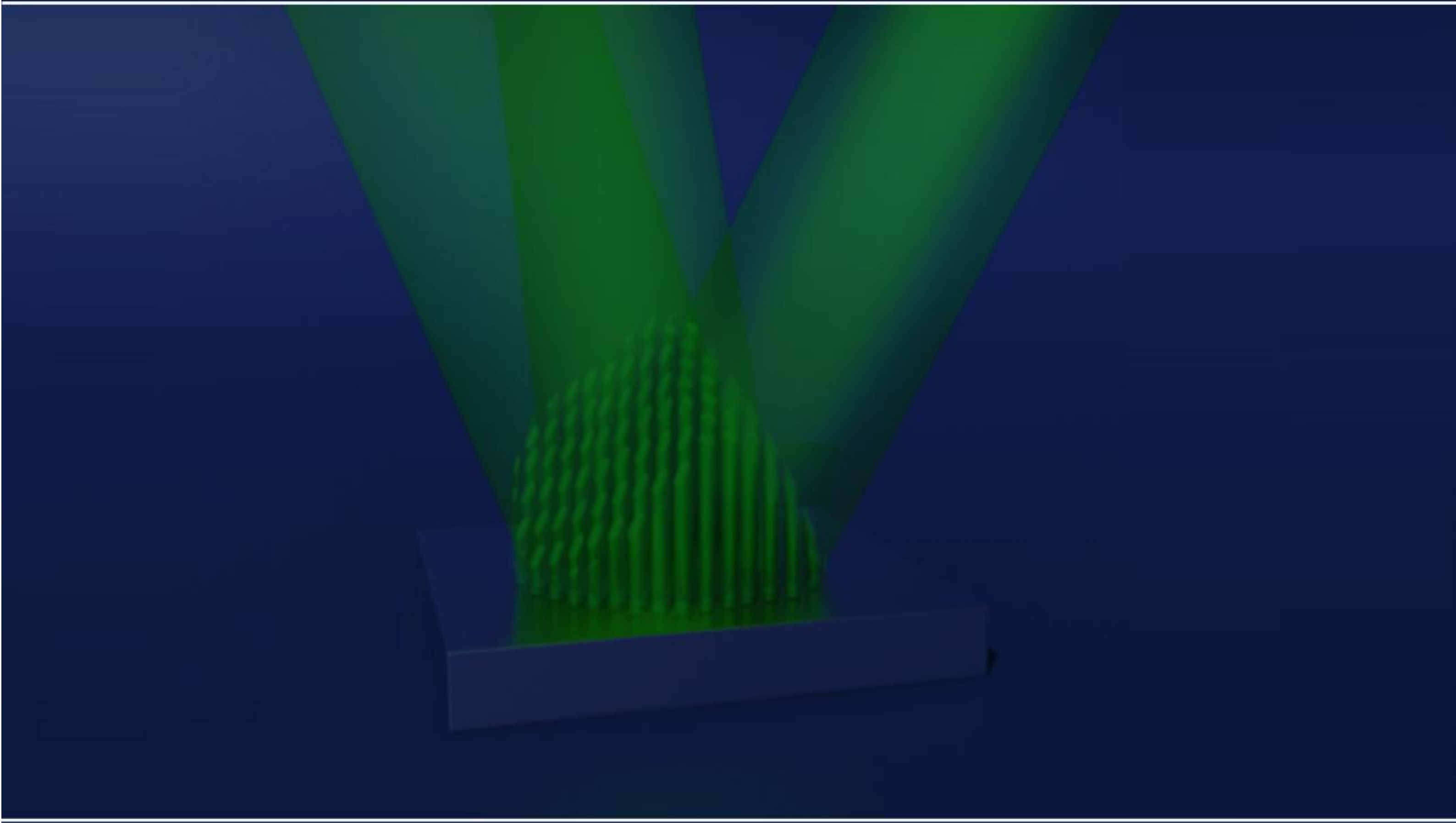


Annual report 2018/2019

Chair of Large Area Laser Based Surface Structuring

Professur für Laserbasierte Methoden der großflächigen Oberflächenstrukturierung

Dear friends and partners of the LMO Professorship,
Dear readers,

The "*Professur für Laserbasierte Methoden der großflächigen Oberflächenstrukturierung*" (Chair of Large Area Laser Based Surface Structuring) is the result of the successful establishment of the so-called "Open Topic Tenure Track Professorships (OTTP)" Program of the TU Dresden. In total, more than 1,300 applications for the professorships were received from all over the world, 500 of them from abroad. This exceptional opportunity has allowed us to develop and improve various technologies that enable a wide range of applications in very different technological fields.

After the very successful realization of the OTTP project, the chair was permanently integrated into the structure of the TU Dresden in 2019. This has confirmed our vision in research and development and enabled us to further develop our teaching activities with new courses and modules. Within this framework, we will offer two new modules for our students starting in 2020, dealing with the applications of laser methods for the functionalization of surfaces as well as photonic measurement methods.

In addition to the impressive number of publications in peer-reviewed journals in 2018 and 2019, the chair has been awarded with a significant number of national and international prizes. This was possible due to the hard work of all our scientists, engineers and cooperation partners.

Our strong collaboration with the Fraunhofer Institute for Material and Beam Technology (IWS) in Dresden, under the "Center for Advanced Micro-Photonics (CAMP)" allowed us to develop together new solutions for laser systems, processes as well as metrology components.

We would like to take this opportunity to thank our national sponsors as well as the European Union, our partners and customers for their trust and our employees for their trustful and constructive cooperation.

A selection from our numerous research projects is presented in this report. We invite you to gain an insight into our work and wish you an inspiring read!

Prof. Andrés Fabián Lasagni

Photograph: Tobias Ritz, tobiasritz.com

Contents

1. The chair in numbers

Expenditure from R&D Income

	2018	2019
Raised funding	906.834 €	1.216.738 €

Employees

	2018	2019
Scientific staff	16	17
Technical employees	1	2
Administration	1	1
Student assistants	9	5
Visiting scientists	2	3
Total employees	29	28

Final theses

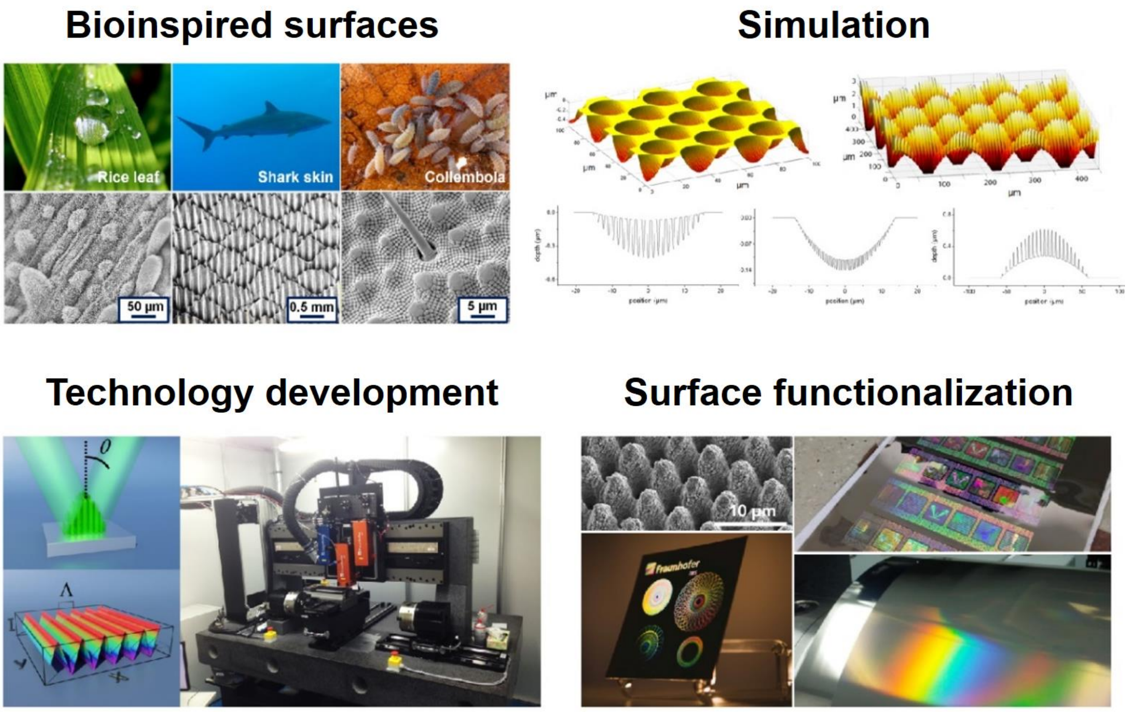
	2018	2019
Doctoral theses	1	2
Diploma theses	3	6
Student projects	5	3
Project theses	3	3

Publication record

	2018	2019
Peer-reviewed papers	16	26
Proceedings and conference articles	13	15
Participation in conferences	53	57
Patent applications	6	1

2. Research and teaching activities

Laser technologies offer a number of advantages, such as the precise modification of surfaces without contamination, remote and contact-free processing, a high degree of flexibility and an exactly localized energy input into the material.
The Chair of Large Area Laser Based Surface Structuring (LMO) is engaged in the development of new laser-based methods and technologies for the high-throughput patterning of different materials in order to provide them with a wide variety of structures in the micro- or sub-micrometer range. In this way, surfaces can be provided with new functions or properties.



Focus in research and teaching

- Design of surface functions by structuring relevant technological materials in the micrometer and submicrometer range.
- Development of laser-based methods and technologies for the high-throughput treatment of large surfaces.
- Roll-to-roll processing of polymer foils using UV radiation and hot-embossing methods.
- Structuring of planar and complex substrate surfaces, process and optics development.

3. Center for Advanced Micro-Photonics (CAMP)

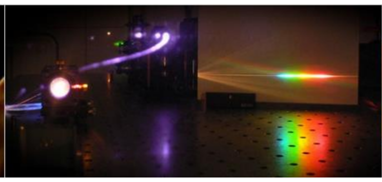
CAMP focuses on laser-based surface modification and patterning processes. The center targets opportunities and challenges in the development of new system, process and measurement solutions. To transfer technologies into the industry, our scientists develop solutions in every step along the entire process chain.

TECHNISCHE UNIVERSITÄT DRESDEN — CAMP CENTER FOR ADVANCED MICRO-PHOTONICS — Fraunhofer IWS

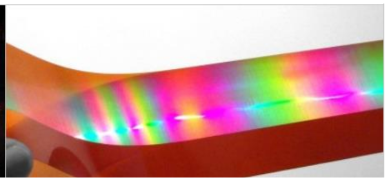
CAMP employs cross-operational approaches ranging from simulation, laser processes and optical measurements to machine learning. The scientists at Fraunhofer IWS and TU Dresden focus on various applications of laser microprocessing and measurement engineering.

The CAMP partners:

Fraunhofer IWS, Business unit Microtechnology



Fraunhofer Application Center for Optical Metrology and Surface Technologies



Chair of Large Area Laser Based Surface Structuring

4. Selected projects

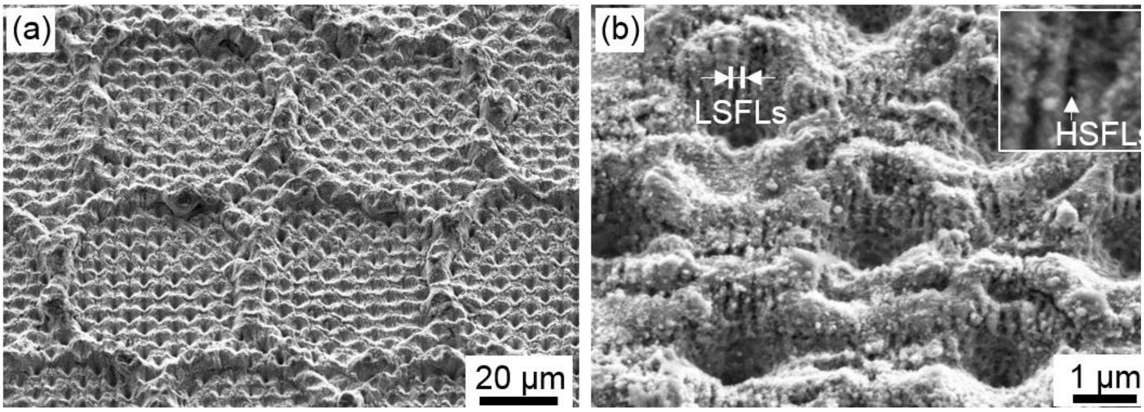
Production of multifunctional titanium surfaces by the generation of hierarchical structures by laser ablation

Funding agency: *Deutsche Forschungsgemeinschaft*
Period: 02/2014 – 10/2019
Project partners: LMO, TU Dresden
Project manager: Dipl.-Ing (FH) Christoph Zwahr

Structured implant surfaces with micrometer and submicrometer features can improve cell adhesion and simultaneously reduce bacterial attachment. However, a critical property of these surfaces is their mechanical stability during implantation. Therefore, advanced surface structures are required that can offer both improved healing and wear resistance to protect the functional surface.

In this project, laser-based manufacturing methods were used to produce different surface topographies on titanium surfaces. First, crater-like structures with a spatial period of 50 µm on unpolished titanium surfaces were created by direct laser writing with a pulsed nanosecond laser. Directly on this structure, a hole-like structure geometry with a space period of 5 µm was produced by direct laser interference structuring (DLIP). While the smaller features are intended to reduce bacterial adhesion, the larger geometry serves to protect the smaller features from wear.

As a result, the adhesion of E. Coli bacteria was successfully reduced by 30% compared to an unmachined reference. In addition, the DLIP structure in the larger DLW craters was preserved in a wear test. Furthermore, a titanium oxide layer was formed which is of advantage by increasing biocompatibility of the implants.



(a) Hierarchical surface on titanium with 5 µm hole-like and 50 µm crater-like structures. (b) High resolution image of the 5 µm hole structure showing additionally self-organized line-like submicrometer structures with a period of 400 nm (LSFLs) and 150 nm (HSFLs).

Sponsored by:
Deutsche Forschungsgemeinschaft

Reinhart-Koselleck project

Funding agency:	Deutsche Forschungsgemeinschaft
Period:	09/2017 – 03/2021
Project partners:	LMO, TU Dresden
Project manager:	Dipl.-Ing. Stephan Milles

Today, technical surfaces require improved functionalities such as superhydrophobic properties, for instance in technological applications in in the field of aeronautics, consumer products or the automotive sector. These water-repellent properties allow surfaces for example to prevent ice-accumulation, allow self-cleaning or anti-corrosive effects.

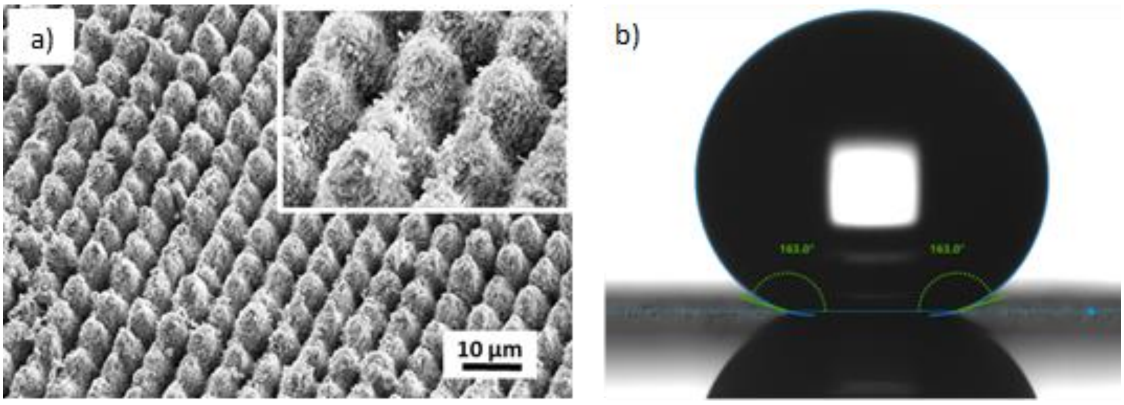
Up to now, this kind of surfaces have been produced using chemicals that are hazardous to health, expensive lithography processes or wear-intensive micro-milling.

An innovative alternative is Direct Laser Interference Patterning (DLIP), which allows polymers, ceramics and metals to be processed fastly and precisely in an one-step process.

Within the scope of the Reinhart Koselleck project, we have succeeded to develop advanced 7.0 µm micrometer-sized pillar structures on aluminum by using DLIP technology. This means that over 2 million of small pillars can be produced per square centimeter.

This topography, which is based on the lotus leaf natural example, avoids water droplets to adhere to the surface as well as rolling off the surface without leaving any residue.

In addition, DLIP structures can be combined with other methods, e.g. direct laser writing, to create hierarchical structures. This is intended to create additional functional surfaces featured with anti-icing or self-cleaning properties in the future.



(a) SEM image of pillar-like microstructures on pure aluminum to optimize wettability, produced with direct laser interference structuring and (b) a non-adhesive water drop on the structured aluminum surface.

Sponsored by:
Deutsche Forschungsgemeinschaft

High throughput Laser structuring with Multiscale Periodic feature sizes for Advanced Surface Functionalities (LAMPAS)

Funding agency:	European Union – Photonics21
Period:	01/2019 - 12/2021
Project partners:	LMO, Trumpf, Lasea, NIT, NextScan, Bosch, BSH, EPIC
Project managers:	Dr.-Ing. Robert Baumann; Dipl.-Ing. Nikolai Schröder

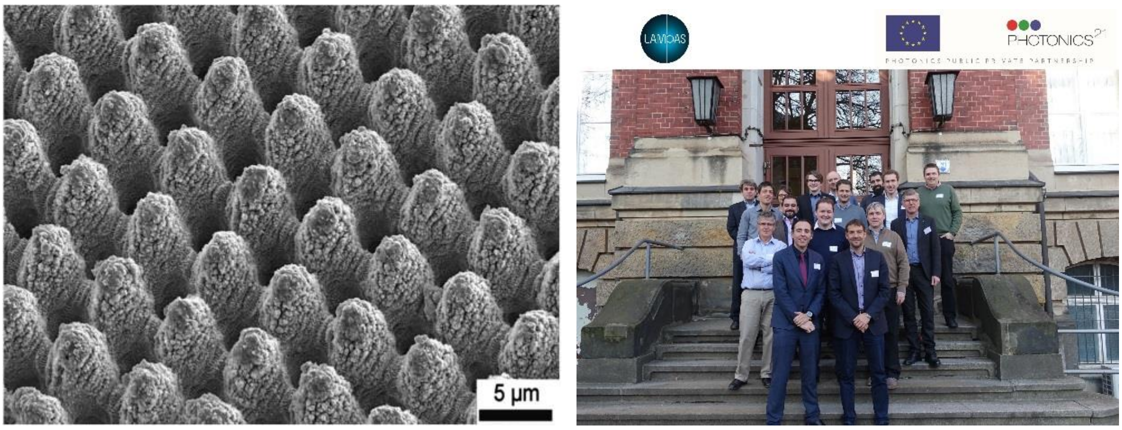
Surface functionalization is one of the most promising fields of research for applications in medical technology, automotive industry and energy research. The use of innovative laser technology makes it possible to create high-precision structures down to the µm range.

The effectiveness of such surface functions has been extensively investigated and proven in previous research projects. However, the goal of the LAMPAS project is to transfer these results to industrial markets.

For this purpose, new high-power beam sources are combined with innovative beam deflection systems in a European research project. In order to offer different markets with microstructured surfaces, it is mandatory to reduce the process times which will allow also to reduce the processing costs for surface functionalization.

For this purpose, an innovative beam deflection device in the form of a polygon scanner is used to guide the laser beam over the material surface. This allows to achieve scanning speeds of 300 m/s.

In order to generate the specific properties, such as self-cleaning or antibacterial surfaces, structural elements in the order of <10 µm have to be generated. The international research team aims not only to generate surface functionalization but also to achieve industrial quality monitoring using innovative camera systems. At the end of 2021, when the project is completed, a prototype structuring system will be set up and validated.



(a) SEM image of structured metallic sample and (b) team picture of the LAMPAS project partners at the kick-off at the TU Dresden in January 2019.

Sponsored by: European Union Horizon2020
An initiative of the "Photonics Public Private Partnership" - Photonics21.org

PHOTONICS21
PHOTONICS PUBLIC PRIVATE PARTNERSHIP

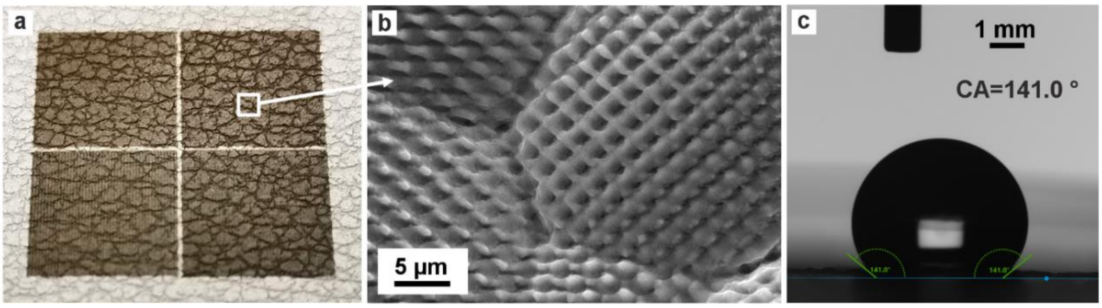
Integrated engraving and impression process for the one-step manufacture of hierarchical, multifunctional embossing structures – inGRAVE

Funding agency:	Sächsische Aufbaubank (SAB)
Period:	10/2017 - 09/2020
Project partners:	LMO, Sächsische Walzengravur GmbH (SWG)
Project manager:	Dr.-Ing. Yangxi Fu

Surfaces with a controlled topography with features in the micro- and submicrometer range are characterized to provide special properties. In this project, three-dimensional hierarchical microstructures are produced on polymer films. The aim is to create multifunctional surfaces with e.g. enhanced optical properties and controlled wetting behavior.

The foils are hot stamped in the nanoimprint process, while the tools are previously structured with Direct Laser Engraving (DLE) and Direct Laser Interference Patterning (DLIP). The structures of the first hierarchy level (e.g. wood or leather pattern) are produced by SWG using DLE. The structures of the second hierarchical level (e.g. hole-like structures with a spatial period in the range of 2 to 5 µm) are produced by DLIP with a 70 ps ultrashort pulse laser.

In order to determine suitable stamp-polymer pairings, comparative studies with microstructured surfaces on nickel, chromium and copper and their molding on polymethylmethacrylate (PMMA) and polyethylene terephthalate (PET) films are carried out in this work. The showed images display a chrome stamp with DLE leather aspect and DLIP hole structures with a spatial period of 5 µm. With this tool, homogeneously distributed, hemispherical microlenses could be embossed on polymer surfaces. The characterization of the wetting behavior is done by measuring the static contact angle on the polymer. Compared to untreated surfaces, the contact angle of PMMA increased from 63.8° to 120.6°. For PET an increase from 81.3° to 141.0° was observed.



(a) Optical micrograph of the leather pattern and (b) SEM images of hierarchical structures on Cr, made with four-beam DLIP, with a spatial period of 5 µm. (c) Static contact angle between a drop of water and the structured surface.

Sponsored by:
Sächsische AufbauBank (SAB)

Europäische Union
Europa fördert Sachsen.
EFRE
Europäischer Fonds für regionale Entwicklung

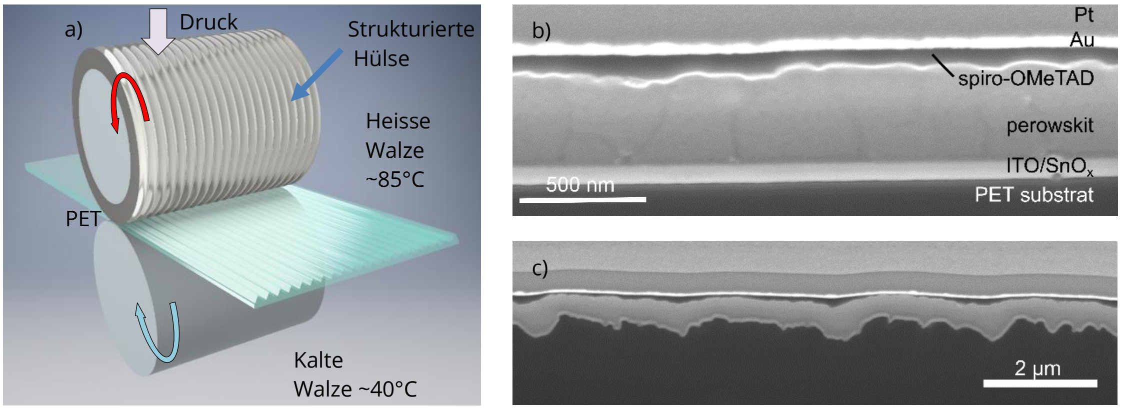
Efficiency improvement through light management in large area next generation solar cells using direct interference laser patterning

Funding agency: Alexander von Humboldt Foundation
Period: 04/2018 - 03/2020
Project partners: LMO, IAPP
Project manager: Dr. Marcos Soldera

The development of organic and perovskite-based solar cells has attracted much attention in recent years. These technologies have great potential to become a cost-effective alternative to traditional silicon solar technology. One obstacle, however, is the still low cost-effectiveness due to the relatively low efficiency of large-area modules. Among the factors limiting efficiency, the reduced light absorption within the photoactive layer plays a decisive role. One of the strategies to increase absorption without changing the electronic properties is the periodic structuring of the solar cell surface.

In this project, thermoplastic films made of polyethylene terephthalate (PET) are printed with light trapping structures over a large area by hot stamping. The films are then used as substrates for the production of perovskite and organic flexible solar cells.

The tools for the plate-to-plate or roll-to-roll processes in the form of plates, rollers or cylindrical sleeves were previously processed using Direct Laser Interference Patterning (DLIP). DILP is a laser-based manufacturing process for the generation of periodic structures in the micro- and submicrometer range. Preliminary tests with perovskite solar cells on substrates with hierarchical, linear structures with spatial periods of 0.45 µm and 2.7 µm showed an efficiency increase of 5%. The optical characterization suggests that this increase is due to an improved absorption of sunlight.



(a) Schematic representation of the roll-to-roll hot stamping process for printing PET film. FIB/SEM cross-sectional images of a perovskite solar cell, on a (b) flat and (c) patterned PET film.

Sponsored by:
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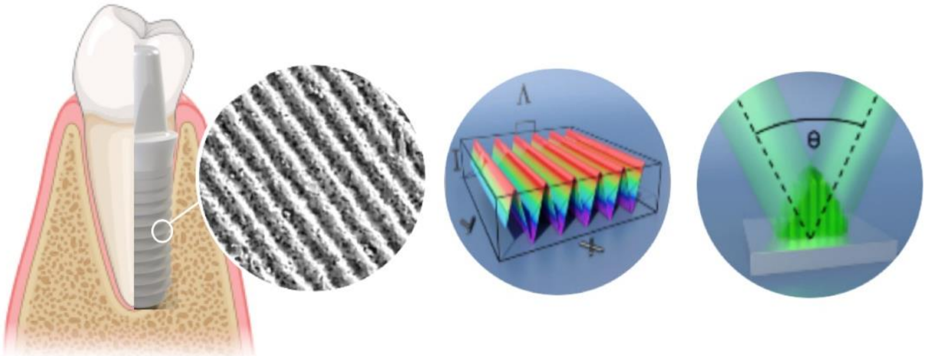
Stiftung / Foundation

Development of Direct Laser Interference Patterned Multifunctional Zirconia BioSurfaces

Funding agency:	Alexander von Humboldt Foundation; CAPES-Brazil
Period:	11/2019 - 07/2022
Project partners:	LMO at TU-Dresden, Institute of Biomaterials at FAU
Project manager:	Prof. Dr. Bruno Alexandre P. C. Henriques

In the last decades, zirconia (ZrO_2) has emerged as a structural material in the biomedical field due to its biocompatibility, aesthetic and unique biomechanical characteristics such as high fracture toughness, fatigue resistance, bending strength and corrosion resistance. Zirconia is however a "bioinert" ceramic and efforts have been made in order to provide bioactivity to zirconia implant surfaces, which is desired for an appropriate cell attachment, proliferation, and differentiation for bone-implant integration. Additionally, its ceramic nature makes it a brittle material that tend to be sensitive to surface or internal flaws, thus limiting the traditional mechanically-based surface modification treatments (e.g. grit-blasting).

The aim of this project is to develop novel multifunctional zirconia surfaces for improved mechanical and biological response of dental implants taking advantage of the versatility of Direct Interference Patterning Patterning (DLIP) technology to produce innovative bio-surfaces, embedding nano- and micrometer periodic textures/features which will be able to increase the reliability and longevity of zirconia dental implant systems. Micrometer periodic structures (1-5 µm) as well as sub-micrometer structures (~200 nm) classified as laser induced periodic surface structures (LIPSS) can be transferred to the surface with highly reproducibility surface patterns and demonstrated beneficial biological outcomes, at the level of cell-guidance or anti-bacterial effect. In order to minimize or avoid surface damage of the ceramic surface, ultra-short pulsed lasers (pico-second and femto-second lasers) with different wavelengths (e.g. 1064 nm, 532 nm, 355 nm or even shorter) will be used.



Schematic of a laser patterned (DLIP) dental implant surface.

Sponsored by:
Alexander von Humboldt Foundation; CAPES-Brazil

Macro and micro structuring of deep drawing tools for Dry Forming

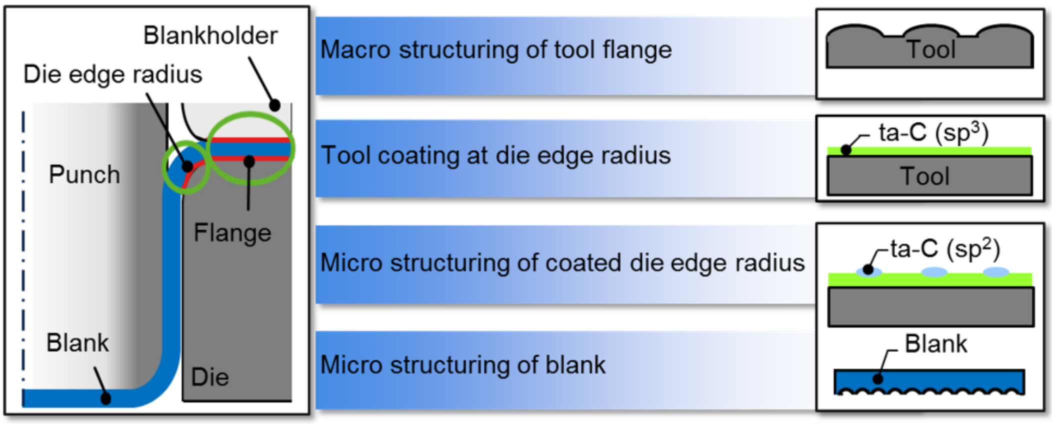
Funding agency: DFG
Period: 02/2014- 05/2020
Project partners: FF, LOT (TU Dresden)
Project manager: M. Eng. Theresa Jähnig (LMO) / M.Sc. Ali Mousavi (FF)

In this project, the loss of tribological functions due to the absence of lubricants in dry forming is to be compensated by a targeted process and tool development. For this purpose, an integrative approach is chosen, which includes the combination of macro- and microstructuring with an appropriate coating of the tools.

By combining the effects achieved in this way, the friction between sheet metal and tool will be reduced, thus making the use of lubricants unnecessary. The relevant cause-and-effect relationships are analyzed with the help of analytical approaches, FE calculations and experimental investigations and thus made usable for an industrial application.

The investigations carried out so far show that the coefficient of friction and wear can be significantly reduced by tool coating and layer functionalization. For example, the friction between sheet metal (DC04) and tool (1.2379) could be reduced by up to 20% compared to a lubricated tool by means of the tetrahedral hydrogen-free amorphous carbon layer (ta-C). In addition, by microstructuring the layer with "Direct laser interference patterning" (DLIP technology), the wear behavior could be reduced up to 90%.

The research work carried out shows that a deep drawing process can be successfully conducted using macro- and microstructured tools without the use of a lubricant while maintaining the same process window size. In the future, we will therefore further develop and optimize the practical method for minimizing frictional forces and wear during deep drawing, while significantly enlarging the process window.



Types of structures and coating for improving tribological properties in dry deep drawing.

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DFG Deutsche Forschungsgemeinschaft

5. Other activities

7th and 8th International Summer School on "Trends and new developments in laser technology"

In cooperation with the Fraunhofer Institute for Material and Beam Technology (IWS) in Dresden, the Chair of Large Area Laser Based Surface Structuring held a one-week international summer school from August 27th to 31st, 2018 and from August 26th to 30th, 2019. International PhD students could intensively learn about the basics and applications of laser technology and discuss the latest developments.

The main program consisted of lectures by laser experts and practical training in the laboratories of Fraunhofer IWS. Some of the topics covered by the summer school were surface hardening, high speed 2D laser cutting, laser welding, additive manufacturing processes and applications of ultra short pulsed lasers netween others.

The exchange of ideas was further promoted by presentations of participants. With its extensive technical equipment, the Fraunhofer IWS Dresden offered excellent conditions for the participants.

TECHNISCHE UNIVERSITÄT DRESDEN DRESDEN concept CAMP CENTER FOR ADVANCED MICRO-PHOTONICS Fraunhofer IWS

The participants travelled from all over the world, for example from Russia, Poland, France and Italy. Besides the professional exchange the students also enjoyed the sights of Dresden and the excellent opportunity for networking. The summer school will be offered again in 2020.

International Workshop on "Laser precision micromachining and material-beam interaction"

In cooperation with the Fraunhofer Institute for Material and Beam Technology (IWS) in Dresden, the Chair of Large Area Laser Based Surface Structuring organized an International Argentinean-German Workshop on Laser Precision Machining from September 21st – 22nd,

2018. The young researchers were introduced to general topics of laser processing, in particular regarding the interaction of light with matter as well as about methods for producing nano/micro structured surfaces for advanced applications.
The workshop was financed by the Technical University of Dresden and the DAAD.

Member of the scientific committee at the Laser-based Micro- and Nano-Processing IX Conference at Photonics West 2018 and 2019 in San Francisco, USA

In February 2018 and 2019 Prof. Lasagni participated as a member of the committee at the "Laser-based Micro- and Nano-Processing IX" conference. The conference was held in San Francisco (USA) and focused on the development of different areas of laser technology. These include laser-based micro- and nanostructuring, direct laser writing and surface modifications.

Member of the scientific committee at the Laser Microprocessing Conference at ICALEO in Orlando, USA

The International Congress on Applications of Lasers & Electro-Optics (ICALEO®) has a 37-year history as a conference where researchers and end users meet to discuss the state of the art and future developments within laser materials processing, laser micro- and nano-processing. In October 2018 and 2019, Prof. Lasagni was a member of the scientific committee of the Laser Microprocessing Conference. The subject of the conference is the research of applications, processes and beam sources in laser material processing.

Topic-coordinator at the Werkstoffwoche 2019, Topic: Surface Engineering, in September 2019, Dresden

In September 2019 Prof. Lasagni coordinated the topic "Surface Engineering" at the "Werkstoffwoche 2019" congress (WW2019) in Dresden. With more than 1,500 participants, the congress is one of the largest German-speaking conferences in the field of materials science and materials engineering.

Topic Coordinator at MSE 2018, "Functional Materials, Surfaces and Devices" in September 2018 in Darmstadt, Germany

In September 2018 Prof. Lasagni coordinated the topic F: "Functional Materials, Surfaces and Devices" at the Material Science and Engineering Congress (MSE) in Darmstadt. He also supported the organization of the "Argentine-German" symposium of the congress together with Prof. Aldo Boccaccini, Dr. Fernando Lasagni, Dr. Flavio Soldera and Prof. Guillermo Requena.

Member of the scientific committee at the "Laser Precision Microfabrication" conference

In 2018 and 2019 Prof. Lasagni participated as a member of the committee at the "Laser Precision Microfabrication" conference (LPM). The theme of the conference was research into applications, processes and beam sources for laser materials micromachining and was held in Edinburgh (UK) in 2018 and Hiroshima (Japan) in 2019.

Member of the scientific committee at the "Lasers in Manufacturing (LiM 2019)" conference, in Munich, Germany

In June 2019, Prof. Lasagni attended the "Lasers in Manufacturing (LiM 2019)" conference as a member of the committee. The LiM focuses on the latest developments and future trends in the field of laser material processing. The conference topics are addressed to all who are interested in the potential of lasers in manufacturing, theory and application. In 2019 the conference was organized in cooperation with the "Association of Industrial Laser Users (AILU)", the "European Laser Institute (LIA)", the "Japan Laser Processing Society (JILPS)" and Swissphotonics.

6. Prizes and awards

Argentinean State Prize for Prof. Andrés F. Lasagni

Prof. Andrés Lasagni and his twin brother Dr.-Ing. Fernando Lasagni were awarded the "Domingo Faustino Sarmiento" prize by the Senate of the Argentine Nation for their outstanding achievements in the field of engineering sciences. The State Prize has already been awarded to the soccer player Diego Armando Maradona, the tennis player Juan Martín del Potro, the ballet dancer Julio Bocca and the tango composer Mariano Mores. Andrés Lasagni heads the Chair of Large Area Laser Based Surface Structuring at the TU Dresden and the Center for Advanced Micro Photonics (CAMP) at the Fraunhofer Institute for Material and Beam Technology IWS. He is one of the leading international experts in laser technology. His brother Fernando Lasagni is managing director of the Advanced Center for Aerospace Technologies (CATEC) in Seville (Spain).

Best poster award at the NISE 2019 conference for Stephan Milles

In June 2019 Stephan Milles together with Dr. Bogdan Voisiat and Prof. Andrés Lasagni received an award for the best poster at the International Conference on Nature Inspired Surface Engineering, in Hoboken NJ, USA.

The presented work describes the effect of laser produced microstructures on the wetting behavior of pure aluminum. For his active participation in the conference, Stephan Milles also received the Travel award from the Graduate Academy of the TU Dresden, endowed with 1,500 €.

DGM Young Talent Award 2018 for Dr. Florian Rößler

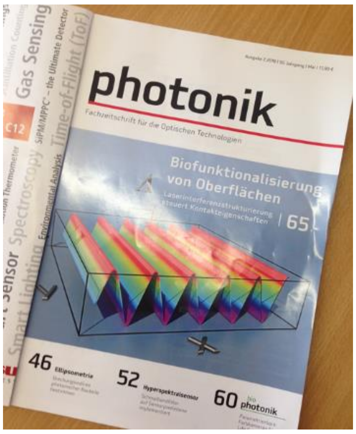
Florian Rößler was awarded the DGM Young Scientist Award 2018 for his dissertation "Fabrication and applications of complex micropatterned polymers using laser interference methods".

The thesis deals with manufacturing strategies for the production of hierarchical surfaces in photoresists and in polymer films and their application in the anti-bacterial field, as well as the light diffraction of multi-scale periodic surface structures as security features against product piracy. The Young Investigator Award is aimed at doctoral students from non-profit research in the field of materials science and materials engineering. Recipients of the award have a completed university degree and have demonstrated an outstanding performance based on his or her work results.

Cover page in "Photonik" Journal (2/2018)

The article "Bio functionalization using interference patterns" published by LMO was awarded with the title page of the international journal "Photonik".

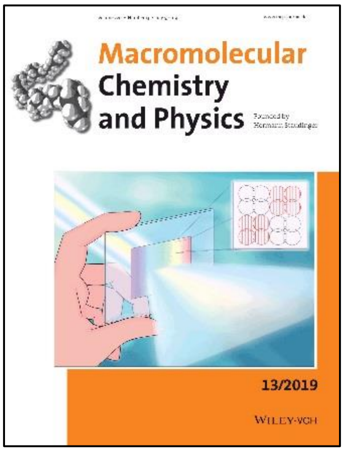
The article describes how new developments are possible by the production of tailor-made micro- and nanostructures with bio-functional effects. For this purpose, it was shown how Direct Laser Interference Patterning allows the versatile production of surface structures and increasingly profits from the progress in laser technology.



Cover page in “Macromolecular Chemistry and Physics“ (13/2019)

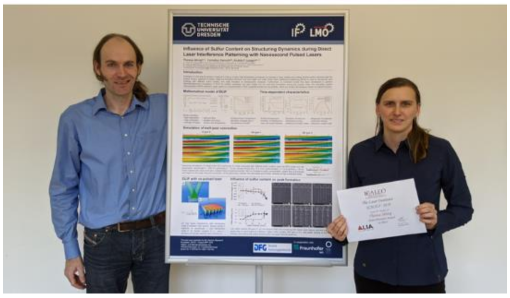
The article "How to Tailor Structural Colors for Extended Visibility and White Light Generation Employing Direct Laser Interference Patterning" published by CAMP, has been awarded the cover of the international journal "Macromolecular Chemistry and Physics".

The article describes an innovative microstructuring technique that makes it possible to change the optical properties of transparent or reflective materials in a way that white light is diffracted.



Best Poster at the ICALEO Conference 2019, USA

Theresa Jähnig and Cornelius Demuth, from CAMP (TU Dresden, Fraunhofer IWS), received the best poster award at the 38th International Congress on Applications of Lasers & Electro-Optics (ICALEO). For more than three decades, ICALEO has been one of the most important international conferences in the field of laser material processing.



7. International cooperation

Dr. Marcos Soldera, Instituto de Investigación y Desarrollo en Ingeniería de Procesos, Biotecnología y Energías Alternativas (PROBIEN, CONICET-UNCo), Argentina
Location: LMO, IF, TU Dresden
Duration: since 01/04/2018
Program: Alexander von Humboldt Foundation

Dr. Daniel Sola, Laboratorio de Óptica (LO·UM), Centro de Investigación en Óptica y Nanofísica (CIOyN), Spain
Location: LMO, IF, TU Dresden
Duration: since 01/04/2019
Program: Marie Skłodowska-Curie (LMO)

Prof. Dr. Bruno Henriques, Mechanical Engineering Department, Universidade Federal de Santa Catarina, Brazil
Location: LMO, IF, TU Dresden
Duration: since 15/11/2019
Program: Alexander von Humboldt Foundation

Franco Fortuna, Universidad Tecnológica Nacional de Córdoba, Argentina
Location: LMO, IF, TU Dresden
Duration: 18/10/2019 – 21/02/2020
Program: Combined Study and Practice Stays for Engineers from Developing Countries (KOSPIE-DAAD)

Valeria Chiara Marinelli, Universidad Tecnológica Nacional de Resistencia, Argentina
Location: LMO, IF, TU Dresden
Duration: 18/10/2019 – 21/02/2020
Program: Combined Study and Practice Stays for Engineers from Developing Countries (KOSPIE-DAAD)

8. Completed thesis

8.1 PhD theses

Florian Rößler (2018):

Fabrication and applications of complex micro-patterned polymers using laser interference methods

The production of multiscale surface structures with features in the micro- and nanometer range enables the design of materials with desired material properties. This complex geometries present advanced functions compared to single-scale patterns. In addition, they enable the combination of different functionalities such as optical, biological or tribological properties. This dissertation focuses on the development of new manufacturing strategies using laser interference techniques for the production of complex structures in polymers and the demonstration of new properties. Bacterial adhesion (S. epidermidis and E. coli) is investigated on single scale and hierarchical structures on photoresist SU-8 and polymer films made of polyimide. The resistance of the structures against mechanical damage is also considered. Furthermore, optical diffraction gratings with hierarchical structures on PET films are investigated in terms of production as well as their application as security feature elements. Finally, an innovative process for the production of periodic structures inside a two-layer polymer film of PC/PMMA is described to protect these structures effectively against mechanical damage.

Christoph Zwahr (2019):

Functionalization of titanium surfaces using laser ablation methods for improving dental implant

The surface topography and chemistry of titanium dental implants have a major influence on the healing process of an implant. In general, a moderate surface roughness between 1 and 2 µm, as well as hydrophilic wetting behavior, promotes osseointegration. Furthermore, the prevention of bacterial adhesion is crucial for the performance of an implant. Therefore, surface treatment of dental implants is considered one of the most important technologies for improving the performance of an implant in the human body. In addition to the required function, the implementation of a method must be also economically efficient, which means that the processing cost must be kept as low as possible. Therefore, Direct Laser Interference Patterning and Direct Laser Writing methods were used in this thesis. Different laser intensity modulations were used to create a wide variety of structural geometries. The morphology of the structures was controlled by different laser parameters. In addition to the surface topography, the surface chemistry was also changed. Finally, the applicability of Direct Laser Interference Patterning for the producing of low cost functionalized dental implants was demonstrated.

Valentin Lang (2019):

Development and Application of Industry-suitable Modular Solutions for Direct Laser Interference Patterning

Direct laser interference patterning aims to optimize surfaces for specific applications by functionalizing them with periodic micro- and sub-micro-structures. Key properties such as high processing rates, hardly any component or space restrictions, and the elimination of additional materials give the process an extraordinary cost-benefit potential for industrial applications. This work accompanies the development of optical assemblies and entire machine systems in the transfer of the potential of laser interference technology from scientific laboratories to industrial production. This includes the development of modular optical assemblies for flexible, industrial use as well as the construction of a prototype of a laser interference processing machine for surface refinement on two- and three-dimensional components. A major goal of the development work is to enable highest processing rates. This is achieved on the one hand by increasing the process speeds directly achievable with laser interference, and on the other hand by extending the process chain by developing methods for processing cylindrical printing tools for roll-to-roll processes.

8.2 Master thesis / Diploma works

Aleksander Madelung (2018): *Untersuchung laserinterferenzstrukturierter Metalllegierungen auf das Fügeverhalten in Kombination mit Reaktiven Multischichtsystemen*

Long Wang (2018): *Herstellung von Grating-Cell-Arrays zur gezielte Lichtbeugung mehrerer Wellenlängen*

Sebastian Storm (2018): *Entwickeln von Mikrostrukturierungsstrategien für dekorative Anwendungen durch Direkte Laserinterferenzstrukturierung*

Zhaochun Wang (2019): *Laserbasierte Texturierung von Titan-oberflächen zum erzielen Bakterienabweisender Eigenschaften*

Huaiyu Wang (2019): *Entwicklung einer Peeling-Funktionseinheit für die Herstellung von OLED-Displays*

Yu Han (2019): *Einfluss des Kathodenmaterials auf das Entladungsverhalten bei unterschiedlichen Grafitvarianten und Sonderwerkstoffen bei der gepulsten Laser-Arc-Verdampfung*

Florian Hundertmark (2019): *Untersuchungen von laserinterferenzstrukturierten Oberflächen hinsichtlich Benetzbarkeit und spektraler Response*

Frederic Schell (2019): *Untersuchung laserinterferenzstrukturierter Oberflächen hinsichtlich Benetzbarkeit mit Wasser und komplexen Substanzen*

Wei Wang (2019): Fabrication of hierarchical microstructures by means of direct laser interference patterning and nanoimprinting lithography

9. Publications

Peer-reviewed journals

1. M. El-Khoury, B. Voisiat, T. Kunze, A. F. Lasagni (2018): Utilizing Fundamental Beam-Mode Shaping Technique for Top-Hat Laser Intensities in Direct Laser Interference Patterning, Journal of Laser Micro/Nanoengineering, 13, 8, 267-272
2. T. Baselt, A. Kabardiadi-Virkovski, D. Ruf, B. Nelsen, A.F. Lasagni, P. Hartmann (2018): Supercontinuum based non-disruptive scattering analyses of mouse fibroblast L929 cells before and after necrosis, Journal of Biomedical Optics, 23, 12, 121619
3. D. Mikhaylov, T. Kiedrowski, A. F. Lasagni (2018): Heat Accumulation Effects during Ultrashort Pulse Laser Ablation with Spatially Shaped Beams, Journal of Laser Micro/Nanoengineering, 13, 2, 95-99
4. F. Rößler. A.F. Lasagni (2018): Fabrication of hierarchical surface pattern using direct laser interference patterning as protection against mechanical damage, Journal of Laser Micro/Nanoengineering, 13, 2, 68-75
5. J. Gebauer, M. Fischer, A. F. Lasagni, I. Kühnert, A. Klotzbach (2018): Laser structured surfaces for metal-plastic hybrid joined by injection molding, Journal of laser applications, 30, 032021
6. J.T. Cardoso, A.I. Aguilar-Morales, S. Alamri, D. Huerta-Murillo, F. Cordovilla, A.F. Lasagni, J.L. Ocaña (2018): Superhydrophobicity on hierarchical periodic surface structures fabricated via direct laser writing and direct laser interference patterning on an aluminium alloy, Optics and Lasers in Engineering 111, 193–200
7. T. Sperk, A. Mousavi, V. Lang, T. Kunze, A. Brosius, A. F. Lasagni (2018): High-speed Direct Laser Interference Patterning of sheet metals for friction reduction in deep drawing processes, Dry Met. Forming OAJFMT, 4 (2018) 62-67
8. S. Heilmann, C. Zwahr, A. Knape, J. Zschetzsche, A. F. Lasagni, U. Füssel (2018): Improvement of the electrical conductivity between electrode and sheet in spot welding process by Direct Laser Interference Patterning, Advanced Engineering Materials, 20, 6, 1700755
9. C. Zwahr, B. Voisiat, A. Welle, D. Günther, A.F. Lasagni (2018): One step fabrication of pillar and crater-like structures on titanium using Direct Laser Interference Patterning, Advanced Engineering Materials, 20, 7, 1800160
10. A.F. Lasagni, S. Alamri, A. I. Aguilar-Morales, F. Rößler, B. Voisiat, T. Kunze (2018): Biomimetic surface structuring using laser based interferometric methods, Applied Science, 2018, 8, 1260, 1-14
11. C. Goppold, F. Urlau, T. Pinder, P. Herwig, A. F. Lasagni (2018): Experimental investigation of cutting performance for different material compositions of Cr/Ni-steel with 1 µm laser radiation, Journal of Laser Applications, 30, 3, 031501
12. A.I. Aguilar-Morales, S. Alamri, T. Kunze, A. F. Lasagni (2018): Influence of processing parameters on surface texture homogeneity using Direct Laser Interference Patterning, Optics and Laser Technology, 107, 216–227
13. A. Mousavi, T. Sperk, T. Gietzelt, T. Kunze, A. F. Lasagni, A. Brosius (2018): Effect of Contact Area on Friction Force in Sheet Metal Forming Operations, Key Engineering Materials, 767, 77-84

14. F. Rößler, K. Günther, A. F. Lasagni (2018): In-volume structuring of polymer film using direct laser interference patterning, Applied Surface Science, 440, 1166-1171

15. S. Alamri, A. I. Aguilar-Morales, A. F. Lasagni (2018): Controlling the wettability of polycarbonate substrates by producing hierarchical structures using Direct Laser Interference Patterning, European Journal of Polymers, 99, 27–37

16. A. I. Aguilar-Morales, S. Alamri, A.F. Lasagni (2018): Micro-Fabrication of High Aspect Ratio Periodic Structures on Stainless Steel by Picosecond Direct Laser Interference Patterning, Journal of Materials Processing Technology, 252, 313–321

17. D. Fabris, A.F. Lasagni, M.C. Fredel, B. Henriques (2019): Direct Laser Interference Patterning of Bioceramics: A Short Review, Ceramics 2 (4), 578-586.

18. C. Zwahr, A. Welle, T. Weingärtner, C. Heinemann, B. Kruppke, N. Gulow, M. große Holthaus, A.F. Lasagni (2019): Ultrashort pulsed laser surface patterning of titanium to improve osseointegration of dental implants, Advanced Engineering Materials, 1900639.

19. T. Baselt, B. Nelsen, A.F. Lasagni, P. Hartmann (2019): Supercontinuum Generation in the Cladding Modes of an Endlessly Single-Mode Fiber, Applied Science, 9, 4428.

20. Y. Fu, M. Soldera, W. Wang, B. Voisiat, A.F. Lasagni (2019): Picosecond Laser Interference Patterning of Periodical Micro-Architectures on Metallic Molds for Hot Embossing, Materials, 12 (20), 3409.

21. S. Milles, M. Soldera, B. Voisiat, A.F. Lasagni (2019): Fabrication of superhydrophobic and ice-repellent surfaces on pure aluminium using single and multiscaled periodic textures, Scientific Reports, 9:13944.

22. A. I. Aguilar-Morales, S. Alamri, B. Voisiat, T. Kunze, A. F. Lasagni (2019): The Role of the Surface Nano-Roughness on the Wettability Performance of Microstructured Metallic Surface Using Direct Laser Interference Patterning, Materials, 12 (17), 2737.

23. C. Bischoff, F. Völklein, J. Schmitt, U. Rädel, U. Umhofer, E. Jäger, A. F. Lasagni (2019): Design and manufacturing method of fundamental beam mode shaper for adapted laser beam profile in laser material processing, Materials, 12 (14), 2254.

24. T. Stark, T. Kiedrowski, H. Marschall, A. F. Lasagni (2019): Avoiding starvation in tribocontact through active lubricant transport in laser textured surfaces, Lubricants, 7, 54, 1-18.

25. V. Vercillo, J.T. Cardoso, D. Huerta-Murillo, S. Tonnicchia, A. Laroche, J. A. Mayen Guillen, J. L. Ocaña, A. F. Lasagni, E. Bonaccurso (2019): Durability of superhydrophobic laser-treated metal surfaces under icing conditions, Materials Letters: X, 3 (2019) 100021.

26. A. Stellmacher, Y. Liu, M. Soldera, A. Rank, S. Reineke, A. F. Lasagni (2019): Fast and cost effective fabrication of microlens arrays for enhancing light out-coupling of organic light-emitting diodes, Materials Letters, 252, 268-271.

27. S. Storm, S. Alamri, M. Soldera, T. Kunze, A. F. Lasagni (2019): How to tailor structural colors for extended visibility and white light diffraction employing Direct Laser Interference Patterning, Macromolecular Chemistry and Physics, 1900205, 1-11.

28. B. Voisiat, W. Wang, M. Holzey, A. F. Lasagni (2019): Improving the homogeneity of diffraction based colors by fabricating periodic patterns with gradient spatial period using Direct Laser Interference Patterning method, Scientific Reports, 9, 7801.

29. R. Baumann, A. F. Lasagni, P. Herwig, A. Wetzig, C. Leyens, E. Beyer (2019): Efficient separation of battery materials using remote laser cutting-high output performance, contour flexibility, and cutting edge quality, Journal of Laser Applications, 31, 022210.

30. V. Lang, B. Voisiat, A. F. Lasagni (2019): High Throughput Direct Laser Interference Patterning of Aluminum for Fabrication of Super Hydrophobic Surfaces, Materials, 12, 1484.

31. V. Lang, B. Voisiat, T. Kunze, A.F. Lasagni (2019): Fabrication of High Aspect-Ratio Surface Micro Patterns on Stainless Steel using High-Speed Direct Laser Interference Patterning, Advanced Engineering Materials, 21, 1900151.

32. C. Zwahr, R. Helbig, C. Werner, A. F. Lasagni (2019): Fabrication of multifunctional titanium surfaces by producing hierarchical surface patterns using laser based ablation methods, Scientific Reports, 9:6721.

33. D. Mikhaylov, B. Zhou, T. Kiedrowski, R. Mikut, A.F. Lasagni (2019): High accuracy beam splitting using spatial light modulator combined with machine learning algorithms, Optics and Lasers in Engineering, 121, 227-235.

34. T. Stark, S. Alamri, A. Aguilar, T. Kiedrowski, A. F. Lasagni (2019): Positive effect of laser structured surfaces on tribological performance, Journal of Laser Micro/Nanoengineering, 14, 13-18.

35. S. Alamri, M. El-Khoury, A. Aguilar, T. Kunze, A. F. Lasagni (2019): Fabrication of inclined non-symmetrical periodic micro-structures using Direct Laser Interference Patterning, Scientific Reports, 9, 5455.

36. S. Alamri, F. Fraggelakis, T. Kunze, B. Krupop, G. Mincuzzi, R. Kling, A. F. Lasagni (2019): On the interplay of DLIP and LIPSS upon ultra-short laser pulse irradiation, Materials, 12, 1018; doi:10.3390/ma12071018

37. J. Ströbel, B. Voisiat, K. Du, A. F. Lasagni (2019): How to get deeper structures with the same energy: fabrication of periodic structures in stainless steel using Direct Laser Interference Patterning with burst mode ps-pulses, Materials Letters, 246, 121-124.

38. S. Teutoburg-Weiss, F. Sonntag, K. Günther, A. F. Lasagni (2019): Multiple method micromachining laser platform for fabricating anti-counterfeit elements with multiple-scaled features, Optics and Lasers in Engineering, 115, 465-476.

39. B. Voisiat, S. Alamri, A.F. Lasagni (2019): One-step fabrication of asymmetric saw-tooth-like surface structures on Stainless Steel using Direct Laser Interference Patterning, Materials Letters, 245, 183-187.

40. S. Milles, B. Voisiat, A.F. Lasagni (2019): Influence of roughness achieved by periodic structures on the wettability of aluminum using direct laser writing and direct laser interference patterning technology, Journal of Materials Processing Technology, 270, 142-151.

41. D. Sola, S. Alamri, A.F. Lasagni, P. Artal (2019): Fabrication and characterization of diffraction gratings in ophthalmic polymers by using UV Direct Laser Interference Patterning, Applied Surface Science, 476, 128-135.

42. B. Voisiat, C. Zwahr, A. F. Lasagni (2019): Growth of regular micro-pillar arrays on steel by polarization-controlled laser interference patterning, Applied Surface Science, 471, 1065-1071.

Proceedings and non-peer reviewed papers

1. A. F. Lasagni, V. Lang, A. Rank, B. Voisiat (2018): Micro-nano structuring of sleeves for roll-to-roll embossing processes using Direct Laser Interference Patterning, in Proceedings of 19th International Symposium on Laser Precision Microfabrication 2018 (UK), 1-5.

2. M. El-Khoury, B. Voisiat, T. Kunze, A. F. Lasagni (2018): Utilizing diffractive focus beam shaper for flat-top laser intensity generation for direct laser interference patterning, in Proceedings of 19th International Symposium on Laser Precision Microfabrication 2018 (UK), 1-5.

3. D. Mikhaylov, U. Graf, T. Kiedrowski, A. F. Lasagni (2018): High power, high pulse energy ultrashort pulse laser ablation of metals using spatially shaped beam profiles, in Proceedings of 19th International Symposium on Laser Precision Microfabrication 2018 (UK), 1-5.

4. T. Kunze, B. Krupop, S. Alamri, T. Steege, A. Aguilar-Morales, S. Trautewig, F. Rößler, A.F. Lasagni (2018): Enhancing surface functionalities by Direct Laser Interference Patterning - Basic principles, industrial approaches and structure lifetime, in Proceedings of 19th International Symposium on Laser Precision Microfabrication 2018 (UK), 1-4.

5. T. Stark, S. Alamri, A. Aguilar, T. Kiedrowski, A. F. Lasagni (2018): Positive effect of laser structured surfaces on tribological performance, in Proceedings of 19th International Symposium on Laser Precision Microfabrication 2018 (UK), 1-6.

6. S. Alamri, A. I. Aguilar-Morales, A. F. Lasagni, Advanced micro-structuring strategies on polymers using Direct Laser Interference Patterning, in Proceedings of 19th International Symposium on Laser Precision Microfabrication 2018 (UK), 1-6.

7. A.I. Aguilar-Morales, S. Alamri, A.F. Lasagni, Homogeneously distributed microstructures produced by Direct Laser Interference Patterning, in Proceedings of 19th International Symposium on Laser Precision Microfabrication 2018 (UK), 1-5.

8. F. Rößler. A.F. Lasagni (2018): Fabrication of hierarchical surface pattern using direct laser interference patterning as protection against mechanical damage, in Proceedings of 19th International Symposium on Laser Precision Microfabrication 2018 (UK), 1-8.

9. U. Klotzbach, V. Franke, T. Kunze, A.F. Lasagni (2018): Oberflächenmodifikation mit Hochgeschwindigkeits-Laserprozessen - Direktlaserinterferenz- / Direktlaser-Mikrostrukturieren: Systemverständnis eröffnet zukünftige Wege, in 6. ATZ-Fachtagung Tribologie, Reibungsminimierung im Antriebsstrang 2017, DOI:10.1007/978-3-658-23147-7-3

10. A.F. Lasagni, B. Voisiat, V. Lang, A. Rank, F. Rößler, K. Günther, D. Günther, C. Zwahr, B. Krupop, S. Alamri, T. Steege, A. Aguilar, T. Kunze (2018): Direct Laser Interference Patterning: new possibilities for surface functionalization at high throughputs, in proceedings of Procédés Laser pour L'industrie (JNPLI 2018), 39-44.

11. T. Kunze, C. Zwahr, A.F. Lasagni (2018): Biofunktionalisierung durch interferenzbasierte Mikrostrukturen, Photonik, 2, 65-67.

12. T. Baselt, F. Rudek, C. Richter, B. Nelsen, A. F. Lasagni, P. Hartmann (2018), Detection of structural changes based on Mie scattering analyses of mouse fibroblast L929 cells before and after apoptosis, Proc. of SPIE Vol. 10685, 106854D.

13. V. Lang, T. Hoffmann, A. F. Lasagni (2018): Optimization for high speed surface processing of metallic surfaces utilizing direct laser interference patterning, in Laser-based Micro- and Nanoprocessing XII, Proc. of SPIE Vol. 10520, 105200K-1-9.

14. A. Lasagni (2019): Vorwort, , DIALOG, 3 (ISSN 2193-3383), 1.

15. S. Milles, M. Soldera, B. Voisiat, M. Nitschke, R. Baumann, A. F. Lasagni (2019): Multifunktionale Aluminiumoberflächen durch laserinduzierte Verfahren, DIALOG, 3, (ISSN 2193-3383), 24-29.

16. T. Jähnig, A. Mousavi, M. Steinhorst, T. Roch, A. Brosius, A. F. Lasagni (2019): Friction reduction in dry forming by using tetrahedral amorphous carbon coatings and laser micro-structuring, Dry Metal Forming OAJ FMT, 5, 025-030.

17. T. Jähnig, T. Roch, A. F. Lasagni (2019): Development in dry metal forming - Structuring ta-C coated tools with Direct Laser Interference Patterning and ultra-short pulsed lasers to reduce friction and wear in Proceedings of ICALEO - the 38th International Congress on Applications of Lasers & Electro-Optics, Orlando, USA, 046

18. J. Czarske, B., A. F. Lasagni, N. Koukourakis (2019): Perspectives of Stimulated Brillouin Scattering for Biomedical Applications, in proceedings of ICO & IUPAP-C17 Topical Meeting on OPTIcs and Applications to SUstainable Development (OPTISUD), Tunis, Tunisia, 1-4.

19. A.F. Lasagni, B. Voisiat, T. Kunze, S. Alamri, C. Zwahr, M. El-Khoury, F. Rößler (2019): New possibilities for Direct Laser Interference Patterning: hierarchical, complex and non-symmetric textures for surface functionalization, in Proceedings of 8th International Congress on Laser Advanced Materials Processing, Hiroshima, Japan, 120340, 1-6.

20. S. Milles, B. Voisiat, A. F. Lasagni (2019): Hydrophobic structures formed on aluminum surface using direct laser writing and direct laser interference patterning technology, in Proceedings of 8th International Congress on Laser Advanced Materials Processing, Hiroshima, Japan, 120686, 1-6.

21. B. Voisiat, W. Wang, M. Holzey, A. F. Lasagni (2019): Investigation of structural colors formed on metal surface by direct laser interference patterning, in Proceedings of 8th International Congress on Laser Advanced Materials Processing, Hiroshima, Japan, 120313, 1-5.

22. F. Kuisat, T. Abraham, M. Weber, G. Bräuer, A.F. Lasagni (2019): Surface modification of forming tools for aluminum sheet metal forming, in Proceedings of 8th International Congress on Laser Advanced Materials Processing, Hiroshima, Japan, 120732, 1-6.

23. B. Voisiat, C. Zwahr, A. Welle, D. Günther, A. F. Lasagni (2019): Single step growth of pillar-like structures on steel and titanium using polarization-controlled Direct Laser Interference Patterning, in Proceedings of 8th International Congress on Laser Advanced Materials Processing, Hiroshima, Japan, 120682, 1-5.

24. B. Voisiat, S. Teutoburg-Weiss, A. Rank, A. Lasagni (2019): DLIP holographic structuring: from basic concept to advanced monitoring methods and industrial scale production, Proc. SPIE 10906, Laser-based Micro- and Nanoprocessing XIII, 109060W; doi: 10.1117/12.2506876

25. J. Gebauer, U. Klotzbach, A.F. Lasagni (2019): Functionalization of fiber-reinforced plastic based on laser micro structuring, in Proc. SPIE 10906, Laser-based Micro- and Nanoprocessing XIII, 109060C; doi:10.1117/12.2505114

26. S. Alamri, B. Krupop, T. Steege, A. Aguilar-Morales, V. Lang, S. Storm, F. Schell, C. Zwahr, C. Kracht, M. Bieda, B. Voisiat, U. Klotzbach, A. Lasagni, T. Kunze (2019): Quo Vadis surface functionalization: How direct laser interference patterning tackle productivity and flexibility in industrial applications, Proc. SPIE 10906, Laser-based Micro- and Nanoprocessing XIII, 109060S; doi: 10.1117/12.2514209

27. D. Mikhaylov, B. Zhou, T. Kiedrowski, R. Mikute, A. F. Lasagni (2019): Machine learning aided phase retrieval algorithm for beam splitting with an LCoS-SLM, in Proc. SPIE 10904, Laser Resonators, Microresonators and Beam Control XXI, 109041M; doi: 10.1117/12.2508673.

28. D. Mikhaylov, T. Kiedrowski, A. F. Lasagni (2019): Beam shaping using two spatial light modulators for ultrashort pulse laser ablation of metals, in Proc. of SPIE Vol. 10685, 106854D. Proc. SPIE 10906, Laser-based Micro- and Nanoprocessing XIII, 1090615; doi: 10.1117/12.2508682.

Presentations/Conference contributions

1. A. F. Lasagni: High throughput surface functionalization using direct laser interference patterning - new possibilities and challenges, 7th International Conference on Power Beam Processing Technologies (ICPBPT2018), October 2018, Nanjing, China (plenary talk)

2. A. F. Lasagni: Direct Laser Interference Patterning: past, challenges and new opportunities for laser textured surfaces, International Congress on Applications of Lasers & Electro-Optics, October 2018, Orlando, USA (plenary talk)

3. B. Voisiat, A. Rank, V. Lang, F. Rößler, A. F. Lasagni, Micro-nanostructuring of sleeves and in-line monitoring approaches for roll-to-roll hot embossing, 17th international Coating Symposium, October 2018 Dormagen, Germany (invited).

4. A. F. Lasagni: Direct Laser Interference Patterning: new possibilities for surface functionalization at high throughputs / Structuration de surface par interférences laser directes: potentialités pour la fonctionnalisation de surface à haute vitesse, Procedes Laser pour l'industrie, July 2018, Bordeaux, France (plenary talk).

5. A. Rank, B. Voisiat, V. Lang, F. Roßler A. F. Lasagni, Micro-nanostructuring of sleeves and in-line monitoring approaches for roll-to-roll hot embossing, 17th international Coating Symposium, October 2018, Dormagen, Germany.

6. A. Rank, B. Voisiat, V. Lang, F. Rößler A. F. Lasagni, Direct laser interferrence patterning for roll-to-roll processing, International Workshop on Advanced 3D Patterning - ad3pa, October 2018, Dresden, Germany.

7. S. Alamri, A. I. Aguilar-Morales, T. Kunze, A. F. Lasagni, Fabrication of inclined micro-structures using Direct Laser Interference Patterning, International School on Laser Micro/Nanostructuring and Surface Tribology, October 2018, Bari, Italy.

8. A. I. Aguilar-Morales, S. Alamri, T. Kunze, A. F. Lasagni, The hydrophobic character of nano features fabricated by picosecond Direct Laser Interference Patterning, International School on Laser Micro/Nanostructuring and Surface Tribology, October 2018, Bari, Italy.

9. A. Rank, B. Voisiat, A. F. Lasagni, Inline Monitoring System for High-Speed Roll-to-Roll hot embossing of micrometer and sub micrometer structures using seamless Direct Laser Interference Patterning treated Sleeves, 17th International Conference on Nanoimprint and Nanoprint NNT 2018; September 2018; Braga, Portugal.

10. M. Soldera, K. Taretto, J. Berger, A. F. Lasagni, Potential of photocurrent improvement in µc-Si:H solar cells using ZnO:B coated substrates structured by direct laser interference patterning, Materials Science & Engineering, September 2018, Darmstadt, Germany.

11. A.F. Lasagni, F. Rößler, S. Alamri: Last developments on Direct Laser Interference Patterning of Polymers with sub-micrometer resolution: strategies and applications, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

12. M. Soldera, A. Rank Y. Liu, K. Leo, V. Lang, A. F. Lasagni: Improving the efficiency of organic light-emitting diodes using textured polymer foils fabricated by R2R hot-embossing method, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

13. B. Krupop, J. Sablowski, G. Hegeholz, H. Nizard, D. Glöss, S. Unz, V. Bogdan, A.F. Lasagni, Surface functionalization of tubes to reduce fouling in heat exchangers, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

14. T. Sperk, A. Mousavi, V. Lang, T. Kunze, A. F. Lasagni, Surface functionalization of sheet metals for lubricant free deep drawing processes, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

15. T. Kunze, B. Krupop, S. Alamri, T. Steege, A. Aguilar, M. El-Khoury, S. Trautewig, F. Rößler, A. F. Lasagni, High speed surface functionalization employing Direct Laser Interference Patterning - Basic principles, industrial approaches and structure lifetime, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

16. B. Voisiat, M. Holzey, A. Rank, V. Lang, A. F. Lasagni, 4-beam Direct Laser Interference Patterning - a tool to draw colorful pictures without paint, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

17. T. Sperk, T. Kunze, S. Trautewig, A. F. Lasagni, Substitution of lubricants in forming processes: Structuring ta-C layers with Direct Laser Interference Patterning, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

18. B. Voisiat, A. Rank, V. Lang, A. F. Lasagni, Inline topography evaluation of microstructures formed by Direct Laser Interference Patterning, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

19. S. Milles, A.F. Lasagni, Fabrication of hydrophobic aluminium surfaces by using combined laser structuring technologies, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

20. A.F. Lasagni, E. Dalibón, G. Schierloh, A. Aguilar, S. Brühl: Laser texturing combined with plasma nitriding as a tool to control the tribological performance of steel components, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

21. L. Setten, D. Mintzer, F. Rößler, A. F. Lasagni, A. Canzian, E. Favret, Controlling adhesion of pathogen bacteria using laser textured surfaces, Materials Science & Engineering 2018 conference, September 2018, Darmstadt, Germany.

22. B. Voisiat, C. Zwahr, A. Rank, S. Alamri, A. F. Lasagni, Growth of regular micro-pillars arrays on steel by polarization-controlled laser interference patterning, 11th International Conference on Photo- Excited Processes and Applications - ICPEPA 11, 10-14 September 2018, Vilnius, Lithuania.

23. M. El-Khoury, T. Steege, A. I. Aguilar-Morales, S. Alamri, A. F. Lasagni, T. Kunze, How uniform is uniform - Characterization and Optimization of structures fabricated by Direct Laser Interference Patterning, 11th International Conference on Photo- Excited Processes and Applications - ICPEPA 11, 10-14 September 2018, Vilnius, Lithuania.

24. F. Rößler, B. Krupop, S. Alamri, Ch. Zwahr, K. Günther, B. Voisiat, T. Kunze, A. F. Lasagni, Individualized holographic product protection using Direct Laser Interference Patterning, 4th International Summer School on Trends in Ultra-precision optical surface engineering. Manufacturing methods and applications, 03-07 September 2018, Leipzig, Germany

25. S. Milles, A.F. Lasagni, Fabrication of large area superhydrophobic structures on aluminium using laser fabrication methods, 7th International Summer School Trends and new developments in Laser Technology 2018, August 2018, Dresden, Germany.

26. Y. Fu, A. Rank, B. Voisiat, A.F. Lasagni, Fabrication of laser textured imprint tools for hot-embossing processing, 7th International Summer School Trends and new developments in Laser Technology 2018, August 2018, Dresden, Germany.

27. S. Storm, S. Alamri, T. Kunze, A. F. Lasagni, Development of microstructuring strategies for decorative applications by direct laser interference patterning, 7th International Summer School Trends and new developments in Laser Technology 2018, August 2018, Dresden, Germany.

28. J. Ströbel, B. Voisat, A. F. Lasagni, Innovative and multifunctional system for homogeneous micrometer structures - MIAMI, 7th International Summer School Trends and new developments in Laser Technology 2018, August 2018, Dresden, Germany.

29. F. Kuisat, T. Abraham, T. Schmidt, A. F. Lasagni, Combination of DLIP structures and coatings for tribological investigations, 7th International Summer School Trends and new developments in Laser Technology 2018, August 2018, Dresden, Germany.

30. A. Mousavi, T. Sperk, T. Gietzelt, T. Kunze, A. F. Lasagni, A. Brosius, Effect on contact area on friction force in sheet metal forming operations, 8th International Conference on Tribology in Manufacturing Processes & Joining by Plastic Deformation, June (2018), Elsinore, Denmark.

31. M.K.L.N. Sikosana, R. Helbig, L.D. Renner, J.-M. Romano, A. Alamri, A. Aguilar, S.S. Dimov, A.F. Lasagni, C. Werner, The true antifouling capabilities of Laser processed surfaces, bioinspired by springtails and tested under realistic conditions, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).

32. T. Stark, S. Alamri, A. Aguilar, T. Kiedrowski, A. F. Lasagni, Positive effect of laser structured surfaces on tribological performance, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).

33. V. Vercillo, A. Laroche, J. A. Mayèn Guillèn, N. Karpen, R. De Andrade Jorge, A. F. Lasagni, E. Bonaccurso, Analysis and modelling of icing of engines' air intake protection grid structures and improvement of performances with surface laser patterning, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).

34. D. Mikhaylov, U. Graf, T. Kiedrowski, A. F. Lasagni, High power, high pulse energy ultrashort pulse laser ablation of metals using spatially shaped beam profiles, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).
35. A. F. Lasagni, V. Lang, A. Rank, B. Voisiat, Micro-nano structuring of sleeves for roll-to-roll embossing processes using Direct Laser Interference Patterning, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).
36. F. Rößler. A.F. Lasagni, Fabrication of hierarchical surface pattern using direct laser interference patterning as protection against mechanical damage, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).
37. T. Kunze, B. Krupop, S. Alamri, T. Steege, A. Aguilar-Morales, S. Trautewig, F. Rößler, A.F. Lasagni, Enhancing surface functionalities by Direct Laser Interference Patterning - Basic principles, industrial approaches and structure lifetime, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).
38. S. Alamri, A. I. Aguilar-Morales, B. Voisiat, A. F. Lasagni, Advanced micro-structuring strategies on polymers using Direct Laser Interference Patterning, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).
39. A.I. Aguilar-Morales, S. Alamri, A.F. Lasagni, Homogeneously distributed microstructures produced by Direct Laser Interference Patterning, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).
40. M. El-Khoury, B. Voisiat, T. Kunze, A. F. Lasagni, Utilizing diffractive focus beam shaper for flat-top laser intensity generation for direct laser interference patterning, 19th International Symposium on Laser Precision Microfabrication, June 2018, Edinburgh, Scotland (UK).
41. S. Milles, A. F. Lasagni, Fabrication of hydrophobic aluminium surfaces by using combined laser structuring technologies, EISAB Forum, Leibnitz IPF, March 2018, Dresden, Germany.
42. M. Soldera, K. Taretto, A. F. Lasagni, Modeling of next generation solar cells deposited on substrates structured by direct laser interference patterning, Network Meeting of the Alexander von Humboldt Foundation, April 2018, Regensburg, Germany.
43. T. Baselt, F. Rudek, C. Richter, B. Nelsen, A. F. Lasagni, P. Hartmann, Detection of structural changes based on Mie scattering analyses of mouse fibroblast L929 cells before and after apoptosis, SPIE Photonics Europe, April 2018, Strasburg, France.
44. B. Voisiat, A. Rank, F. Rößler, A.F. Lasagni (2018): High-Speed Roll-to-Roll Hot Embossing of Micrometer Structures Using Seamless Direct Laser Interference Patterning treated Sleeves for the Fabrication of Advanced Security Elements, NIL Industrial Day 2018, March 2018, Vienna, Austria.
45. M. El-Khoury, L. Reinert, M. Leidner, D. Britz, S. Thoss, T. Kunze, K. Trinh, A. F. Lasagni, F. Mücklich, Improving the contact performance of electrical connectors by DLIP, 10. Internationales Laser- und Fügesymposium, February 2018, Dresden, Germany.
46. T. Steege, S. Alamri, B. Krupop, U. Klotzbach, A. F. Lasagni, T. Kunze, Smart embedded systems for scanner-based direct laser interference patterning, 10. Internationales Laser- und Fügesymposium, February 2018, Dresden, Germany.

47. S. Alamri, A. I. Aguilar-Morales, U. Klotzbach, A. F. Lasagni, Control of Wettability in Polymers by Hierarchical Surface Structuring, 10. Internationales Laser- und Fügesymposium, February 2018, Dresden, Germany.

48. A. I. Aguilar-Morales, S. Alamri, U. Klotzbach, A. F. Lasagni, Mimicking natural superhydrophobic microstructures on Stainless Steel by Picosecond Direct Laser Interference Patterning, 10. Internationales Laser- und Fügesymposium, February 2018, Dresden, Germany.

49. T. Sperk, S. Trautewig, T. Kunze, A. F. Lasagni, How to substitue lubricants in forming processes: Structuring ta-C layers with Direct Laser Interference Patterning and ultra-short pulsed lasers, 10. Internationales Laser- und Fügesymposium, February 2018, Dresden, Germany.

50. T. Kunze, A. Lasagni, Tailored surface functionalization employing direct laser interference patterning - from small scales to big influences, 10. Internationales Laser- und Fügesymposium, February 2018, Dresden, Germany.

51. V. Lang, T. Hoffmann, A. F. Lasagni, Optimization for high speed surface processing of metallic surfaces utilizing direct laser interference patterning, SPIE Photonics West, February 2018, San Francisco, USA.

52. C. Zwahr, S. Heilmann, A. Knape, J. Zschetzsche, A. F. Lasagni, U. Füssel, Increasing the electrode lifetime in spot welding by Direct Laser Interference Patterning, EMRS spring meeting, June 2018, Strasbourg, France

53. T. Sperk, A. Mousavi, T. Roch, T. Kunze, A. Brosius, E. Beyer, A. F. Lasagni, Oberflächenfunktionalisierung von Tiefziehwerkzeugen und Halbzeugen zur Trockenumformung, 5. Zwischenkollogium, Schwerpunktprogramm 1676, January 2018, Braunschweig, Germany.

54. A.F. Lasagni: New challenges for high throughput surface structuring using direct laser interference patterning, 11. Mittweider Lasertagung, November 2019, Mittweida, Germany (plenary talk)

55. A.F. Lasagni: Laser processing strategies for high-throughput low cost production of surfaces, at EPIC Meeting on Surface Structuring, Laser World of Photonics, June 2019, Munich, Germany (invited).

56. A.F. Lasagni: Nuevos desafíos para la fabricación de superficies funcionales utilizando tecnologías laser, XIX Encuentro de superficies y materiales nanoestructurados (Nano 2019), June 2019, Buenos Aires, Argentina (plenary talk)

57. A.F. Lasagni: Functionalization of surfaces using laser based processes, DGM Expert Committee "Functionalisation of Surfaces by Micro- and Nano Patterning Techniques", April 2019, Vienna, Austria (invited).

58. A.F. Lasagni: Technologien in der Laserstrukturierung, Anwendungsbeispiele mit Bezug zur Tribologie, Tribologie, von der Grundlage bis zur Anwendung, April 2019, Schmalkalden, Germany (invited).

59. F. Rößler, A.F. Lasagni: Direct Laser Interference Patterning: how to make high precision surface structures with high precision optics?, EPIC Meeting on Precision and Freeform Optics, March 2019, Balgach, Switzerland (invited).

60. S. Alamri, B. Krupop, T. Steege, A. Aguilar-Morales, V. Lang, S. Storm, F. Schell, C. Zwahr, C. Kracht, M. Bieda, B. Voisiat, U. Klotzbach, A. Lasagni, T. Kunze: Quo Vadis surface functionalization: How direct laser interference patterning tackle productivity and flexibility in industrial applications, SPIE Photonics West, February 2019, San Francisco, USA (invited).

61. T. Jähnig, A. Mousavi, S. Topalski, T. Roch, A. Brosius, A. F. Lasagni, Makro- und Mikrostrukturierung von Tiefziehwerkzeugen zur Trockenumformung, Abschlusskolloquium SPP 1676, November 2019, Bremen, Germany.

62. T. Jähnig, C. Demuth, A. F. Lasagni, Influence of Sulfur Content on Structuring Dynamics during Direct Laser Interference Patterning with Nanosecond Pulsed Lasers, ICALEO - 38th International Congress on Applications of Lasers & Electro-Optics, Oktober 2019, Orlando, USA.

63. Marcos Soldera, Kurt Taretto, Andrés Fabián Lasagni, Optimización de la absorción de luz en celdas solares de películas delgadas estructuradas por interferencia laser directa, RCAA Annual Meeting, Argentinean Embassy in Germany, November 2019, Berlin, Germany.

64. Andrés Fabián Lasagni, Marcos Soldera, Bogdan Voisiat, Mikhael El-Khoury, Christoph Zwahr, Sabri Alamri, Alfredo Aguilar, Tim Kunze, RCAA Annual Meeting, Argentinean Embassy in Germany, November 2019, Berlin, Germany.

65. F. Mücklich, L. Reinert, A.F. Lasagni, Fascinating new surfaces by advanced Laser structuring? - Metallography and mechanical testing of periodic micro-patterned surfaces for reduced friction and contact resistance, MS&T19 conference, October, 2019, Portland, USA.

66. N. Schröder, V. Lang, T. Kunze, A.F. Lasagni: High-throughput laser processing using direct laser interference patterning, EPIC Meeting on High Power Laser Systems 2019, October 2019, Almelo, Netherlands

67. S. Teutoburg-Weiss, M. Soldera, B. Voisiat, A. F. Lasagni, Kontaktlose Diffraktionsmessung an mikrostrukturierten Oberflächen als Inline Monitoring Ansatz, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

68. S. Milles, B. Voisiat, A.F. Lasagni, Superhydrophobe und eisabweisende Mikrostrukturen auf Aluminium hergestellt durch direktes Laserschreiben und Direkte Laserinterferenzstrukturierung, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

69. M. Soldera, Y. Liu, A. Stellmacher, A. Rank, S. Reineke, A.F. Lasagni, Direct Laser Interference Patterning as a tool to structure stamps for hot embossing of polymers: application in organic light-emitting diodes, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

70. Y. Fu, M. Soldera, A. Rank, B. Voisiat, A.F. Lasagni, Picosecond laser interference patterning of periodical micro-architectures on metallic molds for hot embossing of polymers, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

71. B. Voisiat, M. El-Khoury, S. Milles, S. Alamri, T. Kunze, A.F. Lasagni, Properties and applications of periodical surface structures formed with 4 Beam Direct Laser Interference Patterning, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

72. J. Ströbel, B. Voisiat, K. Du, A.F. Lasagni, The effect of the laser burst mode on the morphology of textured surfaces using Direct Laser Interference Pattering, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

73. A. Lasagni, M.M. Soldera, B. Voisiat, M. El-Khoury, C. Zwahr, S. Alamri, A. Aguilar Morales, T. Kunze, Advanced Fabrication of Hierarchical Microstructured Topographies for Surface Functionalization using Laser based Fabrication Methods, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

74. F. Mücklich, L. Reinert, A. Lasagni, Flexible Funktionalisierung durch mikrostrukturierte Oberflächen - schnell, präzise und preiswert durch gepulste Laserinterferenz (DLIP), Werkstoffwoche WW2019, September 2019, Dresden, Germany.

75. Y. Fu, W. Wang, M. Soldera, S. Milles, B. Voisat, A. Rank, A.F. Lasagni, Microstructure imprint in polymers for tuning its surface wettability, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

76. S. Milles, B. Voisiat, A.F. Lasagni, Einfluss lasermikrostrukturierter Oberflächen auf das Benetzungsverhalten von Aluminium, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

77. F. Kuisat, T. Abraham, M. Weber, G. Bräuer, A.F. Lasagni, Oberflächenmodifizierung von Umformwerkzeugen für die Aluminiumblechumformung, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

78. F. Kuisat, F. Rößler, A.F. Lasagni, Komplexe Bearbeitung von 3D Oberflächen mittels direkter Laserinterferenzstrukturierung, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

79. J. Ströbel, B. Voisiat, K. Du, A.F. Lasagni, Direct laser interference pattering with square-shaped flattop laser beam, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

80. S. Teutoburg-Weiss, F. Sonntag, K. Günther, A.F. Lasagni, Mikrostrukturierungs-anlage für hierarchische Strukturen mit Merkmalen im Milli- bis Submikrometerbereich, Werkstoffwoche WW2019, September 2019, Dresden, Germany.

81. T. Baselt, B. Nelsen, A.-F. Lasagni und P. Hartmann, Supermode Supercontinuumerzeugung im Cladding einer PCF, 13. Auswärtsseminar der AG Optische Technologien, September 2019, Schilbach, Germany.

82. J. Czarske, B. Krug, A. F. Lasagni, N. Koukourakis (2019): Perspectives of Stimulated Brillouin Scattering for Biomedical Applications, ICO & IUPAP-C17 Topical Meeting on OPTIcs and Applications to SUstainable Development (OPTISUD), University of Carthage - Engineering School of Communications of Tunis, September 2019, Tunisia.

83. J. Czarske, B. Krug, A.F. Lasagni, N. Koukourakis, Latest developments in Confocal Brillouin Microscopy and endoscopy, 3rd BioBrillouin Meeting, September 2019, Porto, Portugal.

84. A.F. Lasagni, Laser Precision microfabrication, DocMASE Summer School, September 2019, Saabrücken, Germany.

85. F. Bouchard, M. Bieda, A. F. Lasagni, 3D-printing of microfluidic systems using two-photon polymerization, 8th International Summer School, August 2019, Dresden, Germany.

86. S. Teutoburg-Weiss, B. Voisiat, A. F. Lasagni, Reflective diffraction order analysis of surfaces with periodic microstructures, 8th International Summer School "Trends and new developments in Laser Technology 2019", August 2019, Dresden, Germany.

87. A. Madelung, S. Alamri, A. Lasagni, T. Kunze, Scanner based Direct Laser Interference Patterning for 2D and 3D surfaces, , 8th International Summer School "Trends and new developments in Laser Technology 2019", August 2019, Dresden, Germany.
88. P. A. Sürmann, S. Alamri, A. F. Lasagni, T. Kunze, Direct Laser Interference Patterning of transparent materials through backside dry etching, 8th International Summer School "Trends and new developments in Laser Technology 2019", August 2019, Dresden, Germany.
89. M. El-Khoury, B. Voisiat, S. Alamri, T. Kunze, A. F. Lasagni, Fabrication of complex textured surface using multi-pulse direct laser interference patterning with ns pulses, Ultra-short Pulse Lasers Applications in Material Processing (UPLAMP), July 2019, Vilnius, Lithuania.
90. P. A. Sürmann, S. Alamri, A. F. Lasagni, T. Kunze, Direct Laser Interference Patterning of transparent materials through backside dry etching, APPOLO Summer School on Ultra-short Pulse Lasers Applications in Material Processing, July 2019, Vilnius, Lithuania.
91. S. Alamri, F. Schell, T. Steege, A. F. Lasagni, T. Kunze, Increasing heat transfer of metals through periodic microstructures using Direct Laser Interference Patterning, Lasers in Manufacturing (LiM), June 2019, Munich, Germany.
92. S.Milles, B. Voisiat, M. Soldera, A.F. Lasagni, Superhydrophobic and anti-icing micro-structures on aluminium utilizing direct laser writing and direct laser interference patterning, International Conference on Nature Inspired Surface Engineering (NISE), June 2019, Hoboken, USA.
93. S.Milles, B. Voisiat, A.F. Lasagni, Effect of laser fabricated micro-structures on the wetting of pure aluminium, International Conference on Nature Inspired Surface Engineering (NISE), June 2019, Hoboken, USA.
94. M. Soldera, Y. Liu, A. Stellmacher, A. Rank, Q. Wang, V. Lang, A. Abate, S. Reineke, A. F. Lasagni, Estructuración Superficial de Polímeros Transparentes con Alta Productividad para Aplicaciones en Dispositivos Optolectrónicos, XIX Encuentro de Superficies y Materiales Nanoestructurados, June 2019, Buenos Aires, Argentina.
95. A.F. Lasagni, B. Voisiat, T. Kunze, S. Alamri, C. Zwahr, M. El-Khoury, F. Rößler, New possibilities for Direct Laser Interference Patterning: hierarchical, complex and non-symmetric textures for surface functionalization, 8th International Congress on Laser Advanced Materials Processing, May 2019, Hiroshima, Japan.
96. U. Klotzbach, V. Franke, T. Kunze, F. Sonntag, A. Lasagni, C. Leyens, Direct laser writing and firect laser interference patterning for surface modification in automotive, photoviltaic and life science, 8th International Congress on Laser Advanced Materials Processing, May 2019, Hiroshima, Japan.
97. S. Milles, B. Voisiat, A. F. Lasagni, Hydrophobic structures formed on aluminum surface using direct laser writing and direct laser interference patterning technology, 8th International Congress on Laser Advanced Materials Processing, May 2019, Hiroshima, Japan.
98. B. Voisiat, W. Wang, M. Holzey, A. F. Lasagni, Investigation of structural colors formed on metal surface by direct laser interference patterning, 8th International Congress on Laser Advanced Materials Processing, May 2019, Hiroshima, Japan.

99. F. Kuisat, T. Abraham, M. Weber, G. Bräuer, A.F. Lasagni, Surface modification of forming tools for aluminum sheet metal forming, 8th International Congress on Laser Advanced Materials Processing, May 2019, Hiroshima, Japan.

100. B. Voisiat, C. Zwahr, A. Welle, D. Günther, A. F. Lasagni, Single step growth of pillar-like structures on steel and titanium using polarization-controlled Direct Laser Interference Patterning, 8th International Congress on Laser Advanced Materials Processing, May 2019, Hiroshima, Japan.

101. T. Jähnig, A. F. Lasagni, Structuring ta-C coated tools with Direct Laser Interference Patterning and ultra-short pulsed lasers to reduce friction and wear in dry metal forming, 3rd YTRS, May 2019, Wiener Neustadt, Austria.

102. B. Voisiat, S. Teutoburg-Weiss, A. Rank, W. Wang, A.F. Lasagni, DLIP holographic structuring: from basic concept to advanced monitoring methods and industrial scale production SPIE Photonics West, February 2019, San Francisco, USA.

103. J. Gebauer, V. Franke, U. Klotzbach, A.F. Lasagni, Potentials of quasi-cold laser processing of fiber reinforced plastic, SPIE Photonics West, February 2019, San Francisco, USA.

104. A. Rank, V. Lang, B. Voisiat, A.F. Lasagni, Roll-to-roll hot embossing process: A way to scale up the fabrication speed of micro-nano structures formed by direct laser interference patterning SPIE Photonics West, February 2019, San Francisco, USA.

105. T. Kunze, S. Alamri, A. I. Aguilar Morales, T. Steege, B. Krupop, A.F. Lasagni, B. Voisiat, A. Rank, Quo Vadis surface functionalization: How direct laser interference patterning tackle productivity and flexibility in industrial applications, SPIE Photonics West, February 2019, San Francisco, USA.

106. D. Mikhaylov, B. Zhou, T. Kiedrowski, R. Mikute, A. F. Lasagni, Machine learning aided phase retrieval algorithm for beam splitting with an LCoS-SLM, SPIE Photonics West, February 2019, San Francisco, USA.

107. D. Mikhaylov, T. Kiedrowski, A. F. Lasagni, Beam shaping using two spatial light modulators for ultrashort pulse laser ablation of metals, SPIE Photonics West, February 2019, San Francisco, USA.

108. V. Vercillo, S. Tonnicchia, A. F. Lasagni, E. Bonaccurso, Laser micro-/nano-structuring to produce icephobic surfaces, Invited speaker, Workshop YMSE 2019 - Young Materials & Surface Engineers, May 2019, Rome, Italy (invited).

109. V. Vercillo, S. Tonnicchia, A. Laroche, A. F. Lasagni, E. Bonaccurso, Laser pulsed laser micro-/nano-structuring of surfaces for icephobic applications, Heraeus-seminar on wetting on soft or microstructured surfaces, April 2019, Bad Honnef, Germany.

110. J. Gebauer, V. Franke, U. Klotzbach, A.F. Lasagni: Potentials of quasi-cold laser processing of fiber reinforced plastic, in Laser-based Micro- and Nanoprocessing XII, SPIE Photonics West, February 2019, San Francisco, USA (invited).

Book contributions

1. A.F. Lasagni, S. Alamri, F. Rößler, V. Lang, B. Voisiat (2019): Design of Perfectly Ordered Periodic Structures on Polymers Using Direct Laser Interference Patterning, in Wrinkled

Polymer Surfaces (Chapter 7), (eds. Rodriguez-Hernandez, Henríquez), ISBN 978-3-030-05123-5

Patents and patent applications

1. A.F. Lasagni, B. Voisiat, Verfahren zur Herstellung einer strukturierten Oberfläche auf einem Gegenstand, Submission date: 12.09.2019, EP000003626476A1
2. S. Alamri, M. El-Khoury, T. Kunze, A.F. Lasagni, B. Voisiat, Optische Anordnung zur direkten Laserinterferenzstrukturierung, Submission date: 20.11.2018, WO002019134769A1
3. A.F. Lasagni, B. Voisiat, Verfahren zur Herstellung einer strukturierten Oberfläche auf einem Gegenstand, Submission date: 24.09.2018, DE102018216221A1
4. S. Alamri, M. El-Khoury, T. Kunze, A.F. Lasagni, B. Voisiat, Laseroptische Anordnung zur Laserinterferenzbearbeitung, insbesondere Laserstrukturierung von Oberflächen, Submission date: 12.09.2018, EP000003466598A1
5. T. Kunze, A.F. Lasagni, Optische Anordnung zur Laserinterferenzstrukturierung einer Probe, Submission date: 28.03.2018, WO002018184934A1
6. S. Alamri, M. El-Khoury, T. Kunze, A.F. Lasagni, B. Voisiat, Optische Anordnung zur direkten Laserinterferenzstrukturierung, Submission date: 03.01.2018, DE102018200036B3
7. S. Alamri, M. El-Khoury, T. Kunze, A.F. Lasagni, B. Voisiat, Optische Anordnung zur Ausbildung von Strukturelementen mit schräg geneigten Oberflächen Submission date: 03.01.2018, DE102018200037A1

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