Swiss Laser Microprocessing Solutions

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Maschineningenieurstudium an der HTL Brugg-Windisch. Einige Jahre als Projektleiter in der Maschinenindustrie. Technischer Leiter und Mitglied der Geschäftsleitung in einer mittelgrossen Unternehmung.
Seit 1996 an der Fachhochschule Nordwestschweiz, Dozent und Teamleiter des Kompetenzbereiches 3D-Laser Mikromaterialbearbeitung am Institut für Produkt- und Produktionsengineering

Welcome

Prof. Dr. Patrik Hoffmann

Head Laboratory Advanced Materials Processing of Empa Thun BE
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Adjunct Professor at LPMAT, Swiss Federal Institute of Technology Lausanne, EPFL
Laboratory Head of Advanced Materials Processing, Empa, Swiss Federal Laboratories for Materials Science and Technology, Thun.
Chemistry studies at University of Karlsruhe, PhD thesis at EPFL in 1992. Industrial experience at IBM San Jose (USA) and manager of dental section in company (Germany). Since 1997 research and teaching Laser Micro-Processing at EPFL. Since April 2009 heading LAMP at Empa, continuing teaching at EPFL. Author of 111 peer reviewed journal papers and inventor of 6 patents.

Chair Session 1: **Laser Micromachining Applications**

Dr. Andres Oehler

Head of Applications bei Time-Bandwidth Products AG
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since 2012	Time-Bandwidth Products AG, Zurich, Switzerland. Head of Applications
since 2006	Time-Bandwidth Products AG, Zurich, Switzerland. Project manager laser R&D
2006-2010	ETH Zurich, Physics departement Physik, Ultrafast Laser-Physics. Ph.D. Student / postdoctoral research fellow
2000-2005	TRUMPF Laser Marking Systems AG, Grüsch, Switzerland. R&D engineer optics
1999-2000	TRUMPF Lasertechnik GmbH, Ditzingen, Germany. R&D engineer

Ultrafast beam deflection for efficient picosecond laser processing

Emerging industrial applications require picosecond lasers with high average power to increase productivity. While such lasers are readily available, transferring their benefits into industrial processes is challenging - mainly due to the limited performance of available beam delivery. Here we discuss requirements for beam delivery systems and focus on a polygon-scanner to discuss its performance, current technical issues and obtained results.

Dr. Mark Richmond

Product Manager, JK Lasers, part of the GSI Group
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After receiving a DPhil from the University of Oxford in 1985 for research into VUV lasers, he has approaching 30 years' experience in laser developments for defence and industrial applications covering a broad range of laser types and power levels. His focus now is on promoting the advantages of Fiber Laser technology into industrial manufacturing processes.

Smart Fiber Lasers for Micro Machining
This presentation will look at the user benefits possible for the next generation of Fiber Laser based materials processing systems by tightly integrating sensors associated with the laser into the system level control system, aiming to ensure higher throughput and better process control at reduced system cost. These are being looked at as *Smart* Laser features.

Dr. Thomas Bewer

Head of Advanced Development, TRUMPF Maschinen AG, Baar ZG
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Mr. Bewer is responsible for the TRUMPF Laser application centre in Switzerland, located in Baar (ZG). He did his PHD in Mechanical engineering in the field of process development for fuel cells. Since 2011 he is working on the process development with ultrashort pulse lasers.

Laser Micro Machining in the Watch Industry
Ultrashort pulse lasers are an established tool in the production of consumer electronic products, of flat panel displays and photovoltaic cells. With their versatility regarding choice of material they offer broad possibilities for the watch industry. In this talk the possibilities, the current status and obstacles are discussed using descriptive examples from the lab.

Prof. em. Dr. René Salathé

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René Paul Salathé is Professor em. at EPFL since 2009. He is currently a technology consultant for several companies and he serves as an expert member of the Life Science team at the Swiss Innovation Agency (KTI/CTI) in Bern, on the scientific advisory board of the *Fraunhofer-Institut für Lasertechnik ILT* in Aachen, and he participates on expert panels for the *Deutsche Forschungsgemeinschaft*. He is a member of the Swiss Society for Optics and Microscopy, the European Optical Society, the Optical Society of America, a senior member of the IEEE, and a life time member of the Swiss Physical Society.
He received the MS, PhD, and Habilitation degrees at the Uni of Bern in 1970, 1974, and 1979, respectively. Prior to his appointment at EPFL in 1989, he was directing the division *Material Testing and Technology* at the research and development center of the Swiss PTT. He has been active in the fields of semiconductor lasers, fibers, integrated optics, laser processing, and biomedical optics. The results of his research activities have been published more than 250 scientific contributions and 37 PhD theses at EPFL. Several start-up companies have been founded based on patents elaborated in his laboratory and/or by his PhD students. His actual research interests are in the areas of laser tweezers in micro-fluidics for biochemical applications and in optical fiber sensor applications.

Chair Session 2: **Surface Structuring, Polishing, and Laser sintering**

Ingo Ross

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Sept. 19, 1985	Born in Cologne, Germany
1992-2005	School education in Brauweiler, Germany
2005-2011	Study of Mechanical Engineering at RWTH Aachen University
Apr. - Sept. 2009	Student trainee at the Fraunhofer Center for Manufacturing Innovation CMI, Boston, MA
Nov. 2009 - Feb.2010	Student trainee at MTU Aero Engines, Munich
since Jan. 2012	Research associate at the Fraunhofer ILT, Aachen D

Prospects of Laser Polishing for Small and Complex Shaped Parts
Laser polishing is a new contactless manufacturing process for the finish of parts made out of metal, thermoplastic or glass. The key advantages of the process are its capability for automation, processing speed, shape retention and the chemically clean surfaces. This makes laser polishing a highly attractive alternative to the conventional, abrasive processes – especially for small and complex shaped parts.

Dr. Gabriel Dumitru

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Dr. Dumitru a rejoint Blösch SA en 2009 afin d'approfondir la R&D dans le domaine du laser et depuis 2011 il est responsable de la division Composants pour l'Industrie Horlogère, qui regroupe divers procédés d'usinage et traitements galvaniques : l'ablation laser, l'électro-érosion, le moulage des plastiques, l'électro-formage, le dérhodiage etc.
Auparavant engagé auprès de ETH Zürich, de la FHNW et de l'Uni Berne, Dr. Dumitru a acquis une expérience certaine dans l'usinage laser pulsé, en publiant plus de 50 articles scientifiques. Il a passé sa thèse en 2002 à Berne sur la structuration laser des surfaces tribogiques revêtues.

La structuration laser du saphir : applications et défis
Après avoir brièvement discuté le matériel saphir et sa fabrication, la conférence se consacre à la réponse de cette matière au faisceau laser pulsé.
La structuration profonde (gravage) et celle superficielle (matage) seront discutées en images, aussi comme la possibilité d'associer une métallisation PVD avec une structuration laser, tout ça portant sur la métallisation mate.
Pour terminer, l'impact des différents seuils d'ablation laser sera exemplifié avec l'ablation sélective des revêtements décoratifs ou fonctionnels.

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Mask Projection Surface Structuring
Surface structuring of polymer sheets by deep UV light mask projection ablation results in precise surface topographies.
We are developing on both industrial and academic level 3D Microstructures for various applications, such as anti bio-fouling, drag reduction for transport industry, LED-edge-lit lighting, OLED out-coupling films, flexible electronics, flexible organic illuminator, Diffractive Optical Elements (DOE), and more.
The technology pushes the limits of 2.5 D processing to extremes: super high resolution with 2µm line width and 15µm depth, arbitrary curvature 3D microstructures with 20nm rms surface roughness, depth definition below 100nm, lateral resolution below 2µm. All these specifications can be achieved on up to 3m^2 large substrates.
In general a master polymer substrate is ablated, then replicated to Ni shim enabling to produce cost efficient kilometer long smart foils using roll-to-roll embossing.

David Fletcher

European Product Manager, Cooksongold part of the Heimerle + Meule Group, Birmingham UK
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David Fletcher has worked at Cooksongold part of the Heimerle + Meule Group for 25 years and is their European product manager for Direct Metal Laser Sintering in precious metals and precious metal coin blank supply to Mints worldwide. He is a Lean Six Sigma Green Belt. Cooksongold has partnered with Electro Optical Systems (EOS) to launch Laser Sintering Technology in the jewellery and watch industries.

Progress in Direct Metal Laser Sintering for Jewellery & Watch Industry
One of the major challenges to successful implementation of Direct Metal Laser Sintering (DMLS), or any additive manufacturing (AM) process, is design and preparation of computer models. This presentation will explore a vision to use eManufacturing techniques to develop automated design tools to use with DMLS technology. These automated tools can be used to minimize part weight and optimize part design to take full advantage of direct manufacturing processes and produce quality parts that are otherwise unattainable with conventional manufacturing techniques.

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