Swiss Laser Microprocessing Solutions

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Prof. Dr. Beat Neuenschwander

Bern University of Applied Sciences Engineering and Information Technology
Institute for Applied Laser, Photonics and Surface Technologies ALPS, Burgdorf BE
beat.neuenschwander@bfh.ch | www.ti.bfh.ch/laserlab

Dr. Beat Neuenschwander studied physics at the University of Bern and realized 1996 his PhD at the Institute of Applied Physics in the field of diode pumped solid state lasers. Since 2000 he is at the Bern University of Applied Sciences where he built up the laboratory for laser micro machining and the laser surface engineering group. The group activities are focused onto direct and assisted micro material processing with ns and ps laser pulses. Dr. Beat Neuenschwander lectures physics and applied laser technology. He is expert for the Suiss Commission for Technology and Innovation CTI.

Introduction et moderation

Le laser â impulsions ultra-courtes utilisées dans le micro-usinage un mythe, une technologie de la prochaine génération ou déjà une réalité ?

L'intérêt d'utiliser des lasers à impulsions ultra-courtes dans la production a significativement augmenté ces deux dernières années grâce aux spectaculaires résultats obtenus par l'industrie et les instituts de recherche. Néanmoins de nombreuses questions restent encore ouvertes pour l'utilisateur potentiel : quelles sont les limites de cette technologie ? Est-elle prête pour l'industrie ? Quels avantages compétitifs peut-elle apporter à mes produits sur le marché ? Quelles nouvelles chances peut-elle m'offrir ? Cette technologie est-elle compétitive par rapport aux technologies standards ?
La Suisse compte de nombreuses entreprises, spécialisées dans le domaine des lasers à impulsions ultra-courtes, qui sont disponibles pour donner des réponses. Par ailleurs les laboratoires de recherche et développement des universités et des instituts de recherche sont prêtes à soutenir l'industrie dans le lancement de cette nouvelle technologie. Dans ce but, les plus grandes institutions dans ce domaine ont créé le *Swiss National Application Laboratory for Photonic tools and Photonic manufacturing* SNAPP (www.swissphotonics.net/swiss_national_photonics_labs.html) comme interlocuteur unique des industries.

Ultra-short laser pulses in micro-processing: Myth, a next generation technology or already reality?

The interest in the deployment of ultra-short laser pulses as a production technology was boosted in the last two years by showcasing results from institutes and industries. But there exist still many open questions for the end-user as e.g. what are the limits of this technology? Is it really ready for industry? Which competitive advantage does it give to my products and which new chances will be offered to me? Is it commercially competitive compared to standard technologies? Switzerland has quite a lot of specialized companies dealing with this technology and is ready to answer specific questions. In addition, applied research and development laboratories at universities and institutes are ready to support the industry in the introduction of this new technology. To efficiently serve the needs of the industry, Swiss leading houses have formed the *Swiss National Application Laboratory for Photonic tools and Photonic manufacturing* SNAPP to offer a single contact to answer the demands from industry.

Céline Bansal

Oxford Lasers, Oxfordshire, UK
celine.bansal@oxfordlasers.com | www.oxfordlasers.com

With a double Master's degree in *Trade and International Business management* from Lille University (France) and in *European management Strategy* from Staffordshire University (UK), Céline Bansal started her career in the IT industry as an International Business Development Manager at Wolfram Research (Mathematica Software) and then joined Oxford Lasers in January 2010 taking charge of the European market for the sales of micro machining subcontract.

Laser Micromachining of Bulk Substrates and Thin Films

Oxford Lasers have extensive experience in laser micro machining of a wide variety of materials from metals and ceramics through to polymers and glasses. We will present the principles of Laser Micromachining and the importance of various parameters, with emphasis given to the differences between laser ablation of bulk materials and to that of thin films. This will look at the essential differences between different wavelength and pulse length lasers namely nanosecond and picosecond or femtosecond. Examples and applications will be presented showing the nature of these differences.

Thorsten Kramer

CTO Swiss Micro Laser GmbH, Stallikon ZH
t.kramer@swissmicrolaser.ch | www.swissmicrolaser.ch

Ausbildung Diplom-Physiker (1998)
RWTH Aachen (Rheinisch-Westfälische Technische Hochschule Aachen)
Erfahrung Wissenschaftlicher Mitarbeiter (1999 –2003)
Fraunhofer-Institut für Lasertechnik ILT (Steinbachstrasse 15, D-52074 Aachen) *Mikrotechnik, Aufbau- und Verbindungstechnik*
Projektleiter (2004 –2007)
Robert Bosch GmbH (Robert-Bosch-Straße 1, D-91522 Ansbach) *Lasertechnik*
Leiter Lasertechnik (2007 –20012)
ETA SA Manufacture Horlogère Suisse (Schild-Rust-Strasse 17, CH-2540 Grenchen)
Neue Technologien, Innovation

Ultrafast Laser Micro Processing in practice

Ultrafast laser sources are successfully used in production for several years, even if the current application areas are still limited due to high investment and personnel costs as well as low cycle times. In addition to the general challenges of contract manufacturing as short lead times, efficient capacity planning, high flexibility of the systems and effective definition of a unique selling point, it is necessary to cope with process and machine-specific challenges.

Dr. Karl Böhlen

Crealas GmbH, Smart Micromachining, Thun BE
karl.boehlen@crealas.com | www.crealas.com

Dr. Karl Lukas Böhlen born in Riggisberg, Switzerland, has a BSc in Micro-Engineering.
2001-2006 Senior Development Engineer at Exitech Ltd, UK. He defined many innovative processes for applications, ranging from ink jet printer nozzles to polymer displays. His R&D activity resulted in many publications and two patents in the field of laser micromachining.

High Speed Micro-Machining with Nano-Precision!

Crealas is using Excimerlasers for direct machining of structures with nanometer resolution in depth and few micrometer lateral. We can produce optical structures e.g. Diffractive Optical Elements with unprecedented fast writing times and step height resolution of less than 40 nm. We will also present other optical and decorative elements very appealing for watch and other industries.

Josef Stirnimann

Dipl. Masch. Ing. ETH, Leiter Mikro-Fertigung, Inspire AG, Zürich
stirnimann@inspire.ethz.ch | www.inspire.ethz.ch

Josef Stirnimann get his master degree in mechanical engineering at the ETH Zurich in 1982 and he has been working for over 30 years in the fields of sensor, measuring and laser technique in swiss companies. At 2008 he joined Inspire AG, where he is the head of the micro processing research group, where laser, EDM and chipping processes are investigated.

Conditioning of hard tools by ultra short pulsed lasers

Machining of high strength steel, hardened material or fiber reinforced plastics requires abrasion resistant tools with a high hardness. The conditioning of these tools is very time and cost consuming when it is done by diamond grinding tools. In the presentation some laser based methods are shown how diamond-, PCD- or CBN-tools can be conditioned by ultra short laser processes.

David Naman

Technical Director, Class 4 Laser Professionals AG, Burgdorf BE
david.naman@class4laser.ch | www.class4laser.ch

2001 à 2012
Ingénieur d'essai au laboratoire d'application chez Lasag AG, fabricant de système laser YAG pulsé
Depuis Octobre 2011
Directeur Technique et co-fondateur de la société Class 4 Laser Professionals AG
Responsable de la Division Sous-traitance et développement technologique
Spécialiste en usinage laser (découpe, soudage et perçage, …)
Responsable du parc machine équipé de lasers à fibre, lasers pompé par lampe et laser à impulsions ultra-courtes fs et ps

Solving challanging applications with laser micro processing

La Société *Class 4 Laser Professionals AG* est une Start-up fondée en 2011 dans le domaine du micro-usinage laser.
Nous développons des procédés de découpe, soudage, perçage (industrie médicale, horlogerie, ...), travaillons cristaux et céramiques avec la plus haute précision (industrie électronique, outillages , …), réparons par soudage les superalliages bases cobalt et nickel ainsi que les aciers trempés (>60 Hrc). Pour ce faire, nous utilisons tous types de lasers pulsés (ms, ns, pico- et femto- seconde)

Dr. Arnd Szelagowski

Leiter F&E, Trumpf Maschinen AG, Baar ZG
arnd.szelagowski@ch.trumpf.com | www.ch.trumpf.com

Dr. Arnd Szelagowski (45, verheiratet, 1 Sohn) ist seit Oktober 2012 bei der TRUMPF Maschinen AG Baar als Leiter F&E und Mitglied der Geschäftsleitung tätig. TRUMPF ist ein weltweit führender Werkzeugmaschinen- und Laserhersteller für die flexible Blechbearbeitung. Zuvor war Hr. Szelagowski als Verantwortlicher in der Grundlagenentwicklung und Marketing innerhalb des TRUMPF Konzerns tätig. Er promovierte 2002 am Institut für Werkstoffkunde der Universität Hannover.

Short, Shorter, Ultrashort - Pulsed Laser: Megawatt for Micrometer

Die neue Generation der Ultrakurzpulslaser, sogenannte Piko- oder Femtosekundenlaser, ermöglicht mit extrem kurzen Pulsdauern und enorm hohen Pulsspitzenleistungen ein Verdampfen des Materials, die sogenannte *kalte* Materialbearbeitung mit hervorragenden Bearbeitungsqualitäten. Dadurch eröffnen diese Laser dem Anwender in der Mikrobearbeitung ein breites, neues Einsatzspektrum, welches anhand von Beispielen aus dem Bereich der Uhrenindustrie oder der Medizintechnik thematisiert wird.

Simon Caiger

Product Manager Integrated Systems by GMP SA / JK Lasers of GSI Group, Rugby UK
scaiger@gsig.com | www.jklasers.de

BSc Electronics. Prior to joining Lumonics (now JK Lasers) worked in the Nuclear, Defence and Printing industries. Has worked in the laser industry for the past sixteen years in a number of roles including scanning systems development, user interface software design/development and custom automated laser manufacturing systems. Currently Product Manager for the Integrated Solutions product line at JK Lasers.

Choice of Laser Sources for Micromachining Applications

Until now the majority of micromachining applications have been addressed using lamp pumped Nd:YAG lasers, however the increasing complexity of microelectronics and engineering devices and the need for higher yields has placed stringed demands on these techniques leading to the development of fibre lasers with diffraction limited beam quality giving smaller spot size and higher power density.
In this presentation we will show you results obtained from a single-mode fibre source, available with up to 600W average power, and compare them with a similar powered Nd:YAG laser for a range of materials. Our focus will be on micro-cutting, joining and drilling.

SWISS PHOTONICS

Managing director
Dr. Christian Bosshard
bosshard@swissphotonics.net
Telefon +41 61 690 60 40

President
Dr. Christoph Harder
harder@swissphotonics.net
Telefon +41 79 219 90 51

Internet
www.swissphotonics.net