Laser Micromachining and Laser Surface Engineering

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Prof. Dr. Beat Neuenschwander Burgdorf BE

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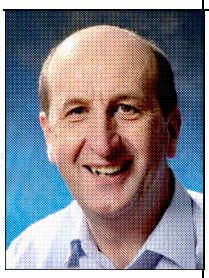
Dr. Beat Neuenschwander studied physics at the University of Bern and realized 1996 his PhD at the Institute of Applied Physics in the field of diode pumped solid state lasers. Since 2000 he is at the Bern University of Applied Sciences where he built up the laboratory for laser micro machining and the 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 currently managing director of the SwissLaser.Net (SLN) and board member of the optics section of the Swiss Society of Optics and Microscopy (SSOM).

SNAPP
The Swiss material processing industry has expressed interest in a Swiss national application laboratory for photonic tools and photonic manufacturing (SNAPP) for the following reasons:
- close proximity
- continuity of personel
- protection of know how
- priority of access



Dr. Steve Norman Southampton UK

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Dr Steve Norman has been with SPI since 2000 and was appointed CTO in 2006. Steve has played a pivotal role in the development and qualification of the company's high-power fiber laser products and in his present role, Steve has wide ranging responsibilities for the current and future technology platform for the company, and an extensive involvement within the Laser community.

Pulsed Fibre Lasers for Precision Marking, Engraving and Micromachining
Nanosecond pulsed fibre lasers utilising *seeded-MOPA* architecture offer out-standing performance flexibility and control, and are increasingly deployed for demanding metal / inorganic-substrate materials processing applications.
We describe a family of MOPA-based pulsed lasers and illustrate diverse applications in marking, texturing, thin-film ablation, fine-feature micromachining and even cutting.

Dr. Alexandre Pauchard Ecublens VD

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Dr. Alexandre Pauchard is CTO at Synova, heading the Engineering, R&D, Project Management and Application departments. Previously he was VP Engineering at id Quantique, Director of Engineering at Nova Crystals (California), Visiting Scholar at UCSD and at the Delft University of Technology. He holds M.S. in Physics from ETH and PhD from EPFL. He has published 80 papers and was awarded 8 international patents.

Laser MicroJet
The basic principle of the water jet-guided laser technology is to focus high-power, pulsed laser beams into a hair-thin, low-pressure water jet. The jet guides the laser beam onto the sample. This concept prevents heat damage by cooling the cutting edges in between the laser pulses and removes any molten material generated. This presentation will cover the various applications of this technology.

Marcel Dubey
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Marcel Dubey est Ingénieur Physicien et Chef de Vente diplômé fédéral. Il a étudié à l'EPFL, l'ETH et à l'Ecole Polytechnique de Paris. Il a ensuite rejoint l'Université de Neuchâtel, où il a développé des cellules photovoltaïques en silicium amorphe et microcristallin.
Depuis 2004, il a collaboré d'abord comme ingénieur de vente chez GMP SA puis comme chef de vente et marketing. GMP SA est une interface active entre les producteurs et les utilisateurs de systèmes laser et instruments de haute technologie.

Solution économique pour usinage laser picoseconde
Les lasers ps et fs traditionnels se sont révélés des sources de micro-usinage très performantes, cependant très onéreuses à l'utilisation.
GMP SA propose une nouvelle technologie, à mi-chemin entre le laser à fibre et les lasers ps et fs complexes. Cette nouvelle solution permet à chaque utilisateur de profiter de la technologie des lasers ultra-rapides, mais de façon bien plus économique!

Joachim Vogt
Biel BE

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47 ans
Ingénieur commercial pour la Suisse Romande
21 ans d'expérience dans le domaine des lasers industriels

La gravure laser dans l'industrie horlogère
Le marquage laser existe depuis de nombreuses années dans le domaine industriel et dans l'horlogerie. La gravure laser a atteint un niveau de qualité compatible avec les besoins horlogers: état de surface, couleur de la gravure, temps de cycle … doivent être au rendez-vous pour correspondre aux besoins de l'horlogerie.
Différentes technologies se présentent comme solutions éventuelles : infrarouge, vert, ultraviolet.

Noémie Dury
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Noémie Dury travaille en tant qu'ingénieur d'application dans la société LASAG AG, fournisseur de sources laser, situé à Thun. Elle y est chargée de développement de process ainsi que d'études de faisabilité dans des applications variées de soudage, découpe, perçage, ablation, …
De formation Optique-Photonique elle s'est spécialisée en usinage laser au sein du centre technique IREPA LASER de Strasbourg en tant que chargée d'étude.

Potentiel du laser picoseconde pour le micro usinage
Le but de notre projet *picoseconde* est de comprendre et évaluer ce procédé du point de vue applicatif. Le laser ps sort des laboratoires et est en passe de rentrer dans le monde industriel. Il est donc naturel pour LASAG en tant que fournisseur de sources industrielles de s'intéresser à cette technologie. Les essais effectués ont démontré un fort potentiel bien que de nombreux aspects restent encore à explorer.

Dr. Kurt
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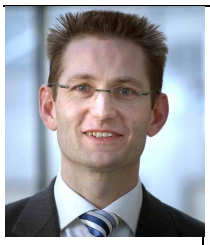
Kurt received his PhD and Masters in Electrical Engineering at Stanford University, where he developed ultrafast electro-optical measurements on integrated circuits using ps lasers, and a BSEE at Georgia Tech in Atlanta.
Kurt founded Time-Bandwidth Products in 1995 to develop simple, robust ultrafast mode-locked lasers for scientific and industrial applications. He founded the VC-funded telecom start-up GigaTera in 2000, which was later acquired by TBP in 2003.

Powerful, flexible and cost-effective picosecond lasers for industrial micromachining applications
The high peak power and short pulse widths of current ps laser systems allows for novel precision material processing via *cold ablation* (e.g. virtually no heat-affected zone, recast, or microcracking). This has many new applications in areas such as precision micromachining of metals, semiconductors, dielectrics, and thin films such as required in solar cell and flat-panel display technology. We review system performance and show micromachined structures.



Dr. Alexander Olowinsky
Aachen DE

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Dr. Alexander Olowinsky studied Mechanical Engineering at the RWTH Aachen. Since 1994 he is working at the Fraunhofer Insititute for Lasertechnology. He received his PhD in the field of laser induced microforming in 2003 from the RWTH Aachen. Since 2000 he is heading the group microjoining in the competence field Joining and Ablation. His fields of work are laser based microjoining processes such as microwelding, soldering and polymer welding.

Precision fiber laser joining with process adapted beam modulation
Mikrofügen mit Faserlasern durch prozessangepasste Strahlmodulation

With fast temporal modulation of the laser beam and ultrafast spatial modulation by fast beam scanning, the excellent focusability of fiber lasers and disc lasers offer new process approaches with reduced energy and less thermomechanical influence on the material. With this approach a new class of micro spot welding of metal components has been realized for thermal sensitive metal-ceramic components. For joining micro fluidic components, a new technique was developed: TWIST® combines the characteristics of the contour and quasi-simultaneous laser welding of polymers, by a high dynamic circular movement along the welding contour. With this approach and high feed rates welding of polymeric components with welding geometries down to less than 100 µm is made possible.

Dr. Lukas Krainer
Zürich ZH

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Lukas Krainer (35, verheiratet, 3 Kinder) ist der Mitbegründer der Onefive GmbH mit Sitz in Zürich und fungiert seither als CEO. Das Untermehmen ist seit September 2005 operativ tätig und hat im Dezember 2008 die Firma Advanced Laser Diode Systems GmbH in Berlin übernommen. Lukas Krainer promovierte 2002 an der ETH Zürich unter der Leitung von Prof. Dr. Ursula Keller.

Real-world applications of intense light matter interaction beyond the scope of classical micromachining
A brief overview of real-world applications of fs and ps pulses in various commercial relevant fields will be given, highlighting the unique benefit of intense light matter interaction.