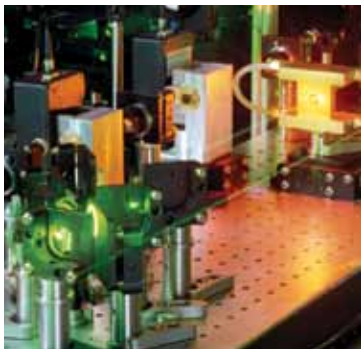
ICALEO®

31st INTERNATIONAL CONGRESS ON APPLICATIONS OF LASERS & ELECTRO-OPTICS

September 23-27, 2012

Anaheim Marriott Hotel | Anaheim, California, USA

Register Online by August 2nd and receive $25 off Early Bird Full Conference Registration www.lia.org/icaleoap



Advance Program

CONGRESS GENERAL CHAIR:
Kunihiko Washio, Paradigm Laser Research Limited, Tokyo, Japan

LASER MATERIALS PROCESSING CONFERENCE CHAIR:
Stefan Kaierle, Laser Zentrum Hannover e.V., Hannover, Germany

LASER MICROPROCESSING CONFERENCE CHAIR:
Henrikki Pantsar, Cencorp Oyj, Salo, Finland

NANOMANUFACTURING CONFERENCE CO-CHAIRS:
Yongfeng Lu, University of Nebraska-Lincoln, Lincoln, Nebraska, USA
Xianfan Xu, Purdue University, West Lafayette, IN, USA

LASER SOLUTIONS SHORT COURSES CHAIR:
Silke Pflueger, ULO Optics, Inc., Los Gatos, CA, USA

BUSINESS FORUM & PANEL DISCUSSION CHAIR:
Ken Dzurko, SPI Lasers, Santa Clara, CA, USA

Printing Sponsored by:

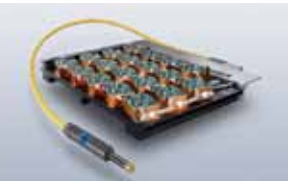
PRECITEC

Presented by:

Laser Institute of America
Laser Applications and Safety

TRUMPF

The right tool for the job.



TRUMPF Lasers
The Power of Choice

There is no "one size fits all" in industrial lasers. Optimization of diverse applications requires different laser technologies. TRUMPF offers the largest application and service network in the world as well as the broadest industrial laser portfolio of any manufacturer, including CO_2, Nd:YAG, disk, fiber, direct diode and more.

www.us.trumpf.com

For more information scan the QR code with your smartphone.

ANAHEIM, CALIFORNIA, USA

September 23-27, 2012

Anaheim Marriott Hotel

Welcome!

Congress General Chair Welcome
Kunihiko Washio, *Paradigm Laser Research Limited,* Tokyo, Japan

HELLO AND WELCOME! The 31st International Congress on Applications of Lasers & Electro-Optics (ICALEO® 2012)) is returning to the West Coast and the Anaheim Marriot Hotel in the heart of the Anaheim Resort District in Orange County, California. Continuing a tradition that began 30 years ago, the ICALEO Program Committee has put together a strong program with an impressive amount of contributions. As always, ICALEO provides an excellent arena in which to meet, collaborate, network and re-connect with colleagues and friends.

ICALEO 2012 will offer three conferences covering a continuously expanding array of laser applications:

The Laser Materials Processing Conference (LMP), organized by Stefan Kaierle, continues its theme on high speed, efficient and flexible macroscopic laser processing applications, equipment and systems. The progress in high brightness processes brought on by advances and improvements in high power fiber, disk and direct diode lasers will be prominently featured.

The Laser Microprocessing Conference (LMF), organized by Henrikki Pantsar, will cover processes and systems for microscopic applications–especially those that take advantage of the small feature sizes and high precision offered by picosecond and femtosecond ultrafast lasers and wavelength optimization. The LMF conference will feature a variety of application-oriented sessions highlighting the versatility of laser microprocessing, such as advanced lasers and optics in energy generation and storage, efficient and high-quality thin smart devices, high-quality lighting devices, next-generation medical devices and biomedical applications, etc.

The Nanomanufacturing Conference (Nano), organized by Yongfeng Lu and Xianfan Xu, will explore topics in the emerging, and rapidly advancing, field of nanotechnology, as well as the role various lasers can play.

The Opening Plenary session will address the following topics: green photonics, recent progress and the application of light sources in material processing. The keynote address will be given on "Recent Status and Future Prospects of Global Research on Green Photonics" by Thomas Baer, Executive Director of the Photonics Research Center at Stanford University. Other plenary session presentations will cover high-power material processing, laser-based microprocessing equipment for electronics industries and laser-produced plasma EUV light sources for nanolithography. This year's Closing Plenary session is organized by Michael Schmidt and will feature topics on ways that knowledge transfer can be used to stimulate the process of international knowledge exchange and cooperation between research institutions, as well as between research institutions and industry. In addition to the plenary sessions, ICALEO 2012 will have two sub-plenary sessions that will cover broader areas with organized invited talks by distinguished researchers. One of the sub-plenary sessions will be held within LMP alone. The other sub-plenary session held jointly by LMF and Nano, will help the audience members to increase their interdisciplinary knowledge and to develop valuable networking contacts.

The Laser Solutions Short Courses, organized by Silke Pflueger, are ideal for those who want to receive a complete overview on the state of the art in specific areas of interest to participants.

The Business Forum and Panel Discussion Chaired by Ken Dzurko, covers the challenging topic of increasing the role of lasers in a non-laser world. Following presentations by laser business leaders, a panel discussion will offer participants opportunities to interact with industry experts and to voice their own views.

The popular Vendor Reception allows attendees to learn about the latest products in the laser application market directly from industry representatives.

Anaheim is home to numerous attractions, including world-famous Disneyland, Disney's California Adventure, the Downtown Disney District and the Angels Stadium of Anaheim, with extensive shopping and dining options and spectacular nighttime entertainment. Combine this with a warm and comfortable climate, Anaheim is clearly an ideal location to experience ICALEO and more with colleagues, friends and family. With all of these great features and opportunities, I extend a warm invitation to all of you to come and take part in ICALEO 2012. See you in Anaheim, California!

ICALEO ADVANCE PROGRAM TABLE OF CONTENTS:

Congress General Chair: **Kunihiko Washio**
LIA President: **Reinhart Poprawe**
LIA Executive Director: **Peter Baker**
LIA Director of Conferences: **Gail Loiacono**

Plenary Session: Green Photonics and Recent Progress in Laser-Based Light Sources and Their Applications in Materials Processing

Session Chair: **Kunihiko Washio,** ***Paradigm Laser Research Limited, Tokyo, Japan***
Monday, September 24 • 9:00am

Green photonics is becoming a key driver for profitable growth and well-being by contributing effective solutions for sustainability issues in the environment, economy and society. Laser-based light sources and their applications in macro-, micro- and nano-materials processing will be significant in advancing and promoting sustainable green photonics. The keynote speech by Thomas Baer, along with the other presentations by impressive leaders in their fields will make this one session you should not miss!

Invited Plenary Speakers:

Keynote Presentation – Recent Status and Future Prospects of Global Research on Green Photonics (OP1)
Thomas Baer, *Stanford Univ., Stanford, CA, USA*

High-Power Laser Materials Processing (OP2)
Eckhard Beyer, *Fraunhofer IWS, Dresden, Germany*

Laser-Based Microprocessing Equipment for Electronics Industries (OP3)
Haibin Zhang, *ESI, Portland, OR, USA*

LPP-EUV Light Source Development for High Volume Manufacturing Lithography (OP4)
Hakaru Mizoguchi, *Gigaphoton, Inc., Oyama, Japan*

Session Chair Appreciation Breakfast

Monday, September 24 • 7:30am

Session Chairs and Plenary Speakers are invited to the Session Chair Appreciation Breakfast on Monday, September 24 at 7:30am. Audio-Visual tips will be provided along with last minute updates and an overview of the week. Please plan to arrive in time to attend this important breakfast.

Welcome Celebration

Sunday, September 23 • 4:00pm

Sponsored by:

IPG PHOTONICS

Plan to arrive early and enjoy live entertainment provided by Beer's Law. In addition, free door prizes will be raffled! This event is a great opportunity for new attendees to meet "old timers" and for everyone to socialize and interact.

ICALEO President's Reception Will Make a Grand Entrance!

Marconi Automotive Museum
Monday, September 24 • 5:30pm

ICALEO® will feature an evening reception hosted by LIA President Reinhart Poprawe at the greatly admired Marconi Automotive Museum. This unique automotive museum was first opened in 1994 and plays host to a 30 million-dollar collection of historical, exotic and classic cars.

Meet the LIA Officers, Board of Directors, ICALEO Congress General Chair and Conference Chairs while being surrounded by high-performance muscle cars and vintage formula racecars. You won't want to miss seeing Kenny Berstien's record breaking "Louie the Lizard" top fuel dragster, one of the five produced 1999 Jaguar XJ-220S and the one-of-a kind Ferrari FX.

Sponsored by:

Fraunhofer ILT

This reception promises to be a memorable one. Join the LIA staff and friends in the winner's circle honoring your LIA President at the Marconi Automotive Museum.

PRECITEC

LÖSNING SOLUÇÃO OPLOSSING **SOLUCIÓN** **SOLUTION** РЕШЕНИЕ SOLUZIONE **OPLOSSING**
LUZIONE **LÖSNING** SOLUÇÃO OPLOSSING РЕШЕНИЕ **LÖSUNG** **SOLUTION** **SOLUZIONE** LÖSNIN
LOSSING SOLUZIONE 解決方案 **SOLUCIÓN** **SOLUÇÃO** SOLUZIONE **LÖSNING** SOLUÇÃO **SOL**

THERE IS ONLY ONE WAY...
THE SMART WAY.

PRECITEC. THE SMART WAY TO LASER

MEASURE

CONTROL

PROCESS

MONITOR

SOLIDCUTTER - LASER CUTTING SYSTEM
FOR ROBOT APPLICATIONS IN HEAVY DUTY ENVIRONMENT

PRECITEC INC. | WIXOM, MI 48393
CALL US: 248 446 8100 | WWW.PRECITEC.COM

LIA Annual Meeting & Awards Luncheon *featuring* the Arthur L. Schawlow Award Presentation

Wednesday, September 26

Luncheon Sponsored by: Fraunhofer IWS

Award Sponsored by: CLAIM

The 2012 Arthur L. Schawlow Award is presented to: Isamu Miyamoto

Isamu Miyamoto started research work in laser material processing in 1965 with developing high power CO_2 lasers at Osaka University and applied this for R&D of laser-matter interaction. Since then he has been involved in different types of laser materials processing using CW to ultrashort laser pulses, publishing more than 300 papers. He is currently Emeritus Professor of Osaka University and Guest Professor of Erlangen SAOT. Professor Miyamoto will give a presentation on the "Origin and New Wave of Laser Welding".

Laser Institute of America first presented the Arthur L. Schawlow Award in 1982 to recognize individuals who have made distinguished contributions to applications of lasers in science, industry or education. The Award presentation consists of a silver medal, a $2,000 cash award and a citation. Awardees become Lifetime Members of LIA.

About Arthur L. Schawlow

Professor Schawlow received a Nobel Prize for Physics in 1981 for "his contribution to the development of laser spectroscopy." He co-authored, along with Professor Charles H. Townes, the book Microwave Spectroscopy, and the first paper describing optical masers. For this latter work, the pair were awarded the Stuart Ballantine Medal by the Franklin Institute (1962) and the Thomas Young Medal and Prize by the Physical Society and Institute of Physics (1963). Professor Schawlow was also awarded the Morris N. Liebmann Memorial Prize by the Institute of Electrical and Electronic Engineers (1964). As the first honoree of this award in 1982, it is fitting that LIA's highest achievement award is given in Professor Schawlow's name.

Closing Plenary Session: Ways of Knowledge Transfer

Session Chair: **Michael Schmidt, *Bayerisches Laserzentrum GmbH, Erlangen, Germany***

Thursday, September 27 • 1:30pm

This year's ICALEO closing plenary session is organized by Michael Schmidt. Our long-term target is the mutual understanding of country specific research cultures to stimulate the process of international knowledge exchange and cooperation between research institutions as well as between research institutions and industry. The goal of this closing plenary session is to introduce different country-specific ways of transferring knowledge in order to spark interest in this topic. After the keynote speech by Isamu Miyamoto on "Study on the German Laser Centers," six distinguished researchers from around the world will discuss their regional methods of transferring knowledge.

Keynote Presentation – Study on the German Laser Centers (C101)
Isamu Miyamoto, *Osaka Univ., Osaka, Japan*

The American Way of Knowledge Transfer (C102)
Jyoti Mazumder, *CLAIM, The Univ. of Michigan, Ann Arbor, MI USA*

The Canadian Way of Knowledge Transfer (C103)
Pierre Galarneau, *National Optics Institute (INO), Quebec, Canada*

The Brazilian Way of Knowledge Transfer (C104)
Walter Weingaertner, *Univ. Federal de Santa Catarina, Florianopolis, Santa Catarina, Brazil*

The Japanese Way of Knowledge Transfer (C105)
Hiroyuki Niino, National Institute of Advanced Industrial Science and Technology (AIST) *AIST, Tsukuba, Japan*

The European Way of Knowledge Transfer (C106)
Andreas Ostendorf, *Ruhr-Univ. Bochum, Bochum, Germany*

Laser Materials Processing Conference

Conference Chair: **Stefan Kaierle,** *Laser Zentrum Hannover e.V., Hannover, Germany*

ICALEO® continues to be one of the most important laser events every year. This is well reflected by one of the highest numbers of abstracts for the LMP conference ever received so far. Once again, many researchers from all over the world have submitted their latest research results to be presented at ICALEO. The LMP conference program is full of excellent contributions covering 19 sessions in many different application fields, including a new format of a sub-plenary session. Major fields of applications are rapid prototyping processes like selective laser melting and laser metal deposition and welding, including combination processes and processing of dissimilar materials. Laser surface treatment, process control and modeling and simulation are further topics to be addressed.

While already being an indispensable tool in vast fields of industrial application, the laser, with its abundant number of applications, still experiences important progress in terms of research. Laser processes continuously cross new borders driven by the application demands from industry. At ICALEO, you can be in the first row to discover latest research results covered from fundamental to application driven topics. You are cordially invited to enjoy these opportunities and network with other researchers and delegates.

LMP Session 1: Pulsating Topics in Laser Materials Processing

September 24, 2012 • 1:30pm

Session Chair: Stefan Kaierle, Laser Zentrum Hannover e.V., Hannover, Germany

The State of Laser Additive Manufacturing (LAM) – Invited Presentation (101)
Paul Denney, Lincoln Electric Company

LAM for Medical Applications – Invited Presentation (102)
Christian Noelke, Laser Zentrum Hannover e.V.

Modeling of Keyhole Formation in Laser and Laser Arc Hybrid Welding Based on CFD Simulations – Invited Presentation (103)
Suck-Joo Na, KAIST

Some Answers to Frequently Asked Questions and Open Issues of Laser Beam Cutting – Invited Presentation (104)
Dirk Petring, Fraunhofer ILT

LMP Session 2: Laser Drilling

September 24, 2012 • 3:20pm

Session Chair: Noemie Dury, LASAG AG, Thun, Swaziland

Drilling with Pulse Shaping by Using Fiber Lasers (201)
Jens Dietrich, Ingomar Kelbassa, Hermann Uchtmann, Lehrstuhl fuer Lasertechnik RWTH Aachen

Development of an Azimuthally Polarized All-in-One Pulsed CO_2 Laser for Microdrilling (202)
Masamori Endo, Tokai Univ.; Ryoji Koseki, Motoi Sasaki, Shibuya Kogyo Co., Ltd.

Comparison of Keyhole Characteristics Obtained by Two Experimental Methods: The "Direct Observation of Drilled Hole" Method and the "Sandwich" Method (203)
Simone Mattei, Jean-Marie Jouvard, Massaud Mostafa, Henri Andrzejewski, Iryna Tomashchuk, Univ. of Burgundy

Simulation of Laser Drilling Process with the Constraint Natural Element Method (204)
Girardot Jeremie, Illoul Lounes, Lorong Philippe, Ranc Nicolas, Favier Veronique, Schneider Matthieu, Berthe Laurent, PIMM Laboratory, Arts et Métiers ParisTech; Chinesta Francisco, GeM, Centrale Nantes

LMP Session 3: Laser Metal Deposition I

September 24, 2012 • 3:20pm

Session Chair: Wolfgang Knapp, CLFA Fraunhofer ILT, Paris, France

Laser-Assisted Development of New Ti-Mo-Zr Alloys for Biomedical Applications (301)
Amelia Almeida, Carole Loable, Rui Vilar, Instituto Superior Tecnico

Residual Stress Control in DMD Process (302)
Hyung Min Chae, Univ. of Michigan

3D Analysis of The Powder Flow of Laser Cladding Nozzles (305)
Rezak Mezari, Pascal Aubry, Thierry Malot, Kevin Verdier, Arts et Métiers ParisTech

A Verified Model of Transient and Residual Stresses in Laser Direct Metal Deposition (304)
Michael Vogel, Mushtaq Khan, Juansethi Ibarra-Medina, Andrew J Pinkerton, Manufacturing and Management Group, School of Mechanical, Aerospace and Civil Engineering, The Univ. of Manchester; Narcisse N'Dri, Mustafa Megahed, ESI GmbH

LMP Session 4: Laser Processing of CFRP

September 25, 2012 • 8:30am

Session Chair: Uwe Stute, Laser Zentrum Hannover e.V., Hannover, Germany

Remote Processing of Tailored Fiber Reinforced Lightweight Structures (401)
Andreas Furst, TU Dresden; Annett Klotzbach, Fraunhofer IWS

Laser-Based Hot-Melt Bonding of CFRP and GFRP - A Novel Joining Technology for Multi Material Design (402)
Philipp Amend, Bayerisches Laserzentrum GmbH; Thomas Frick, Bayerisches Laserzentrum GmbH; Erlangen Graduate School in Advanced Optical Technologies; Michael Schmidt, Bayerisches Laserzentrum GmbH; Chair of Photonic Technologies, Univ. of Erlangen-Nuremberg; Erlangen Graduate School in Advanced Optical Technologies

Experimental and Numerical Analysis of Laser Beam Transmission in Continuous Fiber Thermoplastic Composites (403)
Wolfgang Knapp, CLFA Fraunhofer ILT

Influence of Different Ambient Media on the Laser Ablation Process of CFRP (404)
Christian Freitag, Margit Hafner, Volkher Onuseit, Rudolf Weber, Thomas Graf, IFSW

Laser Joining of Through Thickness Reinforced Glass Fiber Composite Pre-Forms (405)
Gen Satoh, Huade Tan, Lawrence Yao, Columbia Univ.

Advantages and Challenges of CFRP Laser Machining with ns Pulses (406)
Hagen Dittmar, Sven Bluemel, Peter Jaeschke, Uwe Stute, Dietmar Kracht, Laser Zentrum Hannover e.V.

Latest Results in Laser Cutting of Carbon Fiber Reinforced Plastics (407)
Stephan Ziermann, David Havrilla, TRUMPF, Inc.; Nicolai Speker, TRUMPF Laser-und Systemtechnik GmbH; Christian Koerber, TRUMPF GmbH+Co. KG

Simulation of Laser Ablation of CFRP (408)
Christian Freitag, Thomas Graf, Margit Hafner, Andreas Michalowski, Volkher Onuseit, Rudolf Weber, Univ. Stuttgart, IFSW

Laser Surface Pre-Treatment of CFRP for Adhesive Bonding (409)
Fabian Fischer, Stefan Kreling, Klaus Dilger, Institute for Joining and Welding, Univ. of Braunschweig

LMP Session 5: Laser Metal Deposition II

September 25, 2012 • 8:30am

Session Chair: Ingomar Kelbassa, RWTH Aachen Univ., Aachen, Germany

A Study of the Effect of Angle of Beam Incidence on Ytterbium Fiber Laser Cladding of Alloy 625 (501)
Gerald Bruck, Brandon Shinn, Ahmed Kamel, Siemens

Single Crystal (SX) Laser Cladding of CMSX-4 (502)
Boris Rottwinkel, Christian Noelke, Michael Hustedt, Stefan Kaierle, Volker Wesling, Laser Zentrum Hannover e.V.; Nils Weidlich, MTU Maintenance Hannover GmbH

Comparison of Metal Matrix Nanocomposite and Microcomposite Layers on AISI H13 Tool Steel Surface by Addition of TiC Nanoparticles and Microparticles by Laser Cladding (503)
Vicente Rouco, M. Angeles Montealegre, Pilar Rey, Gemma Castro, Marcos Gonzalez, Jorge Arias, AIMEN

Calculating the Stress of Multi-Track Formations in Induction-Assisted Laser Cladding (504)
Frank Brueckner, Dietrich Lepski, Steffen Nowotny, Fraunhofer IWS; Christoph Leyens, Eckhard Beyer, Fraunhofer IWS / Dresden Univ. of Technology

An Investigation of Powder Properties on Some Coating Features of Alloy 625 Coatings Deposited by Laser Cladding (505)
Jonne Nakki, Tampere Univ. of Technology

In-Situ Synthesis of Cr13Ni5Si2 Reinforced Metal Matrix Composite Coatings by Laser Induction Hybrid Cladding (506)
Dengzhi Wang, Qianwu Hu, Xiaoyan Zeng, Wuhan National Laboratory for Optoelectronics

Recent Developments in High Power Laser Cladding Techniques (507)
Jari Tuominen, Jonne Näkki, Henri Pajukoski, Petri Vuoristo, Tampere Univ. of Technology, Department of Materials Science; Tuomo Peltola, Technology Centre Ketek Ltd.

Synthesis of Functionally Gradient TiC Reinforced Nickel Metal Matrix Composites by Laser Direct Deposition with Characterization of Properties (510)
Jon Michael Wilson, Yung Shin, Purdue Univ.

Structure of Ni-Alloys Deposited by Laser Powder Deposition on Single Crystal Superalloy Substrates (509)
Rui Vilar, Instituto Superior Técnico

LMP Session 6: Process Monitoring & Control

September 25, 2012 • 8:30am

Session Chair: Markus Kogel-Hollacher, Precitec Optronik GmbH/Precitec KG, Rodgau, Germany

X-Ray and Optical Videography for Quantitative Measurement of 3D Geometries of Capillary and Melt Pool in Laser Keyhole Welding (601)
Felix Abt, Thomas Graf, Rudolf Weber, IFSW

Process Monitoring and Control for Laser Based Thin Film Treatment (602)
Christian Vedder, Fraunhofer ILT

In-Situ Penetration Depth Control for Laser Welding of Coated and Uncoated Steel Using Spectroscopy (603)
Ali Riza Konuk, Ronald Aarts, Bert Huis in't Veld, Univ. of Twente

Detection of Faults in Laser Beam Welds by Near-Infrared Camera Observation (604)
Holger Braun, Friedhelm Dorsch, Steffen Kessler, Dieter Pfitzner, Volker Rominger, TRUMPF Laser-und Systemtechnik GmbH

Comprehensive Monitoring and Control of Laser Hybrid Arc Welding in Industrial Production (605)
Alexander Kaplan, Jan Karlsson, Luleä Univ. of Technology

Diagnostics of the CO_2 Laser Cutting Process Evaluating the Back Reflected Laser Power (606)
David Schindhelm, Rudolf Weber, Thomas Graf, IFSW

Analysis of Coaxial Vision Systems for Real-Time Z-Height Control for Laser Cladding Process (607)
Rezak Mezari, Thierry Malot, Kevin Verdier, Pascal Aubry, Arts et Métiers ParisTech

Ultrasonic Waves Detection by Electronic Speckle Pattern Shearing Interferometry for Aircraft Components (608)
Enrique Pineiro, Alberto Asensio, Francisco Rodriguez, AIMEN

The Study About the Algorithm of the Detecting Feature on Weld Images During Laser Welding Processes (609)
Duan Aiqin, Wang Bin, Chen Xinsong, BAMTRI

LMP Session 7: Welding I

September 25, 2012 • 1:30pm

Session Chair: Antti Salminen, Lappeenranta Univ. of Technology, Lappeenranta, Finland

Electromagnetic Control of the Weld Pool Dynamics in Partial Penetration Laser Beam Welding of Aluminium Alloy (701)
Vjaceslav Avilov, Andre Schneider, Marco Lammers, Andrey Gumenyuk, Michael Rethmeier, Federal Institute for Materials Research and Testing (BAM)

Laser-Welded Sandwich Floor for Marine Container (702)
Ilpo Maaranen, Ruukki Metals Oy; Jukka Siltanen, Rautaruukki Oyj

Measuring Laser Weldability of Aluminum Alloys: The Controlled Restraint Weldability Test (703)
Nicolas Coniglio, Mario Patry, Patrick Gougeon, CTA-CNRC

Tube-to-Tubesheet Laser Welding with Vision (704)
Stan Ream, EWI

Investigation of Laser Shock Processing on Titanium Alloys by Linear Friction Welding (705)
Zhigang Che, Shuili Gong, BAMTRI

Twinquasi - A New Method for Quasi-Simultaneous Laser Welding of Polymers (706)
Saara Ruotsalainen, Petri Laakso, Veli Kujanpää, VTT Technical Research Centre of Finland; Tuomas Purtonen, Matti Manninen, Antti Salminen, Lappeenranta Univ. of Technology

Controllable Beam Intensity Profile for the Tasks of Laser Material Processing (707)
Alexander Laskin, Vadim Laskin, AdlOptica GmbH

LMP Session 8: Laser Cutting

September 25, 2012 • 1:30pm

Session Chair: Eckhard Beyer, Fraunhofer IWS, Dresden, Germany

A Technical and Commercial Comparison of Fiber Laser and CO_2 Laser Cutting (801)
John Powell, Alexander Kaplan, Luleä Univ. of Technology

Impact of Thermal Focal Shift on Laser Cutting Processes with High Brightness Lasers (802)
Sasia Eiselen, Bayerisches Laserzentrum GmbH; Erlangen Graduate School in Advanced Optical Technologies, Univ. Erlangen-Nuremberg; Heiko Zapf, Eugenia Mantel, Bayerisches Laserzentrum GmbH; Lukas Hofmann, Chair of Photonic Technologies, Univ. Erlangen-Nuremberg; Michael Schmidt, Chair of Photonic Technologies, Erlangen Graduate School in Advanced Optical Technologies, Univ. Erlangen-Nuremberg; Bayerisches Laserzentrum GmbH

Identification and Characterization of Analogies of Remote Fusion Cutting Processes Using Different Beam Sources (803)
Matthias Luetke, Alexander Wagner, Andreas Wetzig, Eckhard Beyer, Fraunhofer IWS ; Jan Musiol, Michael F. Zaeh, Institute for Machine Tools and Industrial Management (IWB), Technische Univ. Muenchen (TUM)

High Efficiency Laser Oxygen Thick Section Cutting of Mild Steels Using Disk Laser (804)
Tao Zhang, Institute of Scientific and Technical Information of China; William O'Neill, Institute for Manufacturing, Univ. of Cambridge

Mass and Momentum Transfer of Oxygen Jet to the Melt in Laser Cutting of Mild Steel (805)
Grigoriy Ermolaev, Alexander Zaitsev, ITAM SB RAS

Advanced Laser Cutting Technology for Sheet Metal by High Power Fiber Laser (806)
Hiroaki Ishiguro, Hiroshi Sako, Amada Co., Ltd.; Dahv Kliner, Martin Muendel, JDSU

Process-Reliable and Cost-Effective Laser Materials Processing (807)
Peter Bruns, Marco Lentjes, Vitalij Lissotschenko, Klaus Reinecke, Michael Voss, LIMO Lissotschenko Mikrooptik GmbH

LMP Session 9: High Brightness Lasers & Systems

September 25, 2012 • 1:30pm

Session Chair: Kerstin Kowalick, Ruhr Univ. Bochum, Bochum, Germany

Mid Infra-Red Fiber Laser Developments and Applications (901)
Tony Hoult, IPG Photonics Corporation

Fiber-Coupled High Power Stabilized Green Laser for Material Processing Applications (902)
Berthold Burghardt, Johannes Richter, Innovavent GmbH; Nick Hay, Ian Baker, Stuart Bashford, Yili Guo, Young Kwon, Powerlase Photonics Ltd.; Jong-Kab Park, EO Technics Co., Ltd.

High Power Disk Lasers - Advances & Applications (903)
David Havrilla, Tracey Ryba, TRUMPF Inc.; Marco Holzer, TRUMPF Laser-und Systemtechnik GmbH

102 W All-Fiber Broadband Superfluorescent Source Based on Ytterbium-Doped Double-Cladding Fibers (904)
Yi Cao, Jiang Liu, Ke Wang, Pu Wang, Beijing Univ. of Technology

Investigation of Thermal Lensing Time Constants in Laser Processing Optics (905)
Christiane Thiel, Axel Hess, Rudolf Weber, Thomas Graf, IFSW

UV Line Beam Laser Optics for Material Processing (906)
Denis Bolshukhin, Berthold Burghardt, Hans-Juergen Kahlert, Innovavent GmbH; Nick Hay, Young Kwon, Powerlase Photonics Ltd.; Jong-Kab Park, EO Technics Co., Ltd.

All Passive Optical Design Laser Beam Analyzer for High Power CO_2 Lasers (907)
Michael Scaggs, Gilbert Haas, Haas Laser Technologies, Inc.

LMP Session 10: Welding II

September 26, 2012 • 8:30am

Session Chair: Ali Khan, TWI Ltd, Cambridge, Great Britain

The Influence of the Pressure of Ar Shielding Gas on the Keyhole Behavior During CO_2 Laser Welding of TA15 (1001)
Aiqin Duan, Shuili Gong, BAMTRI

Studying on Characteristics of Plume/Plasma in Fiber Laser Welding and CO_2 Laser Welding (1002)
Rongshi Xiao, Jianglin Zou, Beijing Univ. of Technology

New Hot Cracking Criterion for Laser Welding in Close Edge Position (1003)
Peter Stritt, GSaME; Rudolf Weber, Thomas Graf, IFSW; Steffen Mueller, Jan-Philipp Weberpals, AUDI AG

Three-Dimensional Visualization of Melt Flows in Molten Pool During Laser Welding by X-Ray Transmission Real-Time Observation System (1006)
Ryoji Ido, Seiji Katayama, Yousuke Kawahito, Joining and Welding Research Institute of Osaka Univ.; Hiroshi Nakamura, Charmant Inc.

Time-Frequency Analysis of Pressure Oscillation Inside the Keyhole for Weld Quality Monitoring (1005)
Seung Lee, The Univ. of Michigan

LMP Session 11: Processing of Dissimilar Materials

September 26, 2012 • 8:30am

Session Chair: Milan Brandt, RMIT Univ., Bundoora Victoria, Australia

Local Laser Joining of Glass and Silicon (1101)
Assi Hansen, Jorma Vihinen, Tampere Univ. of Technology, Department of Production Engineering Yasuhiro Okamoto, Isamu Miyamoto, Osaka Univ.; Tiina Amberla, Corelase Ltd.

Laser Joining of Plastics with Metals (1102)
Jean Pierre Bergmann, Martin Stambke, Ilmenau Univ. of Technology

Dissimilar Metal Joining of Mg Alloy to Al Alloy by Laser Brazing Process (1103)
SookHwan Kim, Mok Young Lee, RIST

Brazing of 22MnB5 Hot-Dip Aluminized Steel with AlSi3Mn (1104)
Florian Schmidt, Frank Vollertsen, BIAS

Joining of Dissimilar Metal Tubes by Laser Autogenous Brazing (1105)
Gen Satoh, Y. Lawrence Yao, Columbia Univ.; Syed Naveed, Boston Scientific Corporation

LMP Session 12: Laser Surface Modification I

September 26, 2012 • 10:30am

Session Chair: Juan Pou, Univ. de Vigo, Vigo, Spain

Production of Conductive Paths by Laser Processing of Printed Nanoparticulate Materials (1201)
Melanie Meixner, Jochen Stollenwerk, Konrad Wissenbach, Fraunhofer ILT

Study on Cavitation Resistance and Wear Properties of TC4 Laser Alloyed with NiAl-VC Coatings (1202)
Yao Jianhua, Zhejiang Univ. of Technology

Effect of the Positions of Off-Focal Points on Alloy 600 Specimen Surface Morphology in a Laser Peening Process (1203)
Chin-Man Chung, Joung Soo Kim, Korea Atomic Energy Research Institute

Generic Parameters Governing the Biofunctionality of Laser Surface Engineered Nylon 6,6 (1204)
Jonathan Lawrence, David Waugh, Univ. of Lincoln

Process Map Approach to Laser Transformation Hardening of Carbon Steels (1205)
Hyungson Ki, Sangwoo So, Ulsan National Institute of Science and Technology

Laser Hardening of Gear Wheels (1206)
Stanislav Nemecek, Matex PM

LMP Session 13: Hybrid & Combination Processes I

September 26, 2012 • 10:30am

Session Chair: Silke Pflueger, ULO Optics Inc., Los Gatos, CA, USA

Double TIG Laser Aluminium Welding Process (1301)
Alexander Barroi, Jörg Hermsdorf, Stefan Kaierle, Volker Wesling, Laser Zentrum Hannover e.V.

Fundamental Investigations and Systems Engineering for Laser-Assisted Milling of Titanium Alloys (1306)
Robert Wiedenmann, Michael F. Zaeh, IWB - Technische Univ. Muenchen

Characterization of Hybrid Disk-Laser Welding of Titanium Alloy Ti-6Al-4V to Aluminum Alloy 2024 (1303)
Vittorio Alfieri, Fabrizia Caiazzo, Francesco Cardaropoli, Vincenzo Sergi, Univ. of Salerno

A Comparative Study of Laser, CMT, Laser-Pulse MIG Hybrid and Laser-CMT Hybrid Welded Aluminium Alloy (1304)
Chen Zhang, Ming Gao, Geng Li, Xiaoyan Zeng, Huazhong Univ. of Science and Technology

Influence of Filler Metal and Mixing on Weld Microstructure of Laser/Hybrid Welded Thick Austenitic Stainless Steel Joints (1305)
Miikka Karhu, Veli Kujanpaa, VTT-Technical Research Centre of Finland; Andrey Gumenyuk, Marco Lammers, BAM - Federal Institute for Materials Research and Testing

Development and Experimental Analysis of Laser-Assisted Plasma Arc Welding (1302)
Achim Mahrle, Michael Schnick, Sascha Rose, Thomas Pinder, Uwe Fuessel, Dresden Univ. of Technology; Eckhard Beyer, Fraunhofer IWS

LMP Session 14: Welding III

September 26, 2012 • 3:00pm

Session Chair: Magdi Azer, GE Global Research, Niskayuna, NY, USA

Welding Battery Tabs for Electrified Vehicles (1401)
Jay Eastman, EWI

Zero-Gap Laser Welding of Zinc Coated Steels in a Lap Joint Configuration (1402)
Shanglu Yang, General Motors China Science Lab

X-Ray Videography Investigation of Keyhole in Laser Welding of Different Joint Geometries (1403)
Mikko Vänskä, Lappeenranta Univ. of Technology, Institut fuer Strahlwerkzeuge, Univ. Stuttgart; Felix Abt, Rudolf Weber, Institut fuer Strahlwerkzeuge, Univ. Stuttgart; Antti Salminen, Lappeenranta Univ. of Technology, Machine Technology Center Turku Ltd; Thomas Graf, Institut fuer Strahlwerkzeuge, Univ. Stuttgart

Development and Application of the 10kW Fiber Laser Welding System (1404)
Yosuke Yamazaki, Osaka Univ., Joining and Welding Research Institute; Akikazu Kitagawa, Hitachi Zosen Corporation

Comparison of Fiber Laser Model Distribution in Industrial Welding Applications (1405)
Daniel Capostagno, SPI Lasers

Bead Features in Laser Hybrid Lap Welding of Superalloys for Aerospace Application (1406)
Fabrizia Caiazzo, Vittorio Alfieri, Francesco Cardaropoli, Vincenzo Sergi, Univ. of Salerno

LMP Session 15: Hybrid & Combination Processes II

September 26, 2012 • 3:00pm

Session Chair: Jörg Hermsdorf, Laser Zentrum Hannover e.V., Hannover, Germany

Combined Laser and Arc Welding of Thick-Section Stainless Steel Sheets (1501)
Ahmed Elmesalamy, Lin Li, John Francis, The Univ. Manchester

Laser-Arc Hybrid Welding of Thick-Section Mild Steel Plates: Microstructure and Performances of the Beads (1502)
Geng Li, Ming Gao, Chen Zhang, Xiaoyan Zeng, Wuhan National Laboratory for Optoelectronics

Laser-GMA Hybrid Welding of Direct Quenched Steel in Lap Joint Configuration - A Preliminary Study (1503)
Miikka Karhu, Veli Kujanpaa, VTT Technical Research Centre of Finland; Jukka Siltanen, Rautaruukki Oyj, Corporate Functions

High Power Laser Welding of Structural Steels (1504)
Duncan Pratt, GE Global Research

Laser GMA Hybrid Welding for Thick Wall Applications of Pipeline Steel with the Grade X70 (1505)
Oliver Seffer, André Springer, Stefan Kaierle, Volker Wesling, Heinz Haferkamp, Laser Zentrum Hannover e.V.

Diode Laser Hybrid Welding (1506)
Brian Victor, Laserline, Inc.

LMP Session 16: Laser Metal Deposition III

September 26, 2012 • 3:00pm

Session Chair: Paul Denney, Lincoln Electric Company, Cleveland, OH, USA

Challenges in the Design of Portable Laser Repair Systems (1601)
Andrew Nissly, Todd Palmer, Edward Reutzel, ARL, The Penn State Univ.

Adaptive Shape Control in Laser Metal Deposition by Adjusting Weld Pool Size (1602)
Masanori Miyagi, Takeshi Tsukamoto, Hirotsugu Kawanaka, Hitachi, Ltd.

A Novel Method of Pulsed Laser-Cladding for Effective Control of Melting of WC Particulates in Nicr-WC Composite Coatings (1603)
Manish Tak, S. M. Shariff, Vikram Sake, Gade Padmanabham, (ARCI)

Evaluation of Wear Properties of Laser Cladded MMC Coatings (1604)
Jo Verwimp, Eric Geerinckx, Filip Motmans, Marleen Rombouts, VITO

Effect of Processing Parameters on Microstructure and Mechanical Properties of Laser Deposited Inconel 718 Superalloy (1607)
Guru Dinda, Kevin Alexander, Douglas Grant, Cherrell Franklin, Robert Ruokolainen, Ashish Dasgupta, Focus: HOPE

Impact of Path Planning on Thermal History During Additive Manufacturing of Ti-6Al-4V (1606)
Shawn Kelly, Todd Palmer, Edward Reutzel, ARL, The Penn State Univ.

Fraunhofer

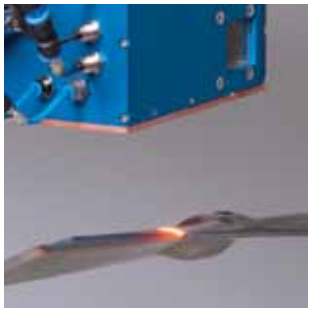
IWS Dresden

FRAUNHOFER INSTITUTE FOR MATERIAL AND BEAM TECHNOLOGY IWS

FINDING ONE-STOP SOLUTIONS

Contract research and development in the fields of laser, surface, and nanotechnology



OUR CORE COMPETENCIES

- high speed and remote cutting
- laser welding and special joining technologies
- laser hardening and thermal treatment
- laser cladding as well as outside and inside diameter laser hardfacing
- PVD and CVD technologies
- process components and complete systems

Fraunhofer IWS Dresden
phone: +49 351 833 910
email: info@iws.fraunhofer.de
web: www.iws.fraunhofer.de
Winterbergstrasse 28,
01277 Dresden, Germany

Activities in the USA
Fraunhofer CCL
web: www.ccl.fraunhofer.de

INVITATION

International Laser Symposium Fiber & Disc (FiSC 2012) and "Tailored Joining"
October 16 - 18, 2012, International Congress Center Dresden, Germany

LMP Session 17: Welding IV

September 27, 2012 • 8:30am

Session Chair: Dirk Petring, Fraunhofer ILT, Aachen, Germany

Effect of Gas Shielding and Heat Input on Autogenous Welding of Duplex Stainless Steel (1701)
Antti Salminen, Lappeenranta Univ. of Technology

High-Quality Laser Welding of Copper Using Appropriate Power Modulation (1702)
Andreas Heider, Rudolf Weber, Thomas Graf, IFSW

Laser Butt Welding for Tailor-Welded Blanks with Hot Press Forming Steel (1703)
Minjung Kang, Cheolhee Kim, KITECH

Spatter-Free Fast Welding with Single Mode Fiber Laser for Magnesium Alloy Sheet (1704)
Mok-Young Lee, RIST

Research on Welding and Heat Treatment of High-Chromium Ferritic Stainless Steel (1705)
Yongqiang Zhang, Jun Zhang, Wei Wang, Xi Zhang, Shukun Mu, Shougang Research Institute of Technology; Lintao Xi, Ping Chen, Beijing Shougang Gitane New Materials Co. Ltd

Optimization of Laser Welding Parameters of ZEK100 Magnesium Alloy in Lap Joint Configuration (1706)
Masoud Harooni, Fanrong Kong, Radovan Kovacevic, Southern Methodist Univ.; Blair Carlson, General Motors

Meeting Quality Criteria When Laser Welding of Alloy 718 (1707)
Chris Allen, Jon Blackburn, Paul Hilton, Ali Khan, TWI Ltd

Influence of Surface Condition in Fiber Laser Welding of Pure Copper (1708)
Guijun Bi, Hui-Chi Chen, Sharon Mui Ling Nai, Jun Wei, Singapore Institute of Manufacturing Technology

Formation Mechanism of Process Instabilities and Strategies to Improve Welding Quality (1709)
Volker Rominger, Thomas Harrer, TRUMPF Laser-und Systemtechnik GmbH; Rudolf Weber, Thomas Graf, IFSW

LMP Session 18: Laser Surface Modification II

September 27, 2012 • 8:30am

Session Chair: Lin Li, The Univ. of Manchester, Manchester, Great Britain

Advances in Large-Scale Laser Paint Stripping (1801)
Stan Ream, EWI

Single-Pulse Control of Ablation by Monitoring Response of Target Material (1802)
Sergey Broude, Chen-Hsiung Cheng, Resonetics

Analysis of Material Removal on Metallic Materials by Pulsed Fiber Lasers (1803)
Mark Brodsky, SPI Lasers

Laser Cleaning of Graffiti from Building Stone Using High Power Diode Laser (1804)
Joaquin Penide, Felix Quintero, Rafael Comesana, Jesus Del Val, Fernando Lusquinos, Juan Pou, Dpto. Fisica Aplicada, Univ. of Vigo; Antonio Riveiro, Centro Univ. de la Defensa; Amadeo Sanchez-Castillo, Facultad de Ingenieria Mecanica, Univ. Michoacana de San Nicolas de Hidalgo

Characterization of the Corrosion Performance of Aluminium Laser Alloyed with Stellite 6 and Zirconium Powders (1805)
Sisa Pityana, Center for Scientific and Industrial Research, National Laser Centre.; Patricia Popoola, Tshwane Univ. of Technology

Characterization of Protective Layers Produced by Laser Treatment (1806)
Vaclav Ocelik, Ismail Hemmati, M2I/Univ. Groningen; Jeff Th.M. De Hosson, Department of Applied Physics, Univ. of Groningen

Surface Glazing of Concrete Using Lasers for Protection and Decommissioning (1807)
Jonathan Lawrence, Univ. of Lincoln

Microstructure Evaluation of A356 Aluminium Alloy Laser Surface Alloyed with Ni-Ti-SiC and Ni-Ti-C (1808)
Clayton D' Amato, Maurizio Fenech, Joseph Buhagiar, John C. Betts, Univ. of Malta

On the Interaction of the Particles of Tantalum with a Substrate of Copper in the Cold Spray Bonding Process (1809)
Nifa Anass, Laurent Berthe, Michel Boustie, Laure-Line Descurninges, CNRS

LMP Session 19: Modelling & Simulation

September 27, 2012 • 8:30am

Session Chair: Remy Fabbro, PIMM Laboratory, Arts et Métiers ParisTech - CNRS, Paris, France

Three-Phase 3D Modelling of a Laser Cutting Process Using Smoothed Particle Hydrodynamics (SPH) (1901)
Lin Li, Noorhafiza Muhammad, Benedict Rogers, The Univ. of Manchester

Numerical Simulation of Cut Kerf Formation Under the Influence of CO_2 and Fiber Lasers Radiation (1902)
Aleksandr Zaitsev, Grigoriy Ermolaev, Alexey Gurin, ITAM SB RAS

Modelling of Cutting Velocity Influence on the Kerf Front During Laser Cutting Process (1903)
El-Hachemi Amara, Centre for Development of Advanced Technologies; Remy Fabbro, PIMM Laboratory (Arts et Métiers ParisTech-CNRS); Koji Hirano, Nippon Steel Corporation

Thermohydraulic Aspects in Laser Welding and Cutting Processes (1904)
Toshiharu Muramatsu, Japan Atomic Energy Agency

The Numerical Simulation of Heat Transfer During a Hybrid Laser-MIG Welding of Duplex Steel (1905)
Issam Bendaoud, Henri Andrzejewski, Alexandre Mathieu, Simone Mattei, Pierre Sallamand, Iryna Tomashchuk, Interdisciplinary Laboratory Carnot of Burgundy, Univ. of Burgundy; Eugen Cicala, Mechanical Engineering Faculty, Polytechnic Univ. of Timisoara; Amelie Fanica, Material Research Centre of Creusot, Arcelor Mittal France/Industeel

Study on Temperature Dependence of Recoil Pressure Near the Boiling Temperature - Towards Better Modeling and Simulation (1909)
Koji Hirano, Nippon Steel Corporation; Remy Fabbro, Maryse Muller, PIMM Laboratory, Arts et Métiers ParisTech - CNRS

Modeling Keyhole and Weld Pool Dynamics of Laser Welding Under Variable Ambient Pressure (1906)
Shengyong Pang, State Key Laboratory of Materials Processing and Die & Mould Technology, Huazhong Univ. of Science & Technology; Koji Hirano, Nippon Steel Corporation; Remy Fabbro, PIMM Laboratory, Arts et Métiers ParisTech - CNRS

Three-Dimensional Dynamic Modeling of Keyhole During Pulse Laser Welding (1907)
Wenda Tan, Yung Shin, Purdue Univ.

Towards a Quantitative Model for Porosity Predication in CO_2 Laser Welding of Titanium Alloy Sheets (1908)
Shengyong Pang, Weidong Chen, Lunji Hu, Huazhong Univ. of Sci. & Tech.

Laser Microprocessing Conference

Conference Chair: **Henrikki Pantsar,** *Cencorp Oyj, Salo, Finland*

The Laser Microprocessing Conference will present an in-depth view into the evolving world of micro-scale laser applications, innovative optics and advances in laser sources. Development in this growing field is fast-paced, and the ICALEO® congress is the place to visit to see and hear the state of the art in applied research and gain knowledge of development trends. Technologies presented in this conference will be the drivers for efficient manufacturing and sustainable growth in the future.

The Laser Microprocessing Conference comprises more than 80 technical and invited papers, featuring a wide spectrum of applications from biomedical to energy generation and storage. In 2012, there is a great deal of emphasis on processing of various materials, such as thin films, CFRP and transparent materials. The importance of laser surface engineering is increasing, and new laser sources and optical concepts have been developed for more cost efficient manufacturing and better quality. In addition, other aspects of micromachining and joining, as well as physical interactions and monitoring solutions, are well covered. Overall, this year's Laser Microprocessing Conference offers a balanced mixture of innovation, science and technology transfer, setting the stage for an exciting ICALEO congress, full of enthusiasm, leading edge technology and networking.

LMF Session 1 (Joint with Nano Conference): World of Applications in Sub-Millimeter Scale

September 24, 2012 • 1:30pm

Session Co-Chairs: Henrikki Pantsar, Cencorp Corporation, Canton, MI, USA; Yongfeng Lu, Univ. of Nebraska-Lincoln, Lincoln, NE, USA

Combination of Photonics and Nano Technology - New Possibilities for Micro and Macro Applications - Invited Presentation (M101)
Michael Schmidt, Bayerisches Laserzentrum GmbH

Overview on How to Integrate Difference Scales in Laser Material Processing – Invited Presentation (M102)
Lin Li, The Univ. of Manchester

LMF Session 2: Medical Devices and Biomedical Applications

September 24, 2012 • 3:20pm

Session Chair: Xiaoyan Zeng, Huazhong Univ. of Science & Technology, Wuhan, People's Republic of China

Variation of Biocompatibility of Titanium Dioxide Film by Femtosecond Laser Irradiation (M201)
Togo Shinonaga, Naoto Horigutchi, Yuichiro Ito, Nobuyuki Abe, Masahiro Tsukamoto, Osaka Univ.; Takao Hanawa, Akiko Nagai, Kimihiro Yamashita, Institute of Biomaterials and Bioengineering, Tokyo Medical and Dental Univ.

Femtosecond Laser Surface Processing of Platinum (M202)
Stephen Brown, Andrew Fisk, Pulse Technologies; Edward Reutzel, ARL, The Penn State Univ.

Femtosecond Laser Manufacturing of Intraocular Implants (M203)
Paul-Etienne Martin, Axel Kupisiewicz, Lasea; Christophe Pagnoulle, Physiol; Eric Mottay, Amplitude Systemes

Effect of Laser Induced Crystallinity Modification on Biodegradation Profile of Poly(L-Lactic Acid) (M204)
Shan-Ting Hsu, Y. Lawrence Yao, Columbia Univ.

LMF Session 3: Innovative Laser Optics

September 25, 2012 • 8:30am

Session Chair: Stefan Heinemann, Fraunhofer CLT, Plymouth, MI, USA

Multiple NUV Beam Internal Structuring of Materials Using a Phase-Only Spatial Light Modulator (M301)
Dun Liu, Zheng Kuang, Walter Perrie, Stuart Edwardson, Geoff Dearden, Ken Watkins, Univ. of Liverpool

Surface Ultrafast Laser Micro-Patterning of Silicon Using Diffractive Multi-Beam Patterns (M302)
Zheng Kuang, Dun Liu, Walter Perrie, Stuart Edwardson, Geoff Dearden, Ken Watkins, Univ. of Liverpool

Picosecond Laser Beam Shaping Using a Spatial Light Modulator (M303)
Dun Liu, Zheng Kuang, Leigh Mellor, Walter Perrie, Stuart Edwardson, Geoff Dearden, Ken Watkins, Univ. of Liverpool

All Solid-State Picosecond Passively Mode-Locked Laser (M310)
Junjie Chi, Beijing Univ. Of Technology

Creating Flattop Square Laser Spots in Microprocessing Systems with Scanning Optics (M305)
Alexander Laskin, Vadim Laskin, AdlOptica GmbH

Increasing the Productivity of Femtosecond Laser Using a Spatial Light Modulator (M306)
Petri Laakso, Raimo Penttilä, Ilkka Vanttaja, VTT; Martti Silvennoinen, Jarno Kaakkunen, Kimmo Päväsaari, Univ. of Eastern Finland

An Aspherical Reflecting Focusing Method for Direct Semiconductor Laser (M311)
Xubao Wang, Qinggai Mi, Dongyu Liu, Institute of Laser Engineering, Beijing Univ. of Technology

Advances in Ultra Short Pulsed Parallel Processing Using a Spatial Light Modulator (M308)
Stuart Edwardson, Zheng Kuang, Dun Liu, Walter Perrie, Geoff Dearden, Ken Watkins, Univ. of Liverpool

The Impact of Graphite Coating and Wavelength on Picosecond Laser Machining of Optical Glasses (M309)
Krystian Wlodarczyk, Frank Albri, Robert Maier, Duncan Hand, Heriot-Watt Univ.; Nick Weston, Renishaw PLC

Program Committee:

Neil Ball, Directed Light Inc., San Jose, CA, USA
Masayuki Fujita, Institute for Laser Technology, Osaka, Japan
Jack Gabzdyl, SPI Lasers, Southampton, Great Britain
Sami Hendow, Consultant, Los Altos, CA, USA
Aravinda Kar, CREOL, The College of Optics and Photonics, Univ. of Central Florida, Orlando, FL, USA
Nam Seong Kim, EO Technics, Anyang, South Korea
Petri Laakso, VTT, Lappeenranta, Finland
Michael Mielke, Raydiance, Inc., Petaluma, CA, USA
Eric Mottay, Amplitude Systemes, Pessac, France
Yasuhiro Okamoto, Okayama Univ., Okayama, Japan
Alexander Olowinsky, Fraunhofer ILT, Aachen, Germany
Yasu Osako, ESI, Portland, OR, USA
Michael Schmidt, Bayerisches Laserzentrum GmbH, Erlangen, Germany
Sascha Weiler, TRUMPF Inc., Farmington, CT, USA
Bodo Wojakowski, Laser Zentrum Hannover e.V., Hannover, Germany
Xiaoyan Zeng, Huazhong Univ. of Science & Technology, Wuhan, People's Republic of China

LMF Session 4: Microwelding

September 25, 2012 • 1:30pm

Session Chair: Geoff Shannon, Miyachi Unitek, Monrovia, CA, USA

Welding Characteristics of Foturan Glass Using Ultrashort Laser Pulses - Invited Presentation (M401)
Isamu Miyamoto, Osaka Univ.; Yasuhiro Okamoto, Okayama Univ.; Kristian Cvecek, Michael Schmidt, Univ. Erlangen-Nuremberg; Henry Helvajian, The Aerospace Corporation

Novel Fusion Welding Technology of Si/Glass Using Ultrashort Laser Pulses with High Pulse Repetition Rates (M402)
Isamu Miyamoto, Osaka Univ.; Yashuhiro Okamoto, Okayama Univ.; Jarno Kangastupa, Tiina Amberla, Corelase Ltd.; Assi Hansen, Jorma Vihinen, Tampere Univ.of Technology

Quasi Continuous Wave (QCW) Long Pulse Fiber Lasers (M403)
Tony Hoult, IPG Photonics Corporation

Examinations on Laser-Welded Joints of Ultra-Thin Metallic Foils (M404)
Andreas Patschger, Univ. of Applied Sciences Jena

Model for Laser Spot Welding Stability and Analyses on Copper (M405)
Anas Moalem, Philipp Von Witzendorff, Uwe Stute, Ludger Overmeyer, Laser Zentrum Hannover e.V.

Micro-Laser-GMA Hybrid Welding - The Advancement from Macro to Micro Range (M406)
Stefan Jakobs, Michael Mavany, Uwe Reisgen, Welding and Joining Institute, RWTH-Aachen Univ.

LMF Session 5: Processing of Transparent and Brittle Materials

September 25, 2012 • 1:30pm

Session Chair: Yasu Osako, ESI, Portland, OR, USA

The Discussion About the Crack in the Glass Caused by Laser (M501)
Chao Huang, Jimin Chen, Jianwen Yuan, Beijing Univ. of Technology

Singulation of Sapphire Substrate with High Aspect Ratio Internal Modification by Sub-Nanosecond Pulsed Fiber Laser (M502)
Yasuhiro Okamoto, Kenta Takahashi, Akira Okada, Okayama Univ.

The Impact of Thermal Strain Rate on Laser Bonding of Polymer Films (M506)
Colin Dowding, Loughborough Univ.

Laser Transmission Welding with Part Adapted Temperature Fields (M507)
Martin Devrient, Thomas Frick, BLZ Bayerisches Laserzentrum GmbH; Verena Wippo, Peter Jaeschke, Heinz Haferkamp, LZH Laserzentrum Hannover e.V.; Michael Schmidt, LPT Lehrstuhl fuer Photonische Technologien Der Friedrich-Alexander Univ. Erlangen-Nuernberg

Diagnostic and Simulation of ps-Laser Glass Cutting - Invited Presentation (M504)
Urs Eppelt, Wolfgang Schulz, Claudia Hartmann, Fraunhofer ILT; Simone Russ, TRUMPF Laser GmbH+ Co. KG; Christof Siebert, TRUMPF Laser-und Systemtechnik GmbH

CO_2 Laser Free-Shape Cutting of Flexible Glass Substrates (M505)
Xinghua Li, Sean Garner, Corning Inc.

LMF Session 6: Thin Film Processing

September 26, 2012 • 8:30am

Session Chair: Sascha Weiler, TRUMPF Inc., Farmington, CT, USA

Influence of Nitrogen on Diamond Films Generated by Laser-CVD (M601)
Knut Partes, Michael Schwander, Frank Vollertsen, BIAS

Line Beam Laser Lift-Off Approach for Sapphire Removal (M602)
Ralph Delmdahl, Rainer Paetzel, Rolf Senczuk, Jan Brune, Coherent GmbH; Michael Kunzer, Ruediger Moser, Christian Gossler, Ulrich Schwarz, Fraunhofer IAF

Evaluation of Damaged Region at the Groove Edge of TCO Film in Pulsed Fiber Laser Processing (M603)
Yasuhiro Okamoto, Naoya Takahashi, Akira Okada, Okayama Univ.; Shin-Ichi Nakashiba, Tomokazu Sakagawa, Kataoka Corporation

Ultrafast Movies of Thin Film Ablation with Ultra-Short Laser Pulses (M604)
Matthias Domke, Stephan Rapp, Gerhard Heise, Heinz Huber, Munich Univ. of Applied Sciences

Mechanism of Selective Removal of Transparent Conductive Oxide Layers: Femtosecond- vs. Picosecond- Laser Pulse Ablation (M605)
Juerg Aus Der Au, Victor Matylitsky, High Q Laser GmbH; Heinz Huber, Lasercenter, Munich Univ. of Applied Science

LMF Session 7: Surface Modification I

September 26, 2012 • 8:30am

Session Chair: Jack Gabzdyl, SPI Lasers, Southampton, Great Britain

Texturing of 3D Curved Surfaces Using Picosecond Pulsed Lasers – Enabling New Applications of Functional Surfaces - Invited Presentation (M705)
Max Groenendijk, Lightmotif B.V.

Comparison Study of Sub Microstructure Generation on Metals Between Femtosecond Ti:Sa Laser and High Repetition Yb Doped Fiber Laser (M702)
Marc Faucon, John Lopez, Rainer Kling, ALPhANOV

Femtosecond Laser Ablation of Dentin (M703)
Rui Vilar, Instituto Superior Técnico

Wear Protection of Drilling Tools Using Laser Dispersing (M704)
Christian Noelke, Laser Zentrum Hannover e.V.

LMF Session 8: Lasers in Energy Generation and Storage

September 26, 2012 • 10:30am

Session Chair: Rainer Kling, ALPhANOV, Talence Cedex, France

Lasers in Thin Film Photovoltaic - Invited Presentation (M801)
Kerstin Kowalick, Ruhr-Univ. Bochum

Laser Scribing of ITO/ZNO Thin Films on Flexible PET Foil for Roll to Roll Production of Polymer Solar Cells (M802)
Susana Abreu Fernandes, Kerstin Kowalick, Ruhr-Univ. Bochum

Transmissive Optic System for Manipulation of Ignition Location in Laser Ignition for Gas Turbines (M803)
Jonathan Griffiths, Jonathan Lawrence, Univ. of Lincoln

Investigation of Different Laser Cutting Strategies for Sizing of Li-Ion Battery Electrodes (M804)
Rahul Patwa, Hans Herfurth, Stefan Heinemann, Fraunhofer USA, CLT; Jyoti Mazumder, Dongkyoung Lee, The Univ. of Michigan

Joining of Lithium-Ion Batteries Using Laser Beam Welding (M805)
Philipp Schmidt, Markus Schweier, Robert Wiedenmann, Michael F. Zaeh, Institute for Machine Tools and Industrial Management (IWB) of Technische Univ. München

LMF Session 9: Surface Modification II

September 26, 2012 • 10:30am

Session Chair: Veli Kujanpaa, VTT Technical Research Centre of Finland, Lappeenranta, Finland

Phase Change Writing in Sn-Doped Ge-Sb-Te Film with Ultraviolet Laser (M901)
Weiping Zhou, Furong Liu, Chao He, Jianjun Zhao, Jimin Chen, Beijing Univ. of Technology

Research Progress on Phase Change Materials for Optical Storage (M902)
JianJun Zhao, Furong Liu, Weiping Zhou, Beijing Univ. of Technology

Laser Precision Surface Sculpting of 2D Diffractive Optical Structures on Stainless Steels (M903)
Stephanie Giet, Andrew Dunn, Marcus Ardron, Duncan Hand, Robert Maier, Heriot Watt Univ.; Nick Weston, Matthew Kidd, Renishaw PLC

Laser Surface Texturing of Bioactive Materials (M904)
Juan Pou, Ramon Soto, Rafael Comesana, Mohamed Boutinguiza, Jesus Del Val, Felix Quintero, Fernando Lusquinos, Univ. of Vigo; Antonio Riveiro, Centro Univ. de la Defensa

Pulsewidth Dependence of Laser Induced Periodic Surface Structures Using a Picosecond Fiber Laser (M905)
Brian Baird, Summit Photonics; Tim Gerke, Fianium Inc.

Improving the Wettability on ZnO and ZrO_2 Single Crystal Surfaces by Laser Irradiation (M906)
Yijian Jiang, Beijing Univ. of Technology

LMF Session 10: Modeling and Physical Interactions

September 26, 2012 • 3:00pm

Session Chair: Yasuhiro Okamoto, Okayama Univ., Okayama, Japan

Infrared-Visible Light Conversion Using DCM Dye Micrograins Embedded in a Resin Sheet and Application to an IR Sensor Card (M1001)
Tadashi Kawazoe, Motoichi Ohtsu, Univ. of Tokyo; Tohru Fujita, Hiroyasu Fujiwara, Minoru Niigaki, Hamamatsu Photonics KK

Femtosecond Laser Ablation of Metals at Different Fluences and the Role of Early Stage Plasma (M1002)
Xin Zhao, Yung Shin, Purdue Univ.

Characterisation of Interaction Phenomena in High Repetition Rate Femtosecond Laser Ablation of Metals (M1003)
Joerg Schille, Lutz Schneider, Lars Hartwig, Robby Ebert, Horst Exner, Univ. of Applied Sciences Mittweida; Patricia Scully, Nicholas Goddard, The Univ. of Manchester

From ps to fs: Dependence of the Material Removal Rate and the Surface Quality on the Pulse Duration for Metals, Semiconductors and Oxides (M1004)
Beat Neuenschwander, Beat Jaeggi, Michelle Buechel, Marc Schmid, Urs Hunziker, Bern Univ. of Applied Sciences Engineering and Information Technology

Non-Dimensional Evaluation of Nonlinear Absorptivity in Internal Modification of Glass Using USLP (M1005)
Isamu Miyamoto, Osaka Univ.; Kristian Cvecek, Bayerisches Laserzentrum; Michael Schmidt, Univ. Erlangen-Nuremberg

Effects of Polarization on Laser Diffusion and Materials Modification (M1006)
Sen-Yong Chen, Aravinda Kar, The College of Optics and Photonics, Univ. of Central Florida; Raj Vaidyanathan, AMPAC, UCF

LMF Session 11: Monitoring and Detection

September 26, 2012 • 3:00pm

Session Chair: Andreas Wetzig, Fraunhofer IWS, Dresden, Germany

Inline Coherent Imaging at Higher Powers - Invited Presentation (M1101)
Paul J. L. Webster, Queen's Univ.

Real Time Surface Tracking System in Laser Micromachining (M1102)
Ville Hautala, Jorma Vihinen, Tampere Univ. of Technology; Antti Maattanen, Primoceler

Analysis of Nanosecond Laser Ablation Rate of Metals with and without Phase Explosion in Air and Water (M1103)
Yunfeng Cao, Xin Zhao, Yung Shin, Purdue Univ.

Characterization of Shaped Nanosecond Laser Ablation Events Using High Speed Pulsed Digital Holography (M1104)
Krste Pangovski, William O'Neill, Institute for Manufacturing, Univ. of Cambridge

1.3μm-Band Si Photodetectors with Optical Gains Fabricated by Dressed Photon Assisted Annealing (M1105)
Hajime Tanaka, Tadashi Kawazoe, Motoichi Ohtsu, The Univ. of Tokyo

LMF Session 12: Microprocessing and Drilling

September 27, 2012 • 8:30am

Session Chair: Kevin Hartke, Mound Laser & Photonics Center, Inc., Miamisburg, OH, USA

Trend Analysis of Laser Micromachining - Invited Presentation (M1201)
Wenwu Zhang, GE GRC

Dual Beam Laser Grooving of CFRP by Pulsed Lasers (M1202)
Masayuki Fujita, Toshihiro Somekawa, Institute for Laser Technology; Takumi Ozaki, Minoru Yoshida, Kinki Univ.; Noriaki Miyanaga, Institute of Laser Engineering, Osaka Univ.

Potentials for Lasers in CFRP Production (M1203)
Rainer Kling, Charly Lumena, John Lopez, ALPhANOV

Heat Accumulation in Short-Pulse Laser Processing (M1204)
Rudolf Weber, Andreas Michalowski, Anne Feuer, Peter Berger, Thomas Graf, IFSW, Univ. of Stuttgart

Laser-Beam Helical Drilling of High Quality Micro Holes (M1205)
Christian Fornaroli, Fraunhofer ILT

Investigation of the Cutting Performance of Laser Dressed Metal Bonded Diamond Blades (M1206)
Philipp von Witzendorff, Anas Moalem, Uwe Stute, Ludger Overmeyer, Laser Zentrum Hannover e.V.

High Precision and High Throughput Surface Structuring by Synchronizing Mechanical Axes with an Ultra Short Pulsed Laser System in MOPA Arrangement (M1207)
Guido Hennig, Guido Hennig, Daetwyler Graphics Ag; Urs Hunziker, Beat Jaeggi, Thomas Meier, Beat Neuenschwander, Markus Zimmermann, Bern Univ. of Applied Sciences Engineering and Information Technology

Pulsed Laser Cutting of Bright Metals (M1208)
Paul Harrison, SPI Lasers

LMF Session 13: Advances in Laser Sources

September 27, 2012 • 8:30am

Session Chair: Nam Seong Kim, EO Technics, Anyang, South Korea

High Average Power Compact Ultrafast Fiber Amplifier (M1301)
Franck Morin, Yoann Zaouter, Robert Braunschweig, Clemens Hoenninger, Eric Mottay, Amplitude Systemes

Hundreds of Milliwatts Supercontinuum Generation in All-Fiber Laser (M1302)
Chang Sun, Beijing Univ. of Technology

Frequency Shifting of High Intensity Picosecond Lasers by Stimulated Raman Scattering (M1303)
Xu Yang, Institute of Laser Engineering, Beijing Univ. of Technology

2μm Tm-Doped Picosecond All-Fiber Laser with 7.8 W Average Output Power (M1304)
Yi Cao, Jiang Liu, Jiang Liu, Qian Qang, Pu Wang, Jia Xu, Beijing Univ. of Technology

Pulse Energy Scaling of ps to ns Pulses in Highly Integrated Fiber Amplifiers for Micromachining (M1305)
Hakan Sayinc, Jörg Neumann, Thomas Theeg, Dietmar Kracht, Laser Zentrum Hannover e.V.

New Generation Q-Switched DPSS Nanosecond Green Laser for Efficient Micromachining Applications (M1306)
Ashwini Tamhankar, Rajesh Patel, Spectra-Physics Lasers, Newport Corporation

High Power 532 nm Square Beam Delivery (M1307)
Andrew Chesworth, Lee Laser, Inc.

The Research on the Micro Processing Used All-Solid-State Nanosecond UV Laser (M1308)
Zhenxu Bai, Beijing Univ. of Technology

High Average Power, High Energy Femtosecond Regenerative Amplifiers (M1309)
Martin Delaigue, Robert Braunschweig, Clemens Hoenninger, Eric Mottay, Amplitude Systemes

Nanomanufacturing Conference

Conference Co-Chairs:

Yongfeng Lu, *Univ. of Nebraska – Lincoln, Lincoln, Nebraska, USA*
Xianfan Xu, *Purdue Univ., West Lafayette, Indiana, USA*

The Nanomanufacturing Conference of ICALEO® presents nanomanufacturing papers relevant to laser technologies. Much progress has been achieved in laser direct writing, laser nanomachining and nanofabrication using ultrafast lasers and laser-assisted growth of nanostructures. This conference will highlight research in emerging nanomanufacturing technologies in 3-D micro/nanofabrication, two-photon lithography, laser synthesis and diagnostics of carbon nanomaterial, epitaxial growth of graphene for optoelectronics, nanolithography, nanoscale thermal imaging, plasmonics, surface nanostructuring, laser sintering and laser-assisted growth and epitaxy. These studies encompass a variety of applications, including nanoelectronics, photonic crystals, optoelectronics, sensors and plasmonic devices.

Nano Session 1: Laser Micro/Nano Processing

September 24, 2012 • 3:20pm

Session Chair: Yongfeng Lu, Univ. of Nebraska-Lincoln, Lincoln, NE, USA

Femtosecond Laser Inscribed Fiber Devices and Their Sensing Applications - Invited Presentation (N101)
Qiying Chen, Ping Lu, Liqiu Men, Memorial Univ. of Newfoundland

Opto-Hydrodynamic Processing of Materials Using Microdroplets - Invited Presentation (N102)
Dongsik Kim, POSTECH

Micromachining Through Silicon Substrates by Ultrafast Laser at 1552 nm (N103)
Yoshiro Ito, Yuichi Morita, Rie Tanabe, Department of Mechanical Engineering, Nagaoka Univ. of Technology; Hidemasa Sakurai, Kozo Tada, Citizen Finetech Miyota Co. Ltd.

Nano Session 2: Laser-Material Interactions at Nanoscales

September 25, 2012 • 8:30am

Session Co-Chairs: Xinwei Wang, Iowa State Univ., Ames, IA, USA; Xianfan Xu, Purdue Univ., West Lafayette, IN, USA

Nonequilibrium Laser Synthesis and Real-Time Diagnostics of Carbon Nanomaterials - Invited Presentation (N201)
David Geohegan, Alex Puretzky, Murari Regmi, Chris Rouleau, Gyula Eres, Karren More, Oak Ridge National Laboratory; Gerd Duscher, Univ. of Tennessee, Dept. of Materials Science and Engineering

Enhanced Mobility of Surface Molecular Species by Laser Ultrasonic Excitation - Invited Presentation (N202)
Henry Helvajian, The Aerospace Corporation

Efficient Laser Coupling into Plasmonic Nanoantenna Arrays for Fabrication and Characterization of Sensitive IR Bolometers (N203)
M. Mahjouri-Samani, W. Xiong, X.N. He, Y.S. Zhou, P Hilger, Yongfeng Lu, Univ. of Nebraska-Lincoln

Femtosecond Laser Welded Plasmonic Thin Films for Enhanced Performance of Si Solar Cells (N204)
Anming Hu, Univ. of Waterloo

Epitaxial Graphene for Photonics and Optoelectronics – Invited Presentation (N205)
Ji Wei, National Univ. of Singapore

Nanotemplate-Assisted Fabrication of Nanoneedle/Nanoprotrusion Array and Nano-Periodic Surface Ripples - Invited Presentation (N206)
Mitsuhiro Terakawa, Go Obara, Yuto Tanaka, Hisashi Shimizu, Minoru Obara, School of Integrated Design Engineering, Keio Univ.; Eric Mazur, Department of Physics, Harvard Univ.

Laser Direct Written Silicon Nanowires and Graphene for Chemical Sensing Applications (N207)
Woongsik Nam, James Mitchell, Dapeng Wei, Xianfan Xu, Purdue Univ.

Nano Session 3: Thermal Characterization and Processing at Micro/Nanoscales

September 26, 2012 • 8:30am

Session Chair: David Geohegan, Oak Ridge National Laboratory, Oak Ridge, TN, USA

Far-Field Nanoscale Thermal and Structure Imaging - Invited Presentation (N301)
Xinwei Wang, Iowa State Univ.

Role of Metal/Matrix Interfaces in the Thermal Management of Metal-Carbon Composites - Invited Presentation (N302)
Namas Chandra, Yongfeng Lu, Dept. of Electrical Engineering, Univ. of Nebraska-Lincoln; Thomas Guillemet, Jean-Marc Heintz, Jean-Francois Silvain, Institute of Condensed Matter Chemistry of Bordeaux, Univ. Bordeaux

Evaluation of Thermal Resistance at Silicon/Diamond Interfaces Through Infrared Photothermal Radiometry (N303)
Jean-Luc Battaglia, Andrzej Kusiak, Andrea Cappella, Institut de Mecanique et Ingenierie, Dept. Trefle; Yongfeng Lu, Dept. of Electrical Engineering, Univ. of Nebraska-Lincoln; Namas Chandra, Jean-Marc Heintz, Jean-Francois Silvain, Institute of Condensed Matter Chemistry of Bordeaux; Thomas Guillemet, Univ. of Nebraska – Lincoln, Institute of Condensed Matter Chemistry of Bordeaux

Fabrication of Micro-Nano Hierarchical Cu Structures on Engineering Substrate by Hybrid Laser Approach and their Application to Photodegradation of Methyl Orange Under Visible Light (N304)
Minlin Zhong, Changsheng Dong, Ting Huang, Tsinghua Univ.

Nano Session 4: Laser Nanolithogrpahy and Nanostructuring

September 26, 2012 • 10:30am

Session Chair: Henry Helvajian, The Aerospace Corporation, Los Angeles, CA, USA

Plasmon-Assisted Nanolithography Exposed by Femtosecond Laser Beam Through Gold Nanostructured Photomasks - Invited Presentation (N401)
Kosei Ueno, Hokkaido Univ.

The Black and Colored Metals and Applications - Invited Presentation (N402)
Chunlei Guo, Univ. of Rochester

Multi-Material Projection Micro-Stereolithography and its Applications (N403)
Howon Lee, Howon Lee, Chunguang Xia, Univ. of Illinois at Urbana-Champaign; Nicholas Fang, MIT

Three-Dimensional Micro/Nano-Fabrication by Integration of Additive and Subtractive Femtosecond-Laser Direct Writing Processes (N404)
W. Xiong, Y.S. Zhou, X.N. He, Y. Gao, M. Mahjouri-Samani, Y.F. Lu, Univ. of Nebraska-Lincoln; T. Baldacchini, Newport Corporation

Beam Shaping Optics to Improve Holographic and Interferometric Nanomanufacturing Techniques (N405)
Alexander Laskin, Vadim Laskin, AdlOptica GmbH

Nano Session 5: Laser Applications in Flexible Electronics

September 27, 2012 • 8:30am

Session Chair: Dongsik Kim, POSTECH, Pohang, South Korea

Laser-Assisted Dry Transfer of Vertically Aligned Carbon Nanotube Array on Flexible Polymer Substrates (N501)
Daeho Lee, Jung Bin In, Costas Grigoropoulos, UC Berkeley

An Experimental Investigation into the Laser Sintering Process of Cu Nanoparticle Based Ink on Polymer Substrates for Printed Electronics (N502)
Juan Carlos Hernandez-Castaneda, Gary Ka Lai Ng, Lok Boon Keng, Singapore Institute of Manufacturing Technology

Nano-Needle Fabrication Based on Optical Vortex Laser Ablation (N503)
Kohei Toyoda, Katsuhiko Miyamoto, Nobuyuki Aoki, Takashige Omatsu, Chiba Univ.

Program Committee:

Craig Arnold, Princeton Univ., Princeton, NJ, USA
Tommaso Baldacchini, Newport Corporation, Irvine, CA, USA
Stephan Barcikowski, Univ. of Duisburg-Essen and Center for Nanointegration Duisburg-Essen (CeNiDE), Essen, Germany
Kevin Chen, Beijing Golden Way Scientific Co. Ltd., Beijing, People's Republic of China
Shaochen Chen, Univ. of Texas at Austin, Austin, TX, USA
Haris Doumanidis, Univ. of Cyprus, Nicosia, Cyprus
Nick Fang, MIT, Cambridge, MA, USA
Costas Grigoropoulos, Univ. of California - Berkeley, Berkeley, CA, USA
Changzhi Gu, Institute of Physics, Chinese Academy of Sciences, Beijing, People's Republic of China
Peter Herman, Univ. of Toronto, Toronto, Canada
Yoshiro Ito, Nagaoka Univ. of Technology, Nagaoka, Niigata, Japan
Sungho Jeong, Gwangju Institute of Science and Technology, South Korea
Lan Jiang, Beijing Institute of Technology, Beijing, People's Republic of China
Yuankun Lin, Univ. of Texas-Pan American, Edinburg, TX, USA
Etsuji Ohmura, Osaka Univ., Toyonaka, Osaka, Japan
Alberto Pique, Naval Research Laboratory, Washington, DC, USA
Genot Pomrenke, AFOSR, London, Great Britain
Xinwei Wang, Iowa State Univ., Ames, IA, USA
Yunshen Zhou, Univ. of Nebraska – Lincoln, Lincoln, NE, USA

Poster Presentation Gallery

Tuesday, September 25 & Wednesday, September 26

The Poster Presentation Gallery will be featured on Tuesday and Wednesday of the conference. Join presenters Wednesday morning for breakfast and sharing of ideas. Poster Presenters will be by their posters on Wednesday morning from 7:45am – 8:30am to answer questions. Poster presenters who submit a manuscript will be included in the ICALEO Proceedings.

TEA CO_2 Laser Machining of Carbon Fiber-Reinforced Polymer Composites (P101)
Adel Salama, Paul Mativenga, Lin Li, The Univ. of Manchester

Study of the Behaviour of Carbon-Fiber-Reinforced Polymer Composite Using Shock Produced by Laser (P102)
Laurent Berthe, CNRS/Laboratoire Procedes et Ingenierie en Materiaux et Mecanique

Independent Focus Position and Focus Diameter Control - An Optimized Laser Cutting Head for High Brightness Solid State Lasers (P103)
Björn Wedel, Hagen Zimer, HIGHYAG Lasertechnologie GmbH

Observations of Delamination Induced by Laser Drilling on a Cobalt Base Superalloy (P104)
Girardot Jeremie, Schneider Matthieu, Berthe Laurent, Favier Veronique, PIMM Laboratory, Arts et Métiers ParisTech

Diode-Pumped Nanosecond Nd:YAG Laser Micromachining of Ti-3Al-2.5V Tubes for Fatigue Life Study (P105)
Yaomin Lin, Alfred Mann Foundation for Scientific Research; Mool Gupta, Department of Electrical and Computer Engineering, Univ. of Virginia

Investigation of the Interactions Between Laser-Sustained Plasma and a Substrate Without Direct Laser Irradiation (P106)
Amber Black, Judith Todd, The Penn State Univ.; Stephen Copley, ARL, The Penn State Univ.

Design for Laser Welding (P107)
David Havrilla, TRUMPF Inc.

Maximizing Laser Utilization and Productivity - On-The-Fly Robot Remote Laser Welding in the 3rd Dimension (P108)
Björn Wedel, Hagen Zimer, HIGHYAG Lasertechnologie GmbH

Position Welding of 960 MPa Ultra High-Strength Steel (P110)
Jukka Siltanen, Rautaruukki Oyj

Evaluation of Laser Welding Quality Based on a Plasma Spectroscopy in a Continuous Steel Process (P111)
Jun Choi, POSCO

Pulsed Laser Weldability of Hastelloy C-276: Corrosion Resistant Property (P113)
Dongjiang Wu, Guangyi Ma, Shibo Liu, Mengxue Wu, Dalian Univ. of Technology

Welding of Aluminum Alloy 6061 to Zinc Coated Steels by Cold Metal Transfer (P114)
Shanglu Yang, General Motor China Science Lab

Study on Microstructures and Properties of Laser Beam Welded 2024 Aluminum Alloy T-Joint (P115)
Enguang He, Beijing Aeronautical Manufacturing Technology Research Institute

Laser Beam Welding of Al-Li Alloys for Aerospace Application (P116)
Xinyi Zhang, Rongshi Xiao, Beijing Univ. of Technology

Yb:YAG Laser Welding for CaO Added AZ31 Mg Alloy (P117)
Cheolhee Kim, Minjung Kang, KITECH

Effect of Laser Shocking on Intergranular Corrosion Resistance of 304 Type Austenite Stainless Steel (P119)
Zhenyu Gu, Sen Yang, Nanjing Univ. of Scinece and Technology

Effects of Laser Peening Parameters on Plastic Deformation of SUS316L (P120)
Kohei Mizuta, Kinki Univ.

Characterization of TC17 Titanium Alloy Treated by Square-Spot Laser Shock Peening (P121)
Cao Ziwen, BAMTRI

Microstructural Evolution at the Overlap Zones of X12Cr Martensitic Stainless Laser Alloyed with TiC (P122)
Isaac Adebiyi, Abimbola Patricia Popoola, Tshwane Univ. of Technology; Sisa Pityana, Centre for Scientific and Industrial Research

Dual System of Laser Cladding and Heat Treatment System for Low Friction and Good Wear Resistivity of Mechanical Bearing Surface (P123)
Sun-Hong Park, Byeong Geun Seong, RIST

Laser Cladding with Coaxial Wire Feeding (P124)
Henri Pajukoski, Jonne Näkki, Petri Vuoristo, Jari Tuominen, Tampere Univ. of Technology, Department of Materials Science; Sebastian Thieme, Steffen Nowotny, Fraunhofer IWS, Material and Beam Technology

Corrosion Resistant Laser Coatings for Hydraulic Piston Rods (P126)
Jari Tuominen, Jonne Näkki, Petri Vuoristo, Tampere Univ. of Technology, Department of Materials Science; Juha Miettinen, Tampere Univ. of Technology, Department of Mechanics and Design; Juha Junkala, Tuomo Peltola, Technology Centre Ketek Ltd.

Thermal and Mechanical Modeling of Single Metallic Powder Layer for Laser Micro Sintering (P128)
Jie Yin, Haihong Zhu, Linda Ke, Chongwen He, Panpan Hu, Hong Chen, Duluo Zuo, Huazhong Univ. of Science and Technology, College of Optoelectronic Science and Engineering

Fabrication of Three-Dimensional Nickel Parts Using Laser Micro Sintering (P129)
Linda Ke, Haizhong Zhu, Jie Yin, Chongwen He, Panpan Hu, Hong Chen, Xinbing Wang, Huazhong Univ. of Science and Technology

Laser-Assisted Manufacturing of Porous Metallic Structures (P130)
Jesus Del Val, Rafael Comesana, Fernando Lusquinos, Mohamed Boutinguiza, Felix Quintero, Juan Pou, Univ. of Vigo; Antonio Riveiro, Centro Univ. de la Defensa

Analysis of Process Parameters on Melt Pool Stability in Powder Bed Laser Melting (P131)
Pascal Aubry, Arts et Métiers ParisTech

Capability of Hot Isostatic Pressing on Crack Healing and Microstructure Modification on Rene'80 Prepared by Direct Laser Deposition (P132)
Yanmin Li, Henry Peng, Zhiwei Wu, General Electric (China) Research & Development Center Co. Ltd.

Analysis and Simulation of the Effects of Clad Strategy on Layer Microstructure and Properties (P133)
Mushtaq Khan, Michael Vogel, Juansethi Ibarra-Medina, Andrew J Pinkerton, Manufacturing and Management Group, School of Mechanical, Aerospace and Civil Engineering, The Univ. of Manchester; Narcisse N'Dri, Mustafa Megahed, ESI GmbH

Laser Powder Deposition of AlMgB14/TiB2 (BAM) Ultra-Hard Coatings on Steel and Titanium Substrates (P134)
Michael Carter, South Dakota School of Mines & Technology; James Sears, Quad City Manufacturing Laboratory / South Dakota School of Mines & Technology

Incorporation of CNT-Yarns into Metals by Laser Melting of Powder (P135)
Alexander Kaplan, Alexander Soldatov, Luleä Univ. of Technology; Peter Norman, The Swedish Welding Commission; John Powell, Laser Expertise Ltd.; Shaoli Fang, Ray Baughman, The Univ. of Texas at Dallas

Fieldbus Interfaces and Robust Design Laser Beam Monitoring Meet the Requirements for Applications in Production (P138)
Volker Brandl, Otto Märten, Kramer Reinhard, Harald Schwede, Stefan Wolf, PRIMES GmbH

A New Method of Calculating Diode Laser Beam Quality for Fiber Coupling (P140)
Jing Gao, Beijing Univ. of Technology

Fiber Amplified Diode Lasers with Programmable Pulse Shapes as a Versatile Light Source for Micromachining (P141)
Rainer Erdmann, Gerald Kell, Dietmar Klemme, Kristian Lauritsen, Thomas Schoenau, Picoquant GmbH

3W All-Fiber Super-Continuum Generation (P142)
Yu Feng, Beijing Univ. of Technology

An Experimental Study of Laser Deep Machining (P143)
Emilie Le Guen, Institute of Condensed Matter Chemistry of Bordeaux

Numerical Studies of Laser Cutting of an Anode for Lithium-Ion Batteries (P144)
Dongkyoung Lee, The Univ. of Michigan

Micro Structuring of Steel Using Ultra Short Laser Pulses (P145)
Peter Lickschat, Joerg Schille, Robby Ebert, Horst Exner, Steffen Weissmantel, Univ. of Applied Sciences Mittweida

Influence of Surrounding Gas Type and Pressure Condition on Micro-Drilling Characteristics of Silicon Carbide by Harmonics of Nd:YAG Laser (P146)
Yasuhiro Okamoto, Shin Urushibata, Akira Okada, Okayama Univ.; Shin-Ichi Nakashiba, Tomokazu Sakagawa, Kataoka Corporation

Laser Micromaching of Si3N4 Ceramics (P147)
Markus Höfer, Lothar Schäfer, IST; Sisa Pityana, CSIR - National Laser Centre; Lerato Tshabalala, Tshwane Univ. of Technology

High Quality and High Speed Cutting of Al_2O_3 Substrate with Single Mode Fiber Laser (P148)
Toshiaki Sakai, Akira Fujisaki, Kousuke Kashiwagi, Takashi Kayahara, Takashi Shigematsu, Furukawa Electric Company, Ltd.

Application of LBM Technology for Precise Sapphire Hip Implant Manufacturing (P149)
Dominik Wyszynski, Jozef Gawlik, Cracow Univ. of Technology

Ultrashort Pulse Laser Dicing Process of Sapphire Wafer Using a Multi-Beam (P150)
Yongkwon Cho, Jiyeon Choi, Sangkyu Choi, Dongsig Shin, Jeong Suh, Korea Institute of Machinery and Materials

Laser Precision Micromachining and Quality Evaluation of Tempered Oxide Glasses (P151)
Jiyeon Choi, Hyonkee Sohn, Jeong Suh, Korea Institute of Machinery and Materials

Suitable Processing Conditions Determined from the Standpoint of Residual Strain in Laser Scribing of Glass (P152)
Masanao Murakami, Seiji Shimizu, Mitsuboshi Diamond Industrial Co.,Ltd.; Etsuji Ohmura, Keisuke Yahata, Osaka Univ.

Comparison of Laser Glass Cutting Processes Using ps and fs Lasers (P153)
Byoungcheol Kim, Hyeonguk Kim, Nam Seong Kim, Cheonya Seong, EO Technics

Nanosecond UV Laser Patterning of a Buildup Film with SiO_2 Fillers for Embedded Circuits (P154)
Hyonkee Sohn, Korea Institute of Machinery and Materials

Optimizing Ultrashort Laser Pulses for High-Precision and High-Performance Micromachining Process (P155)
Hoon Jeong, Korea Institute of Industrial Tech; Dongjoo Lee, Kyunghee Park, KITECH

Ultrafast Laser Delineation of Indium Tin Oxide Films for Photovoltaic Devices (P156)
Liqiu Men, Qiying Chen, Memorial Univ. of Newfoundland

Thin-Film Laser Scribing Processes Using ns, ps, and fs Pulses in CIGS Solar Cell Fabrication (P157)
Byoungcheol Kim, Nam Seong Kim, Hong Lee, Hwangjin Lee, EO Technics

Selective Structuring of a Platinum/Tantalum Pentoxide Thin-Film Layer System by Induced Laser Ablation Investigated with Pump-Probe Microscopy (P158)
Janosch Rosenberger, Matthias Domke, Gerhard Heise, Heinz Huber, Munich Univ. of Applied Sciences

Femtosecond Laser Microfabricated Optofluidic Devices and Underlying Laminar Flow (P159)
Daiying Zhang, Liqiu Men, Qiying Chen, Memorial Univ. of Newfoundland

3D Laser Printing for Manufacturing Micro Structure of Tungsten Based Material (P160)
Rui Guo, GE Global Research Shanghai; Yanmin Li, Minghu Guo, Henry Peng, Wen Tan, Ge (China) Research & Development Center Co. Ltd.; Zemin Wang, Xiaoyan Zeng, Huazhong Univ. of Science & Technology

A Thermal Investigation of Conductive Silver Ink Track Cured on Flexible Substrate by Repeating Irradiations of Nd:YAG Laser at the Wavelength at 532 nm (P161)
Liwei Fu, Eamonn Fearon, Walter Perrie, Geoff Dearden, Ken Watkins, Shuo Shang, Univ. of Liverpool

Variation of Photocatalytic Activity in Titanium Dioxide Film Modified by Femtosecond Laser Irradiation (P162)
Naoto Horiguchi, Togo Shinonaga, Graduate School of Engineering, Osaka Univ.; Nobuyuki Abe, Joining and Welding Research Institute, Osaka Univ.; Masahiro Tsukamoto, Joining and Welding Research Institute, Osaka Univ.; Minoru Yoshida, School of Science and Engineering, Kinki Univ.; Masanari Takahashi, Osaka Municipal Technical Research Institute; Masayuki Fujita, Institute for Laser Technology, Osaka Univ.

Matrix Independent Carbonization for the Laser Marking of Plastics (P165)
Matthew Gailey, EMD Chemicals, Inc.

Correction for Point Cloud Acquired by Unstable Scanner (P166)
Jianfeng Ao, Kan Wu, Ming Zhou, China Univ. of Mining and Technology

Mechanism of Micromachining of Semiconductor Silicon by Nano Short Pulses of Multi Wavelength Nd:YVO4 Laser (P167)
Shiva Gadag, RCAM Southern Methodist Univ.

Laser Welding of Seal Tubes for the Instrumented Fuel Irradiation Test (P168)
Soo-Sung Kim, Jon-Man Park, Don-Bae Lee, Yoon-Sang Lee, Korea Atomic Energy Research Institute

Study on Ultrafast Imaging of the Silicon Surface Ablated by a Single Nanosecond Laser Pulse (P169)
Peng Gu, Song Haiying, Ge Qini, Liu Shibing, Liu Song, Dong Xiangming, Beijing Univ. of Technology

Research on Improving of Cut Surface Quality of Laser-Cut Fine Ceramics (P170)
Lingfei Ji, Yijian Jiang, Yinzhou Yan, Yong Bao, Xiaochuan Chen, Beijing Univ. of Technology

Sponsored by:

Student Paper Award Contest

Announcing the 14th Annual ICALEO® Student Paper Award! LIA appreciates the importance of student contributions to ICALEO by offering the opportunity to have their work recognized with this award. Students with accepted papers will be judged by an international panel on the following criteria: Originality of Topic/Material presented, Scientific and Technical Merit and Presentation Quality. Professors do not judge their own student's papers. Prize winners will be notified after the conclusion of ICALEO and will be announced through an article in the *LIA TODAY* newsletter featuring conference highlights.

Cash awards will be presented to 1st, 2nd, 3rd place winners. Winning papers may be submitted to LIA's *Journal of Laser Applications*® for publication (papers will go through the peer review process).

Business Forum & Panel Discussion

Chair: **Ken Dzurko,** *SPI Lasers, Santa Clara, CA, USA*
Monday, September 24 • 1:30pm

Increasing the Role of Lasers in a Non-Laser World

The forum explores growing the serviceable available market (SAM) for industrial lasers by addressing the barriers perceived by traditionally non-laser manufacturing approaches. Success in accelerating the penetration of laser manufacturing technology relies on expanded awareness and acceptance. Considerations include:

- Beyond Star Wars – Perception of lasers needs to advance beyond the exotic to be accepted as a mainstream manufacturing tool. Safety and infrastructure needs, when examined closely, are no worse than traditional manufacturing methods.
- Capability – Laser applications demonstrate compelling capabilities to improve manufacturing precision, quality, yield and throughput.
- Cost triggers – When do laser beams become more cost effective than razor blade, glue and punch presses?

Laser Solutions Short Courses

Short Courses Chair: **Silke Pflueger,** *ULO Optics Inc., Los Gatos, CA, USA*

ICALEO's short courses session offers the opportunity to learn something new or brush up on exisitng skills. The first course discusses beam characterization, essential for everybody working with lasers. Heat treatment has been around for decades, but new lasers and sensors have made it a very competitive industrial process. Marking and engraving are standard technologies, but do you really understand them? Hybrid welding and micromachining are hot topics everybody talks about - learn more about them in the afternoon courses. The day also includes an exciting talk on how to turn your invention into a company!

Course 1: Beam Diagnostics - Measurement Techniques and Applications

Sunday, September 23 • 9:00am

Volker Brandl, **PRIMES GmbH,** *Pfungstadt, Germany*

Participants will learn about the physical principles behind the instruments that measure laser properties. After a brief introduction to the parameters that describe a laser, we will discuss detection methods and try to find links between different application situations and the properties of the different detection techniques. Examples will be presented that show the links between alterations seen in the measurement data and the kind of error that occurred in the laser, beam path or focusing optics. Applications and future developments of laser beam analysis are outlined.

The objectives for this course are:

1) Quality assurance at laser systems.
2) Beam parameters – theory and practical measurements.
3) Detection techniques – physical principles behind beam analysis.
4) The impact of optical element failure on measurement data.
5) Industrial applications and integration of beam analysis.

Course level: Beginner to Intermediate

Course 2: Laser Heat Treatment with Latest System Components

Sunday, September 23 • 10:15am

Steffen Bonss, **Fraunhofer IWS,** *Dresden, Germany*

Laser beam heat treatment has been established during the last years as a complementary technology for local hardening treatment tasks at tool manufacturing, automotive industry and many others. New high power diode lasers and a lot of process supporting systems, that have been developed in recent years, are responsible for the increase of industrial laser hardening applications. The short course starts with information about the basics of laser heat treatment. Thereafter, a review about suitable lasers and recommended systems for reliable and well adapted laser heat treatment processes is given. Examples of the last ten years transfer of laser beam hardening into industry are presented and discussed.

The objectives for this course are:

1) Laser heat treatment.
2) High power diode laser application.
3) Process monitoring and control.
4) Application examples from industry.

Course level: Beginner to Intermediate

Course 3: Understanding Laser Marking, Engraving and Annealing and Current Trends

Sunday, September 23 • 11:15am

Jeff Thorsen, **Telesis Technologies,** *Fremont, CA, USA*

Today's micro material processing consists of many applications such as laser marking, laser annealing and laser engraving, yet many end users interchange these terms. Our short course will help define what each is, as well as educate the audience about the best means to mark, engrave and anneal using conventional mechanical pinstamp and industrial lasers. It is very common to hear technology people in a discussion throw around terms like marking, engraving and annealing. This course will provide the audience with a firm understanding of what these are and the methods and technologies to perform each.

The objectives for this course are:

1) Define what laser marking, engraving and annealing are.
2) Understand what technologies are available, such as fiber, solid state and gas lasers.
3) Understand what alternative technologies are available for marking and engraving such as pin stamp.

Course level: Beginner to Intermediate

Course 4: Entrepreneurial Engineering

Sunday, September 23 • 12:45pm

Larry Marshall, **Southern Cross Ventures,** *Palo Alto, CA, USA*

Learn how to turn your invention into a company - learn how a fellow laser engineer founded 5 1/2 successful companies and delivered 2 successful IPOs.

The objectives for this course are:

1) Reverse how you think about technology and markets.
2) How to build and manage the right team for success.
3) How to pitch your idea to investors and secure capital.
4) How to create your business plan and pivot when necessary.
5) How and when to exit your company.

Course level: Beginner to Intermediate

Course 5: Introduction to Laser Material Interactions and Micromachining with Pulsed Lasers

Sunday, September 23 • 1:55pm

Sami Hendow, **Consultant,** *Los Altos, CA, USA*

Sascha Weiler, **TRUMPF Inc.,** *Farmington, CT, USA*

Participants will learn about the various regimes of laser-material interactions using pulsed lasers from microsecond to ultrashort pulse durations. We will discuss the various processes that are associated with energy exchange and their contribution to material processing. We will then cover the effects of changing peak power, pulse energy and pulse width, using nsec, psec and fsec pulses. We will also contrast the observed effects between these regimes on metal, silicon and ceramic materials, as well as other side effects such as oxide formation due to surface heating.

The objectives for this course are:

1) Basic understanding of the principles involved in laser-material interactions when pulsed lasers are used.
2) Recognize the various processes involved when a pulse is absorbed and ablation commences and their effects on material removal and HAZ.
3) Understand the effects of changing pulse peak power and pulse energy on material processing.
4) Recognize the impact of shortening pulse width on material processing.
5) Cover machining examples using nsec, psec and fsec lasers.

Course level: Beginner to Intermediate

Course 6: Review of Hybrid Laser Arc Welding

Sunday, September 23 • 2:55pm

Brian Victor, **Laserline, Inc.,** *Santa Clara, CA, USA*

This course provides an introduction to Hybrid Laser Arc Welding (HLAW), the combination of a laser and arc process in the same weld pool. This short course will review the fundamentals of each welding process, how to choose laser and arc equipment, typical process parameters and examples, typical defects, as well as the synergic benefits for multiple alloy systems: aluminum, steel/stainless and titanium.

The objectives for this course are:

1) Review the basics of each welding process.
2) Select the right equipment.
3) Determine starting parameters.
4) Learn how to troubleshoot common defects.

Course level: Beginner to Intermediate

laserline

Visit us at the ICALEO vendor reception on Sept. 25

Industrial Lasers

Low Maintenance Diode Technology

Lasers for cladding, welding, heat treatment, brazing. Fiber delivered, compact, efficient, high power, high brightness.

Established Technology Leader

Since 1999, we have continued to focus on the creative and disciplined transformation of new ideas into industrial innovations, adhering to the highest standards of quality. This enables us to develop customized systems solutions that work economically and reliably, even under the toughest production conditions. For more informations visit **www.laserline-inc.com**

Laserline Inc., 1800 Wyatt Drive, Suite 9, Santa Clara, CA 95054, USA
Tel. +1 408 834 4660 | www.laserline-inc.com

Laser Industry Vendor Reception & Tabletop Display

Tuesday, September 25 • 4:00pm

Sharing Ideas. Discovering Solutions.

As the world's premier conference on laser materials interaction, ICALEO® attracts over 200 companies and organizations from more than 30 countries. The Laser Industry Vendor Program gives vendors and conference attendees the opportunity to discuss equipment and applications in a relaxed setting. After completion of the technical sessions, enjoy drinks and hors d'oeuvres while sharing product ideas with your colleagues and suppliers! This is the only scheduled event for the evening, allowing participants access to the full attention of attendees. For information about participating as an ICALEO Sponsor or Vendor, please contact Jim Naugle at *jnaugle@lia.org.*

Sponsors and Vendors registered as of May 21st:

AdlOptica Optical Systems GmbH (AdlOptica GmbH)
Aerotech, Inc.
Altos Photonics, Inc.
Amplitude Systemes
AppliCote Associates LLC
Cambridge Technology Inc.
CLAIM, The University of Michigan
Coherent, Inc.
Directed Light Inc.
Electro-Optics Technology, Inc.
Fraunhofer Institute for Laser Technology ILT
Fraunhofer IWS
Haas Laser Technologies, Inc.
HIGHYAG Lasertechnologie GmbH
II-VI Infrared
IMRA America, Inc.
Innovative Laser Technologies, Inc.
IPG Photonics
Jenopik Optical Systems
JK Lasers
Kenteck Corporation
Laser Mechanisms, Inc.
Laserline, Inc.
LASERVISION USA
Lee Laser
LIMO Lissotschenko Mikrooptik GmbH
National Science Foundation
Newport Corporation
Northrop Grumman Cutting Edge Optronics
Nufern
Onefive GmbH
OZ Optics LTD.
PicoQuant GmbH
Precitec, Inc.
PolarOnyx, Inc.
RPMC Lasers, Inc.
SCANLAB America, Inc.
SPI Lasers
Teem Photonics
Time Bandwidth, Inc.
TRUMPF, Inc.
ULO Optics Inc.
Vytran LLC

Sponsors highlighted in bold

Thank you to the ICALEO Media Partners & Cooperating Societies

the association of ALLU laser users

American Welding Society

CLUB LASER ET PROCÉDÉS

ELI European Laser Institute

LaserFocusWorld

PHOTONICS MEDIA
THE PULSE OF THE INDUSTRY

About LIA

Laser Institute of America (LIA), founded in 1968, is the international society dedicated to fostering lasers, laser applications and laser safety worldwide. LIA has grown to represent hundreds of corporate and thousands of individual members in the laser industry.

Visit *www.lia.org* for more information!

Join the LIA!

To take advantage of member registration rates, please go to the LIA website at *www.lia.org* for membership information and an application, or call +1.800.34LASER or +1.407.380.1553.

Laser Institute of America
Laser Applications and Safety

Conference Registration

Registration can be completed online or by downloading a PDF registration form from *www.icaleo.org.*

Full conference registration includes admission to all technical sessions, the Plenary Sessions, Laser Solutions Short Courses, Receptions (Welcome Celebration, President's Reception and Vendor Reception), Awards Luncheon and a technical digest.

Student registration includes admission to all technical sessions, the Plenary Sessions, Laser Solutions Short Courses, Receptions (Welcome Celebration, President's Reception and Vendor Reception), Awards Luncheon and a technical digest. A valid student ID is required to process registration. Student registration will not be accepted on-site; students must be pre-registered by August 31.

One-day registration includes admission to technical sessions, Laser Solutions Short Courses and receptions on that day only and a technical digest.

Guests may attend the Awards Luncheon and all receptions by purchasing tickets. Please pre-register your guest so we may prepare a nametag. Non-industry guests only.

Early Bird registrants must be paid in full by August 2. Visa, MasterCard and American Express will be accepted. You may send a check (US funds only, drawn on a US bank) payable to Laser Institute of America. Purchase orders must be paid in full by August 2 to qualify for discount. **Bank transfers must include a $30 wire transfer fee.**

On-site Registration Times

Sunday, September 23	8:00am – 4:00pm
Monday, September 24	7:00am – 5:00pm
Tuesday, September 25	7:30am – 4:00pm
Wednesday, September 26	7:30am – 5:00pm
Thursday, September 27	7:30am – 12:00pm

Register Online and Save!

Register online by August 2nd and receive $25 off Early Bird Registration!

www.lia.org/icaleoap

Hotel Accommodations

Anaheim Marriott® Hotel
700 West Convention Way
Anaheim, CA 92802
Phone: +1.407.827.4000 • Fax: +1.407.827.3890

The Marriott® Anaheim hotel is conveniently located in the heart of the Anaheim Resort District, offering amenities and service unrivaled by other Anaheim hotels near Disneyland® Park. Anaheim Marriott Hotel is walking distance to Downtown Disneyland District, an outdoor promenade with restaurants, theatres and shopping in a tropical setting. Just steps in the other direction will take you to the Anaheim GardenWalk, an oasis of outdoor shopping, dining and entertainment in the heart of Orange County. Book your hotel online at *https://resweb.passkey.com/Resweb.do?mode=welcome_ei_new&eventID=8180718* or call +1.714.750.8000.

Hotel Reservation Deadline is Thursday, August 30, 2012

FEES

Full Conference Registration

Early Bird (payment received by August 2)
$725.....Member
$725.....Cooperating Society
$840.....Non-Member
$390.....Student
$425.....Retired LIA Member

(August 3 – August 31)
$775.....Member
$775.....Cooperating Society
$890.....Non-Member
$460.....Student
$475.....Retired LIA Member

(September 1 – On-site)
$825.....Member
$940.....Non-Member

One Day Conference Registration

Early Bird (payment received by August 2)
$295.....Member
$325.....Non-Member

(August 3 – August 31)
$325.....Member
$355.....Non-Member

(September 1 – On-site)
$360.....Member
$390.....Non-Member

Laser Solutions Short Course Registration

Early Bird (payment received by August 2)
$295.....Member
$325.....Non-Member

(August 3 – August 31)
$325.....Member
$355.....Non-Member

(September 1 – On-site)
$360.....Member
$390.....Non-Member

**Single short course admission fee $100 LIA Member and Non Member.*
Purchase orders will not be accepted on-site.

Proceedings

CD-Rom Proceedings will be available on-site (they will not be shipped to you). It includes all submitted papers from ICALEO (Plenary, Laser Materials Processing, Laser Microprocessing, Nanomanufacturing and Poster Manuscripts).

Payment received by August 2
$145*.....Member
$170*.....Non-Member

Payment received after August 2
$155*.....Member
$180*.....Non-Member

**Please note: 7.75% Sales Tax and Local Tax will be added to the CD-Rom proceedings in accordance with local tax laws.*

Special Needs

If you have any special needs that we can address to make your participation more enjoyable, please contact LIA by phone: +1.407.380.1553, Fax: +1.407.380.5588 or email: *icaleo@lia.org.*

Transportation

Shuttle Service

Prime Time Shuttle provides shuttle service to and from the Anaheim Marriott Hotel. Make your reservations and print a coupon to save $4 off your round trip transportation by visiting *www.lia.org/conferences/icaleo/transportation* or call +1.800.733.8267, press 1 for reservations and mention profile ID 398007.

Transportation from LAX airport to Anaheim Marriott is $30.00 round trip, per person.

Rental Cars

Call Avis Rental Car at +1.800.331.1600 and mention AVIS worldwide discount number J093783

Average September Temperatures:

87° F / 31°C High
63°F / 17°C Low

Join the LIA!

To take advantage of member registration rates, please go to the LIA website at *www.lia.org* for membership information and an application, or call +1.800.34LASER or +1.407.380.1553.

Substitutions and Cancellations

We understand that circumstances may occur to prevent you from attending the conference. If you find that you are unable to attend ICALEO®, you have several options:

1. **Send a substitute.** Substitutions can be made at any time – even on-site at the conference. (Please have the substitute bring your letter of confirmation to the registration desk)
2. **Refund of monies.** Requests for refunds must be made in writing and received on or before **August 2**.

There is a $75 processing fee applied to all refunds. All refunds will be processed after the conference. No refund requests will be accepted after August 2. Guest Tickets, Proceedings & LIA Membership Dues are all non-refundable.

Sunday, September 23

8:00am ICALEO Registration Desk & LIA Bookstore Open
9:00am Laser Solutions Short Courses
11:30am LIA Board of Directors Meeting
4:00pm Welcome Celebration

Monday, September 24

7:00am ICALEO Registration Desk & LIA Bookstore Open
7:30am Session Chair Appreciation Breakfast
8:00am Attendee Continental Breakfast
9:00am Plenary Session: Green Photonics and Recent Progress in Laser-Based Light Sources and Their Applications in Materials Processing
10:10am Morning Break

Lunch on own

1:30pm LMP 1: Pulsating Topics in Laser Materials Processing
LMF 1 (Joint with Nano Conference): World of Applications in Sub-Millimeter Scale
Business Forum & Panel Discussion: Increasing the Role of Lasers in a Non-Laser World
2:50pm Afternoon Break
3:20pm LMP 2: Laser Drilling
LMP 3: Laser Metal Deposition I
LMF 2: Medical Devices and Biomedical Applications
Nano 1: Laser Micro/Nano Processing
5:30pm President's Reception

Tuesday, September 25

7:30am ICALEO Registration Desk & LIA Bookstore Open
8:00am Attendee Continental Breakfast
8:00am Poster Presentation Gallery
8:30am LMP 4: Laser Processing of CFRP
LMP 5: Laser Metal Deposition II
LMP 6: Process Monitoring & Control
LMF 3: Innovative Laser Optics
Nano 2: Laser-Material Interactions at Nanoscales
10:10am Morning Break

Lunch on own

1:30pm LMP 7: Welding I
LMP 8: Laser Cutting
LMP 9: High Brightness Lasers & Systems
LMF 4: Microwelding
LMF 5: Processing of Transparent & Brittle Materials
2:50pm 10 Minute Intermission
4:00pm Laser Industry Vendor Reception & Tabletop Display

Wednesday, September 26

7:30am ICALEO Registration Desk & LIA Bookstore Open
7:45am Attendee Breakfast/Poster Presentation Gallery Q & A
8:30am LMP 10: Welding II
LMP 11: Processing of Dissimilar Materials
LMF 6: Thin Film Processing
LMF 7: Surface Modification I
Nano 3: Thermal Characterization & Processing at Micro/Nanoscales
10:10am Morning Break
10:30am LMP 12: Laser Surface Modification I
LMP 13: Hybrid & Combination Processes I
LMF 8: Lasers in Energy Generation & Storage
LMF 9: Surface Modification II
Nano 4: Laser Nanolithography & Nanostructuring

LIA Annual Meeting & Awards Luncheon

3:00pm LMP 14: Welding III
LMP 15: Hybrid & Combination Process II
LMP 16: Laser Metal Deposition III
LMF 10: Modeling & Physical Interactions
LMF 11: Monitoring & Detection
5:00pm Afternoon Break

Thursday, September 27

7:30am ICALEO Registration Desk & LIA Bookstore Open
8:00am Attendee Continental Breakfast
8:30am LMP 17: Welding IV
LMP 18: Laser Surface Modification II
LMP 19: Modelling & Simulation
LMF 12: Microprocessing & Drilling
LMF 13: Advances in Laser Sources
Nano 5: Laser Applications in Flexible Electronics
10:10am Morning Break

Lunch on own

1:30pm Closing Plenary Session: Ways of Knowledge Transfer
3:50pm Farewell Break

** Program subject to minor changes*




The same can be said for your existing flatbed cutter.

Systems technology is constantly changing and evolving but staying relevant and ahead of your competition doesn't mean having to spend an exorbitant amount of money. IPG's fiber lasers are affordable, compact, maintenance-free and energy efficient, saving you money upfront and minimizing overhead costs. Additionally, unlike CO_2 lasers, IPG's lasers are capable of cutting most metals, even copper, aluminum and brass, therefore broadening the capabilities of the flatbed cutter.

Do your research and see why IPG Photonics' fiber lasers are the best power source available for today's flatbed cutting systems.

Contact IPG Photonics today for a list of authorized suppliers of flatbed cutting machines.

2 kW Ytterbium Fiber Laser, 558 x 790 x 815 mm

IPG Photonics Corporation
(508) 373-1100 • sales.us@ipgphotonics.com • www.ipgphotonics.com

IPG PHOTONICS®

Laser Institute of America
Laser Applications and Safety

13501 Ingenuity Drive, Suite 128
Orlando, FL 32826

LIA and ICALEO would like to thank our current sponsors:

PLATINUM LEVEL SPONSOR

Fraunhofer ILT

GOLD LEVEL SPONSORS

CLAIM

Fraunhofer IWS

IPG PHOTONICS
The Power to Transform

SPI Lasers
inspiring your products & manufacturing

TRUMPF

SILVER LEVEL SPONSORS

COHERENT

NSF

PRECITEC

BRONZE LEVEL SPONSORS

Newport
Experience | Solutions

Spectra-Physics
A Newport Corporation Brand