ICALEO®

33rd INTERNATIONAL CONGRESS ON
APPLICATIONS OF LASERS & ELECTRO-OPTICS

Sheraton® San Diego • San Diego, CA USA

October 19–23, 2014

ADVANCE PROGRAM

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

Laser Materials Processing Conference Chair:
Silke Pflueger, DirectPhotonics, Los Gatos, CA, USA

Laser Microprocessing Conference Chair:
Henrikki Pantsar, Cencorp Corporation, Canton, MI, USA

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

Laser Solutions Short Courses Chair:
Kerstin Funck, Ruhr Univ. Bochum, Bochum, Germany

Business Forum & Panel Discussion Chair:
Klaus Loeffler, TRUMPF Laser and Systems GmbH, Ditzingen, Germany

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Laser Applications and Safety

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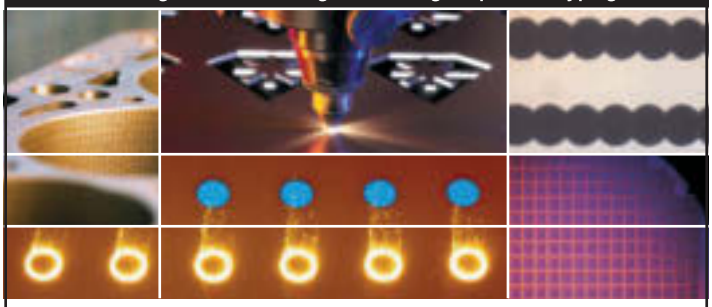

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ICALEO ADVANCE PROGRAM

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LIA Executive Director: Peter Baker
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San Diego, CA, USA
October 19–23, 2014
Sheraton® San Diego

Welcome...

to San Diego! The 33rd International Congress on Applications of Lasers & Electro-Optics (ICALEO®) returns to one of the early years' venues of ICALEO, above all the birthplace of California.

Stefan Kaierle
Laser Zentrum Hannover e.V.,
Hannover, Germany

ICALEO 2014 continues its over 30 year history of being the most important conference worldwide in the field of laser materials processing and again features the three conferences on Laser Materials Processing (LMP, organized by Silke Pflueger), Laser Microprocessing (LMF, organized by Henrikki Pantsar), and Nanomanufacturing (organized by Yongfeng Lu). The Laser Materials Processing Conference traditionally covers a wide range of topics on laser macro processing addressing various applications, related laser equipment and systems. The Laser Microprocessing Conference addresses processes and systems for microscopic applications while the Nanomanufacturing Conference provides recent findings on the nano-scale.

The ICALEO program committee has put together yet another highly interesting program with outstanding contributions from research and engineering covering all parts of emerging laser applications. The plenary session will provide superb and groundbreaking presentations of internationally recognized experts about "Ultra High Precision Photonic Applications", followed by the sub-plenary sessions of LMP and the joint LMF/Nano. Special features of this year's ICALEO are also the laser business session, organized by Klaus Loeffler, and the vendor reception, both addressing the latest industrial developments in the field. Special attention is given again to the Laser Solutions Short Courses, organized by Kerstin Funck, jointly conducted on the day before the main conference providing a comprehensive overview on selected topics. Tying with a young tradition, ICALEO will be concluded with the closing plenary session addressing "Unusual Laser Applications" – invited presentations on topics generally not seen at the conference.

Besides being a strong information pool for the latest results in research and development, ICALEO also has become a major meeting point for the whole laser community where young professionals can easily get in touch with the senior experts! Plenty of networking opportunities perfect the yield of the event. Be part of it and discuss the applications and trends of tomorrow. You are warmly welcomed to share this unique experience together with all conference attendees in beautiful San Diego! See you there!

More information at:

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Plenary Session: Ultra High Precision Photonic Applications

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

Monday, October 20th • 9:00am

ICALEO® keeps on the tradition to present exceptional topics in the field of lasers and photonics during the opening plenary session. The program committee has acquired three outstanding speakers of very complementary fields, covering Ultra High Precision Photonic Applications: Karsten Danzmann from the Albert-Einstein-Institute in Hannover will explain how gravitational waves can be detected. Shaochen Chen from the Institute of Engineering in Medicine, University of California, San Diego will present how nanoscale 3D-printing of hydrogels for tissue engineering applications is performed. The final interesting presentation will describe how lasers can be used to prevent people from getting malaria.

Invited Plenary Speakers:

Listening to the Universe: Gravitational Wave Detection on the Ground and in Space (OP1)

Karsten Danzmann, *Max Planck Institute for Gravitational Physics (Albert-Einstein-Institut) and Institute for Gravitational Physics, Leibniz Universität Hannover, Hannover, Germany*

Nanoscale 3D-printing of Hydrogels: Materials, Fabrication, and Tissue Engineering Applications (OP2)

Shaochen Chen, *Institute of Engineering in Medicine, Univ. of California, San Diego, CA, USA*

Lasers Zap Malaria (OP3)

Session Chair Appreciation Breakfast

Monday, October 20th • 7:30am

Session Chairs and Short Course Instructors are invited to the Session Chair Appreciation Breakfast on Monday, October 20th at 7:30am. Audio-Visual tips will be provided along with any last minute updates and an overview of the week. Please plan to arrive in time to attend this important breakfast.

Welcome Celebration

Sunday, October 19th • 4:00pm

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Plan to arrive early and enjoy live entertainment. In addition, free door prizes will be raffled! This event is a great opportunity for new attendees to meet experienced professionals and for everyone to socialize and interact.

ICALEO President's Reception

Monday, October 20th • 5:00pm

The opening day of ICALEO® features an evening reception hosted by LIA President Yongfeng Lu. Meet the LIA Executive Committee, Board of Directors, ICALEO General Chair Stefan Kaierle and Conference Chairs Silke Pflueger and Henrikki Pantsar. Join the LIA staff and mingle with old friends at this exciting venue. This will be an unforgettable event!




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

Wednesday, October 22nd

The 2014 Arthur L. Schawlow Award is presented to: Reinhart Poprawe

Prof. Dr. Reinhart Poprawe holds a M.A. in Physics degree from the California State University in Fresno which he received in 1977. After completion of his diploma and PhD in physics (Darmstadt 1984), he joined the Fraunhofer Institute for Laser Technology in Aachen where he began working as head of the department "Laser oriented process development" in 1985. From 1989 to January 1996, Prof. Poprawe has been managing director of Thyssen Laser Technik GmbH in Aachen. Since February 1996, he has been managing director of the Fraunhofer Institute for Laser Technology and holds the University Chair for Laser Technology at the RWTH Aachen.

Currently, Prof. Poprawe is a member of the board in the AKL Arbeitskreis Lasertechnik e.V. Aachen. He has been elected to the grade of Fellow in the Society of Manufacturing Engineers (SME) in USA since 1998. In 2006, he became Fellow of the Laser Institute of America (LIA). In 2012, he served as president of LIA. Prof. Poprawe also serves on many national and international boards as advisor, referee or consultant. During the period of September 2005 until September 2008, he was Vice-Rector for Structure, Research and Junior Academic Staff. He is still chairing the RWTH-International Board and is the Rectors delegate for China. Prof. Poprawe received an Honorary Professorship at Tsinghua University in 2014.

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: Unusual Laser Applications

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

Thursday, October 23rd • 1:00pm

Tying with a young tradition, ICALEO® will feature a closing plenary session to conclude the conference. During this session several presentations about rather "unusual laser applications" will be given typically not found in common technical sessions. Get inspired by how, for example, lasers can be used to transmit power over large distances up to the orbit. Or how lasers can be used to treat fabrics. These amazing presentations promise to stimulate your mind!

New for 2014, the Student Paper Award winners will be announced during the closing plenary session.

Practical Applications for Laser Power Beaming (C101)
Brian Turner, *KC Space Pirates, Kansas City, MO, USA*

The Effect of CO_2 Laser Irradiation on Surface and Dyeing Properties of Wool for Textile Design (C102)
Laura Morgan, *Loughborough University, Nottingham, Great Britain*

Plus Additional Invited Presentations

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LIA's Laser Running Club

Join LIA's Laser Running Club and meet with your colleagues for a traditional run before the sun. Enjoy a brisk run as you view the beautiful San Diego Marina. Participants will meet in the lobby of the hotel and enjoy a great workout. Be one of the first in the lobby and receive a FREE gift! Complete details will be available on-site at the ICALEO Registration Desk.

LIA'S LASER RUNNING CLUB

Conference Chair: **Silke Pflueger,** *DirectPhotonics, Los Gatos, CA, USA*

Industrial uses of lasers are ever expanding, powered by robust research activity. Every year, ICALEO's® Laser Material Processing (LMP) conference showcases the best research worldwide. It continues to serve as a forum for new ideas, collaboration and education.

This year, we can all look forward to presentations that expand the boundaries of laser processing with more powerful lasers, innovative hybrid processes, and laser applications that push the boundaries of what has been done and what can be done. Welding takes up a large share of the conference followed by surface modification including cladding and coating. 3D printing or laser assisted machining is strongly represented, as are traditional well established processes like cutting and drilling. Rounding out the conference are contributions simulating all these processes, to strengthen and support the results of more experimental papers.

LMP contributors are coming from 39 countries and 6 continents, many of those peer reviewed – a new feature in this year's event, certainly raising the quality of the conference.

LMP Session 1: Lasers in Energy Generation

Monday, October 20th • 1:30 PM

Session Chair: Silke Pflueger, DirectPhotonics, Los Gatos, CA, USA

Integrated Manufacturing Process Chains for Laser Additive Manufacturing in Industrial Production (101)
Fritz Klocke, Kristian Arntz, Maximilian Wegener, Yuan Liu, Fraunhofer Institute for Production Technology IPT

Optimisation of Underwater Laser Cutting for Decommissioning Purposes (102)
Paul Hilton, Ali Khan, TWI Ltd

Evaluation of Fiber Laser Cutting and Crushing Applied to the Removal Technology of Fuel Debris and In-Vessel Structures (103)
Tomonori Yamada, Toshihide Hanari, Toshihiko Takebe, Yukihiro Matsunaga, Nguyen Phi Long, Toshiharu Muramatsu, Japan Atomic Energy Agency

LMP Session 2: Cladding I

Monday, October 20th • 3:30 PM

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

Development of an Adaptive Laser Cladding System with Variable Spot Size (201)
M. Angeles Montealegre, Jorge Rodriguez, Félix Vidal, Jorge Luis Arias, AIMEN Technology Centre; Peter Abels, Stefan Man, Fraunhofer ILT; Filip Motmans, VITO; Manuel Zenz, SILL Optics; Markus Kogel-Hollacher, PRECITEC KG; Petr Palatka, NEOVISION; Raimond Franch, Talleres Mecánicos Comas-TMC; Marko Bojinovic, TIC-LENS Laserske Tehnologije d.o.o.

Repair of Aircraft Components by Laser Cladding Process (202)
Peter Khan Sharp, Qianchu Liu, Richard Djugum, Defence Science and Technology (DSTO), Australia; Milan Brandt, School of Aerospace, Mechanical and Manufacturing Engineering, RMIT Univ.; Neil Matthews, Rosebank Engineering Pty Ltd, Australia

Laser Cladding and Tribocorrosion Testing of Cobalt-Free Hardfacing Coatings for Fast Neutron Reactors (203)
Pascal Aubry, Van De Tran, Cecile Blanc, Jerome Varlet, CEA

Laser Cladding Assisted by Induction Heater of Stainless Steel (420) with Mo to Enhance Corrosive Performance (204)
Zhe Zhang, Parisa Farahmand, Radovan Kovacevic, Southern Methodist Univ.

LMP Session 3: New Laser Sources

Monday, October 20th • 3:30 PM

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

Power Scaling of Direct Diode Lasers for Material Processing Applications (301)
Jens Meinschien, Lutz Aschke, Peter Bruns, Ihab Kardosh; Vitaly Lissotschenko, Michael Voß, LIMO Lissotschenko Mikrooptik GmbH

Application Versatility of ns Pulsed Fiber Lasers (302)
Jack Gabzdyl, SPI Lasers

Latest Advances in High Brightness Direct Diode Lasers and Their Applications (303)
David Havrilla, Tracey Ryba, TRUMPF Inc.; Marco Holzer, TRUMPF Laser und Systemtechnik GmbH

LMP Session 4: Welding of Non-Ferrous Materials

Tuesday, October 21st • 8:30 AM

Session Co-Chairs: John Powell, Lulea Univ. of Technology, Lulea, Sweden; Simon Olschok, RWTH Aachen Univ., Aachen, Germany

High-Power Laser Sources Enable High-Quality Laser Welding of Copper (401)
Peter Stritt, Rudolf Weber, Thomas Graf, Andres Heider, Institut fuer Strahlwerkzeuge

Experimental Investigation of Mass Transfer During Laser Welding of Titanium/Titanium Alloy and Lead (402)
Shusen Zhao, Xuechun Lin, Chunyang Zhou, Yibo Wang, Falan Liu, Wenyan Gao, Institute of Semiconductors, Chinese Academy of Sciences

High Power Fiber Laser Welding of Aerospace Alloys (403)
Mohammed Naeem, Prima Power Laserdyne

Possibilities of Improving Weld Seam Quality in Laser Welding of Aluminum Die Cast (404)
Christian Boerner, Klaus Dilger, Fabian Fischer, TU Braunschweig

Special Thanks to the ICALEO International Advisory Board:

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Minlin Zhong, *Tsinghua Univ., Beijing, People's Republic of China*

Evaluation of Cyclic Deformation Behaviour of Laser-Welded Shape Memory NiTi Alloys at Different Working Temperatures (405)
Chi-Wai Chan, School of Mechanical and Aerospace Engineering, Queen's Univ. Belfast; Hau-Chung Man, Department of Industrial and Systems Engineering, The Hong Kong Polytechnic Univ.

Nickel-Containing Superalloy Laser Weld Qualities and Properties (406)
Chris Allen, Robert Shaw-Edwards, TWI Ltd.; Thijs Nijdam, TNO

Temporally Resolved Measurement of Temperature Gradients During Power Modulated Laser Welding of Copper to Aluminium (407)
Michael Jarwitz, Peter Stritt, Rudolf Weber, Thomas Graf, Institut für Strahlwerkzeuge Universität Stuttgart

Effects of Different Joining Geometries on Cracking Susceptibility and Process Efficiency Using Multi-Alloy Aluminum (408)
Cyrille Bezençon, Joerg Simon, Novelis Switzerland SA; Daniel Weller, Peter Stritt, Rudolf Weber, Thomas Graf, IFSW, Institut fuer Strahlwerkzeuge; Corrado Bassi, Novelis Switzerland

Spatter Free Fast Welding with Single Mode Fiber Laser for Magnesium Alloy Sheet (409)
Mok-Young Lee, RIST; Katayama Seiji, Jwri

LMP Session 5: Cladding II

Tuesday, October 21st • 8:30 AM

Session Co-Chairs: M. Angeles Montealegre, AIMEN- Technology Centre, Porriño, Spain; Bill O'Neill, Univ. of Cambridge, Cambridge, Great Britain

The Use of Holographic Optics for Heat Flow Control in Wire-Based Laser Cladding (501)
John Tyrer, Nick Goffin, Shuai Hou, Rebecca Higginson, Loughborough Univ.

Effect of Synchronous Laser Irradiation on the Coating Characteristics of Cold Sprayed Copper (502)
Bo Li, Lijing Yang, Zhihong Li, Jianhua Yao, Zhejiang Univ. of Technology

The Effects of Process Parameters in Laser Cladding on Substrate Melted Area and Substrate Melted Shape (503)
Dara Moazami Goodarzi, Joonas Pekkarinen, Antti Salminen, Lappeenranta Univ. of Technology

Formation Mechanism, Morphology Characteristics and Reinforcing Behavior of (Ti, Nb)C Reinforced Particle in the Coating Fabricated by Laser Rapid Cladding (504)
Qingtang Li, Yongping Lei, Hanguang Fu, Beijing Univ. of Technology

Correlation Between Cladding Speed, Microstructure and Hardness of Laser-Deposited Steel Coatings: The Role of Strengthening Mechanism (505)
Ismail Hemmati, Vaclav Ocelik, Jeff Th.M. De Hosson, Univ. of Groningen

Laser Cladding of Diamond Beads for Wire Saws (506)
Daniel Rommel, Florian Scherm, Uwe Glatzel, Universität Bayreuth

Fatigue Behaviour of Laser Cladding Repair of AerMet 100 Ultra-High Strength Low Alloy Steel (507)
Shi Da Sun, Martin Leary, Qianchu Liu, Milan Brandt, RMIT Univ.

Experimental and Numerical Investigation of Laser Induction Hybrid Cladding of Ni-60%WC Composite Coating (508)
Parisa Farahmand, Zhe Zhang, Radovan Kovacevic, Southern Methodist Univ.

Laser Surface Treatment of Machinable Martensitic Stainless Steel (509)
Salah Hassab Elnaby, Samar Reda Al-Sayed, NILES, Cairo Univ.; Ahmed Hussein, Faculty of Engineering, Cairo Univ.; Adel Nofal, CMRDI; Haythem Algazzar, H. Elgazzar, CMDI

LMP Session 6: Welding I

Tuesday, October 21st • 8:30 AM

Session Co-Chairs: Thomas Seefeld, BIAS, Bremen, Germany; Xudong Zhang, Hitachi Ltd., Ibaraki-ken, Japan

Keyhole Oscillations During Laser Deep Penetration Welding at Different Spatial Laser Intensity Distributions (601)
Joerg Volpp, Frank Vollertsen, Bias GmbH and Univ. of Bremen

Investigating the Keyhole Behavior by Using X-Ray and Optical Depth Measurement Techniques (602)
Meiko Boley, Rudolf Weber, Institut fuer Strahlwerkzeuge, Universitaet Stuttgart

Fiber Laser Welding of High-N, High-Mn Austenitic Stainless Steel (603)
Stephan Tate, Stephen Liu, Colorado School of Mines

Laser Based Metal and Plastics Joining for Lightweight Design (604)
Klaus Loeffler, TRUMPF Laser & Systems GmbH

Effect of Gas Shielding on High Brightness Laser Welding of High Thickness (605)
Frederic Coste, Remy Fabbro, PIMM-CNRS; Kenneth Yeoh, ENSAM

Effect of Welding Parameters and the Heat Input on Weld Bead Profile of a Laser Welded T-joint in Structural Steel (606)
Anna Unt, Antti Salminen, Lappeenranta Univ. of Technology

Fundamental Study on Welding Properites of 515 nm Green Laser (607)
Xudong Zhang, Masanori Miyagi, Hitachi, Ltd.

An Experimental Approach for Quantification of Fluid Dynamics in Laser Metal Welding (608)
Felix Tenner, Benjamin Berg, Christian Brock, Florian Klämpfl, Michael Schmidt, Institute of Photonic Technologies, Friedrich-Alexander-Universität Erlangen-Nürnberg

Studies Using Defocusing Technique in Laser Multi Pass Welding of Austenitic Stainless Steel Joints (609)
Miikka Karhu, Veli Kujanpää, VTT Technical Research Centre of Finland

LMP Session 7: CFRP

Tuesday, October 21st • 1:30 PM

Session Chair: Annett Klotzbach, Fraunhofer IWS, Dresden, Germany

Laser Cutting of CFRP Using a 30 kW Fiber Laser (701)
Dirk Herzog, Matthias Schmidt-Lehr, Marten Canisius, Max Oberlander, Jan Tasche, Claus Emmelmann, Hamburg Univ. of Technology

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Christian Freitag, Margit Wiedenmann, Jan-Philipp Negel, André Löscher, Volkher Onuseit, Rudolf Weber, Marwan Abdou-Ahmed, Thomas Graf, Institut für Strahlwerkzeuge IFSW

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Jianhua Yao, *Zhejiang University of Technology, Hangzhou, Peoples Republic of China*

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Yuji Sato, Masahiro Tsukamoto, Shinichiro Masuno, Osaka Univ.; Fumihiro Matsuoka, Kenjiro Takahashi

Advanced Laser Welding of High-Performance Thermoplastic Composites (705)
Peter Jaeschke, Verena Wippo, Oliver Suttmann, Ludger Overmeyer, Laser Zentrum Hannover

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Andre Heckert, Michael F. Zaeh, Institute for Machine Tools and Industrial Management, Technische Universitaet München

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Sven Bluemel, Sebastian Brede, Peter Jaeschke, Oliver Suttmann, Ludger Overmeyer, Laser Zentrum Hannover e.V.

LMP Session 8: Emerging Applications

Tuesday, October 21st • 1:30 PM

Session Chair: Alena Zavadilová, Czech Technical Univ. in Prague, FNSPE, Prague, Czech Republic

Automated Glass Fusion with Powder Additive (801)
Leonhard Pohl, Philipp von Witzendorff, Oliver Suttmann, Ludger Overmeyer, Laser Zentrum Hannover e.V.

Design, Processing and Characterization of Nickel Titanium Micro-Actuators for Medical Implants (802)
Ronny Hagemann, Laser Zentrum Hannover e.V.

Experimental and Numerical Investigation of Laser Forming of Closed-Cell Aluminum Foam (803)
Grant Brandal, Advanced Manufacturing Lab, Department of Mechanical Engineering, Columbia Univ.

The Effect of CO_2 Laser Irradiation on Surface and Dyeing Properties of Wool for Textile Design (804)
Laura Morgan, John Tyrer, Faith Kane, Loughborough Univ.

Laser Interaction in Water Confinement Regime for Laser Shock Processing (LSP): Absorption Measurements (805)
Laurent Berthe, Courapied Damien, Arnaud Sollier, CNRS/PIMM

Influence of Peak Temperature on Formation of Residual Stresses According to Behavior of S355 Steel (806)
Fabian Klaproth, BIAS - Bremer Institut für Angewandte Strahltechnik

The Abstract of the New LSP (807)
Wenwu Zhang, Ningbo Institute of Materials Technology & Engineering, Chinese Academy of Sciences

LMP Session 9: Cutting

Tuesday, October 21st • 1:30 PM

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

High Speed Imaging and Analysis of Dross Formation in Fiber Laser Cutting (901)
Torbjörn Ilar, Jetro Pocorni, Alexander Kaplan, Luleå Univ. of Technology; John Powell, Laser Expertise Ltd.

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Jean-Philippe Lavoie, Stephen Lee, Coherent; Leonard Migliore, Laser Kinetics

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Juergen Groeninger, Laser Center (LFM) Muenster Univ. of Applied Sciences; Hud Wahab, Klaus Dickmann, Univ. of Applied Science Muenster; Peter Bruns, Ihab Kardosh, Michael Voß, Jens Meinschien, Lutz Aschke, Limo Lissotschenko Mikrooptik GmbH

The Role of Combustion Effects in Laser-Oxygen Cutting: Basic Assumptions, Numerical Simulation and High Speed Visualization (904)
Grigory Ermolaev, Alexander Zaitsev, Khristianovich Institute of Theoretical and Applied Mechanics, Siberian Branch of Russian Academy of Sciences

Differences in Cutting Efficiency Between CO_2 and Fiber Lasers When Cutting Mild and Stainless Steels (905)
Dirk Petring, Fraunhofer-Institut für Lasertechnik ILT; Eckard Deichsel, Bystronic Laser AG; John Powell, Laser Expertise Ltd.; Jetro Pocorni, Alexander Kaplan, Luleå Univ. of Technology

Efficient Production of Electrical Machines (906)
Renè Baumann, Robert Baumann, Technische Universitaet Dresden; Patrick Herwig, Andreas Wetzig, Eckhard Beyer, Fraunhofer IWS Technische Universitaet Dresden

Ultrahigh-Speed Separation Process Using a Combination of Gas-Supported Laser Ablation and Laser Cutting (907)
Frank Zibner, Arnold Gillner, Jens Holtkamp, Patrick Gretzki, Fraunhofer ILT

LMP Session 10: Optics and Beams

Wednesday, October 22nd • 9:00 AM

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

Focusshift with Multikilowatt Single Mode Lasers (1001)
Volker Brandl, Reinhard Kramer, Otto Märten, Harald Schwede, Stefan Wolf, Primes GmbH

Design and Characterization of a 1 um High Power Cutting Head with Minimal Thermal Focus Shift (1002)
Rebecca Durfee, Matthew Pitschman, Gregg Davis, Derek Hohman, Alan Hedges, II-VI Infrared

Quantitative Study on Optics and Their Alignment in Laser Material Processing Systems (1003)
Michael Scaggs, Gilbert Haas, Haas Laser Technologies, Inc.

A Method for Reducing the Footprint of the Spectral Beam Combining (1004)
Zhanda Zhu, Beijing Univ. of Technology

LMP Session 11: LAM I

Wednesday, October 22nd • 9:00 AM

Session Chair: Barbara Previtali, Politecnico Di Milano, Milano, Italy

Fabrication with High-Performance Materials and Light-Weight Structures by Direct Metal Deposition (1101)
Frank Brueckner, Mirko Riede, Thomas Finaske, Steffen Nowotny, Christoph Leyens, Eckhard Beyer, Fraunhofer IWS Dresden, Technische Universitaet Dresden

Simultaneous Laser Beam Melting of Multi-Material Polymer Parts (1102)
Tobias Laumer, Thomas Stichel, Philipp Amend, Bayerisches Laserzentrum GmbH; Michael Schmidt, Institute for Photonic Technologies

Laser Polishing of Additive Laser Manufacturing Surfaces (1103)
Benoit Rosa, Pascal Mognol, Ecole Normale Superieure de Rennes; Jean Yves Hascoet, Ecole Centrale de Nantes

The Effects of Inclination Angle of a Coaxial Nozzle on Crystal Growth and Microstructure Formation in Laser Powder Deposition of Single-Crystal Superalloy (1104)
Zhaoyang Liu, Huan Qi, Shanghai Jiaotong Univ.

LMP Session 12: Hybrid Welding

Wednesday, October 22nd • 10:50 AM

Session Chair: Parisa Farahamand, Southern Methodist Univ., Dallas, USA

Gap Tolerant Joining of 22MnB5 Steel by Laser Hybrid Welding with Beam Oscillation and Laser Brazing with Two Laser Beams (1201)
Helge Kügler, Anton Geier, Christoph Mittelstädt, Felix Möller, Thomas Seefeld, BIAS

Interaction Mechanisms in Hybrid Laser Arc Welding (1202)
Achim Mahrle, Eckhard Beyer, TU Dresden / IWS Dresden; Sascha Rose, Uwe Füssel, TU Dresden

Magnetohydrodynamic Control of Weld Shape in Laser Beam Welding Under an Electrical Current (1203)
Xinyi Zhang, Rongshi Xiao, Institute of Laser Engineering, Beijing Univ. of Technology

Hybrid Laser Welding in Shipbuilding - Extension of the Application Range to Vertical Down Welding (1204)
Christoph Turner, Uwe Reisgen, Simon Olschok, RWTH Aachen Univ. - Welding and Joining Institute ISF

Laser and Laser-Gma Hybrid Welding of 960 Mpa Direct Quenched Structural Steel in a Butt Joint Configuration (1205)
Jukka Siltanen, Ruukki Metals Oy

LMP Session 13: Drilling

Wednesday, October 22nd • 10:50 AM

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

Specific Kerfing Energy Optimization for Laser Drilling in Carbonate Rocks (1301)
Luiz Felipe Orlando Gama, Giancarlo de Faria, Arthur Braga, Pontifical Catholic Univ. of Rio De Janeiro; Mario Germino da Silva, Petrobras; Luiz Carlos Valente, Ouro Negro

Drilling of Cooling Holes by Using High Power Ultrashort-Pulse Laser Radiation (1302)
Hermann Uchtmann, Marcel Friedrichs, Ingomar Kelbassa, RWTH Aachen Univ.; Jens Dietrich, Siemens AG

A Vision-Based Laser Drilling Breakthrough Detection System (1304)
Hongbo Zhao, Xiang Ren, Huan Qi, UM-SJTU Joint Institute, Shanghai Jiao Tong Univ.

Drilling of High Aspect Holes with µs-Pulsed High Power Nd:Yag and Qcw Single Mode Lasers (1305)
Colin Woratz, Rofin Lasag Lasers AG

LMP Session 14: Surface Modification

Wednesday, October 22nd • 3:00 PM

Session Chair: Jianhua Yao, Zhejiang Univ. of Technology, Hangzhou, People's Republic of China

Structuring by Laser Remelting of Titanium Alloy Ti6Al6V (1401)
Andre Temmler, RWTH Aachen Univ.

Corrosion Behaviour of Laser Alloyed UNS G10170 Steel with Al+Sn Powders. (1402)
Olawale Fatoba, Tshwane Univ. of Technology

Laser Texturing for High Friction Applications (1403)
Andrew Dunn, Jesper Carstensen, Erica Hansen, MAN Diesel & Turbo; Krystian Wlodarczyk, Jonathan Shephard, Duncan Hand, Heriot-Watt Univ.; Paul Harrison, Jack Gabzdyl, SPI Lasers UK Ltd.

Phase Constituents and Microhardness of Laser Modified Ti–6Al–4V Alloy (1404)
Damilola Isaac Adebiyi, Patricia Popoola, Tshwane Univ. of Technology; Sisa Pityana, Centre for Scientific and Industrial Research

Non-Equilibrium Diffusion of Noble Metals in a Superalloy Using Laser Assisted Heat-Treatment (1405)
Thiwanka Wickramasooriya, Raj Vaidyanathan,Ashwini Kaul, Aravinda Kar, Univ. of Central Florida

LMP Session 15: LAM II

Wednesday, October 22nd • 3:00 PM

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

A Study of Cost Structure in Laser Additive Manufacturing of Stainless Steel (1501)
Ville Matilainen, Heidi Piili, Antti Salminen, Lappeenranta Univ. of Technology; Olli Nyrhilä, EOS Finland

Comparison of Geometrical Properties of Parts Manufactured by Powder Bed Based (SLM) and Powder Fed Based (LMD) Laser Additive Manufacturing Technologies (1502)
Moritz Alkhayat, RWTH Aachen Univ.

Additive Manufacturing Fundamentals and SLM 3D Printed Rocket Engine (1503)
Youping Gao, John Malinzak, Aerojet Rocketdyne

Additive Manufacturing of Aluminium Alloys (1504)
Sozon Tsopanos, TWI Ltd.

Selective Laser Melting of Aluminium Die-Cast Alloys - Correlations Between Process Parameters, Solidification Conditions and Resulting Mechanical Properties (1505)
Damien Buchbinder, Wilhelm Meiners, Konrad Wissenbach, Fraunhofer Institute for Laser Technology ILT; Reinhart Poprawe, RWTH Aachen Univ.

LMP Session 16: Welding II

Wednesday, October 22nd • 3:00 PM

Session Chair: Alexander Kaplan, Lulea Univ. of Technology, Lulea, Sweden

Weld Root Instabilities in Fiber Laser Welding (1601)
John Powell, Torbjörn Ilar, Jan Frostevarg, Alexander F.H. Kaplan, Luleå Univ. of Technology; Javad Mohammad, Tarbiat Modares Univ.; Suck-Joo Na, Kaist; Dirk Petring, Fraunhofer ILT Aachen; Linjie Zhang, Xi'an Jiaotong Univ.

Investigation of Keyhole Dynamics and Porosity Formation in Continuous Wave and Pulse Laser Welding (1603)
Yung Shin, Purdue Univ.

Novel Approach by Remote Scanner Laser Welding on Lap Weld Strength Comparison of Different Weld Shapes and Weld Seam Gap Bridging Using Wobbling Features for T-Joint and Butt Joint (1605)
(Nara) Simhan Sreenivasan, TRUMPF Inc.

LMP Session 17: LAM III

Thursday, October 23rd • 8:30 AM

Session Co-Chairs: Milan Brandt, RMIT Univ., Bundoora, Australia; Sozon Tsopanos, TWI Ltd., Victoria, Great Britain

Fabrication of Functional Metallic Parts by Laser Wire Deposition (1701)
Christoph Leyens, Eckhard Beyer; Sebastian Thieme, Robert Kager, Steffen Nowotny, Frank Kubisch, Frank Brueckner, Fraunhofer IWS Dresden

A Camera Based Control of Deposition Bead Width in Laser Powder Deposition Process (1702)
Sen Xiang, Huan Qi, Shanghai Jiao Tong Univ.

Scalability of the Mechanical Properties of Slm Produced 316L Micro Struts (1703)
Simonb Merkt, Fraunhofer Institute for Laser Technology ILT

Selective Laser Melting of Bioceramics for Direct Manufacturing of Orthopedic Resorbable Implants (1704)
Pascal Aubry, CEA; David Marchat, ENSM Saint-Eitenne; Didier Nimal, OSSEOMATRIX

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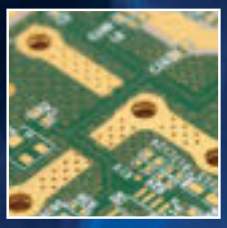
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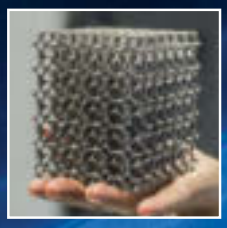
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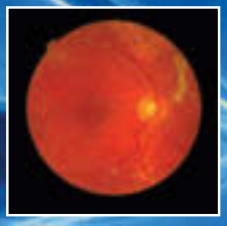
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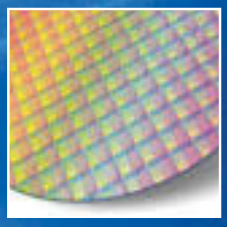
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Rapid Laser Sintering of Alkaline Fuel Cell Substrates Using Integrating Mirror (1705)
Jorge Paredes Garibay, Jarno Kaakkunen, Raimo Penttilä, Petri Laakso, Veli Kujanpää, VTT Technical Research Centre of Finland; Jennifer Harris, John McIntyre, AFC Energy PLC

Preliminary Characterization of Phenomena Occurring During Single Track Fabrication in Laser Additive Manufacturing of Stainless Steel (1706)
Ville Matilainen, Heidi Piili, Antti Salminen, Lappeenranta Univ. of Technology; Tatu Syvänen, Olli Nyrhilä, EOS Finland

Mechanical Properties of Selective Laser Melted Ti-6Al-4V with Different Layer Thickness (1707)
Milan Brandt, Shoujin Sun, School of Aerospace, Mechanical and Manufacturing Engineering, RMIT Univ.; Qianchu Liu, Peter Khan Sharp, Defence Science and Technology Organisation (DSTO), Australia

Remote Sensing of Temperature for Laser Metal Deposition of 3D Free Form Structures. (1708)
Stefano Zarini, Ali Gökhan Demir, Daniele Colombo, Barbara Previtali, Politecnico di Milano

Effect of Process Parameters on Stress Formation and Cracking During Deposition of Inconel 718 on Ti-6Al-4V (1709)
Kamran Shah, Izhar Ul Haq, Institute of Mechatronics Engineering, Univ. of Engineering & Technology Peshawar

LMP Session 18: Modelling and Simulation

Thursday, October 23rd • 8:30 AM

Session Chair: Aravinda Kar, CREOL, The College of Optics and Photonics, Univ. of Central Florida, Orlando, FL, USA

A Finite Element Model for an Additive Manufacturing Process : Direct Metal Deposition (1801)
Guillaume Marion, Georges Cailletaud, Christophe Colin, Matthieu Maziere, Mines ParisTech - Centre Des Materiaux Cnrs Umr 7633

Effect of Uncertainty in Processing Parameters on the Microstructure of Single Melt Tracks Formed by Selective Laser Melting (1802)
Sankhya Mohanty, Jesper Hattel, Technical Univ. of Denmark

Modeling of Laser Beam and Powder Flow Interaction in Laser Cladding Using Ray-Tracing (1803)
Wim Devesse, Dieter De Baere, Patrick Guillaume, Vrije Universiteit Brussel

Numerical Sensitivity Analysis of Single Pulse Laser Welding with a C-shaped Beam (1804)
Jesper Sundqvist, Alexander F.H. Kaplan, Luleå Univ. of Technology, Department of Engineering Sciences and Mathematics; Choon Yen Kong, Jon Blackburn, TWI Ltd; Eurico Assunção, Luisa Coutinho, Universidade de Lisboa, Instituto Superior Técnico

Numerical Modelling and Characterization of The Laser-Matter Interaction During High-Power CW Laser Perforation of Thin Metal Plates (1805)
Johannes Horak, Dominic Heunoske, Martin Lück, Jens Osterholz, Matthias Wickert, Fraunhofer EMI

Process Velocity Effect on Melt Film Dynamics During Laser Cutting of Metals (1806)
El-Hachemi Amara, Karim Kheloufi, Toufik Tamsaout, CDTA

Three-dimensional Simulation of Titanium and Aluminum Welding Brazing Process (1807)
Morgan Dal, Patrice Peyre, PIMM, UMR 8006 CNRS

Numerical Methods to Predict Overheating in SLM Lattice Structures (1808)
Martin Leary, Matthew McMillan, Darpan Shidid, Maciej Mazur, Stephen Sun, Milan Brandt, School of Aerospace, Mechanical & Manufacturing Engineering, RMIT Univ.; Hans VanToor, Delft Univ. of Technology

Comparative Study of Numerical Models of the Laser Forming Process (1809)
Alberto Torres Cruz, Dirk Frederik de Lange, Hugo Ivan Medellín Castillo, Universidad Autónoma de San Luis Potosí

LMP Session 19: Welding III

Thursday, October 23rd • 8:30 AM

Session Co-Chairs: Anna Unt, Lappeenranta Univ. of Technology, Lappeenranta, Finland; Friedhelm Dorsch, TRUMPF Werkzeugmaschinen, Ditzingen, Germany

Reduced Velocity of Sound in the Weld Pool in the Presence of Bubbles (1901)
Peter Berger, Institut fuer Strahlwerkzeuge, Universitaet Stuttgart

Inline Coherent Imaging of High-Power Laser Processing: Beyond Depth Control (1902)
Christopher Galbraith, James Fraser, Queen's Univ.; Paul Webster, Cole Van Vlack, Laser Depth Dynamics, Inc.

Study of Weld Pool Geometry When Applying Beam Patterns (1903)
Morten Kristiansen, Ole Madsen, Klaus Schütt Hansen, IPU / Department of Mechanical and Manufacturing Engineering, Aalborg Univ.; Flemming Ove Olsen, IPU; Veli Kujanåaä, VTT

Minimization of Distortions During Laser Welding of Ultra High Strength Steel (1904)
Karl Fahlstrãm, Arne Melander, Swerea KIMAB; Oscar Andersson, Urban Todal, Volvo Cars Corporation

High Quality Laser Welding by Reducing the Ambient Pressure (1905)
Christian Bãrner, Klaus Dilger, Fabian Fischer, Tu Braunschweig

Laser Beam Welding Under Vacuum of a Fine-Grained Steel (1906)
Uwe Reisgen, Simon Olschok, Stefan Jakobs, RWTH Aachen Univ. ISF

Absorption Peaks Depending on Topology of the Keyhole Front and Wavelength (1907)
Alexander Kaplan, Ramiz Saeed Matti, Lulea Univ. of Technology

Laser Beam Welding of an Austenitic-Ferritic Duplex Steel and Comparison with Arc Welding (1908)
Sheila Medeiros De Carvalho, Instituto De Aeronautica E Espaco; Milton S. F. Lima, Instituto De Estudos Avancados

Enabling Lightweight Designs by a New Laser Based Approach of Joining of Aluminium to Steel (1909)
Ruediger Brockmann, Oliver Müllerschön, Sebastian Kaufmann, Antonio Candel-Ruiz, Marc Kirchhoff, TRUMPF Laser- und Systemtechnik GmbH

Conference Chair: **Henrikki Pantsar,** *Cencorp Corporation, Canton, MI, USA*

ICALEO® is always the congress to attend due to its high level technical content and excellent networking. With three conferences there are plenty of interesting topics for everyone. As for the Laser Microprocessing Conference, we are experiencing significant growth from previous years and the quality of papers is very impressive. The possibility to have the papers peer reviewed has increased interest in the conference and we are looking forward to a great program.

ICALEO is the place to witness the trends in laser processing and as the laser community knows, the focus keeps shifting. Highlight topics this year include applications in microelectronics and after a couple of quieter years, laser processing in renewable energy device manufacturing is significantly increasing its presence. Along with the growing application areas, surface engineering and laser processing of transparent materials still continue to be among the most reported areas of research.

Based on the more than eighty papers submitted to the LMF conference, lasers are doing well and a lot of work has been done globally to find new processes, applications and products where lasers can make their mark. It is always exciting to experience the progress at first hand and I am sure that this year's conference will be one to look forward to.

LMF Session 1: Advanced Beam Delivery for Speed and Precision (Joint Session with Nano)

Monday, October 20th • 1:30pm

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

Effect of Large Deflection Angle on the Laser Intensity Profile Produced by AOD Scanners in High Precision Manufacturing (M101)
Tiansi Wang, Aravinda Kar, CREOL, The College of Optics & Photonics, Mechanical and Aeronautical Eng., and Mat. Sci. and Eng. Department; Chong Zhang, Aleksandar Aleksov, Islam Salama, Intel Corporation

Self Optimizing LCOS-SLM Based Beam Splitter for High Precision Material Processing (M102)
Patrick Gretzki, Fraunhofer Institut for Laser Technology

Recent Advances in Laser Peening Technology and Process Exploration by X-ray Laser (M103)
Yuji Sano, Toshiba Corporation

LMF Session 2: Applications in Renewable Energy Devices I

Monday, October 20th • 3:30pm

Session Chair: Rainer Kling, ALphANOV, Talence, France

Mechanisms and Applications of Trans-Wafer Processing Using a Nanosecond 2 µm Tm:Fiber Laser (M201)
Ilya Mingareev, Sascha Berger, Thomas Tetz, Lawrence Shah, Martin Richardson, Townes Laser Institute, Univ. of Central Florida

Optimized Laser Processes for Interconnection Width Minimization of Thin-Film Silicon Solar Modules (M203)
Stefan Haas, Bugra Turan, Forschungszentrum Jülich GmbH

A New Approach to Clamping in Micro Welding (M204)
Andreas Patschger, Andreas Hopf, Jens Bliedtner, Univ. of Applied Sciences Jena; Tobias Loose, Ingenieurbüro Loose; Jean Pierre Bergmann, Ilmenau Univ. of Technology

High Speed Drilling in Alkaline Fuel Cell Electrode Manufacturing (M205)
Henrikki Pantsar, Ville Lampinen, Cencorp Oyj; Gene Lewis, Chris Reynolds, Mark Boland, Holger Schiller, AFC Energy PLC

LMF Session 3: Processing of Transparent Materials I

Monday, October 20th • 3:30pm

Session Chair: Alexander Olowinsky, Fraunhofer ILT, Aachen, Germany

Ultra-High-Precision Helical Laser Cutting of Sapphire and Glass (M301)
Frank Zibner, Arnold Gillner, Jens Holtkamp, Chao He, Fraunhofer ILT

Sapphire Cutting and Engraving with Short and Ultrashort Laser Pulses (M302)
Nicolas Falletto, ESI; Anthony Kirsch, Rainer Kling, Alphanov

Shiny Marking of Glass and Sapphire without Cracks and Adjustable Visibility (M303)
Ulrike Timmer, Oliver Haupt, Coherent LaserSystems GmbH Co. KG.; Magnus Bengtsson, Coherent, Inc.

Effect of Laser Beam Scanning Mode on Material Removal Efficiency in Laser Ablation for Micromachining of Glass (M304)
Zhongke Wang, Xincai Wang, Singapore Institute of Manufacturing Technology; Hongyu Zheng, Simtech; Wei Liang Seow

LMF Session 4: Processes and Application in Microelectronics

Tuesday, October 21st • 8:30am

Session Chair: Jean-Philippe Lavoie, Coherent, Inc., Santa Clara, CA, USA

Laser Doping of GaN for Advanced Optoelectronic Applications (M401)
Islam A. Salama, Intel - Assembly and Test Technology Development; Nathaniel R. Quick, Applicote Associates, LLC; Aravinda Kar, CREOL, The College of Optics and Photonics, Univ. of Central Florida

Laser Ablation Cutting of Thin Silicon Substrates with Tunable Ultra-Short Pulsed Lasers from 200 fs - 10 ps (M402)
Christian Fornaroli, Arnold Gillner, Fraunhofer ILT

Towards the Production of Glass Based Printed Circuit Boards (M404)
Philipp von Witzendorff, Oliver Suttmann, Ludger Overmeyer, Kristin Plat, Laser Zentrum Hannover e.V.

Comparison of Different Ultra-Short Pulsed Laser Sources Used for Semiconductor Substrate Processing (M405)
Ilya Mingareev, Martin Richardson, Townes Laser Institute, CREOL, Univ. of Central Florida; Christian Fornaroli, Arnold Gillner, Thomas Tetz, Fraunhofer Institute for Laser Technology

Laser Machining with QCW Fiber Lasers (M406)
Marco Mendes, Vijay Kancharla, IPG Photonics Corporation; Cristian Porneala, Xiangyang Song, Mathew Hannon, Rouzhbeh Sarrafi, Joshua Schoenly, Dana Sercel, Sean Dennigan, Roy VanGemert, John Bickley, Jeff Sercel, IPG Photoincs - Microsystems Division

Laser Post Processing of Printed Graphene Interconnects (M407)
Elahe Jabari, Ehsan Toyserkani, Univ. of Waterloo

LMF Program Committee:

Neil Ball, *Directed Light Inc., San Jose, CA, USA*
Masayuki Fujita, *Institute for Laser Technology, Osaka, Japan*
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Bo Gu, *BOS PHOTONIC, North Andover, MA, USA*
Rui Guo, *GE (China) Research and Development Center Co, Ltd., Shanghai, People's Republic of China*
Sami Hendow, *Adaptive Laser Processing, Los Altos, CA, USA*
Aravinda Kar, *CREOL, The College of Optics and Photonics, Univ. of Central Florida, Orlando, FL, USA*
Nam Seong Kim, *Lutronic, Goyang, South Korea*
Petri Laakso, *VTT, Lappeenranta, Finland*
Michael Miekle, *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*

Laser Based Dry Integration of Rolled-Up Nanostructures into Polymer Substrates (M408)
Tom Enderlein, Christian Helke, Joerg Nestler, Technische Universitaet Chemnitz, Center for Microtechnologies; Stefan M. Harazim, Oliver G. Schmidt, Leibniz-Institut für Festkörper- und Werkstoffforschung (IFW); Sascha Geidel, Thomas Otto, Thomas Gessner, Fraunhofer ENA

High Precision Excimer Laser Structuring for Advanced Chip Packaging (M409)
Ralph Delmdahl, Rainer Pätzel, Rolf Senczuk, Jan Brune, Coherent LaserSystems GmbH & Co. KG; Magnus Bengtsson, Coherent, Inc.

Thermal Effects of Material Microprocessing as a Function of Pulsewidth Spanning the Picosecond Regime (M412)
Tim Gerke, Fianium; Brian Baird, Summit Photonics

LMF Session 5: Processing of Transparent Materials II

Tuesday, October 21st • 1:30pm

Session Chair: Bo Gu, BOS PHOTONICS, North Andover, MA, USA

Laser Processing of Glass and Other Transparent Materials (M501)
Philipp von Witzendorff, Laser Zentrum Hannover e.V.

Study on Fused Silica Micro-Grooving with Picosecond Laser (M503)
Junke Jiao, Wenwu Zhang, Liang Ruan, Tianrun Zhang, Jiaqiang Sun, Ningbo Institute of Material Technology and Engineering, Chinese Academy of Sciences

Structuring Glass with ps Laser (M504)
Christian Schindler, Jens Bliedtner, Oliver Elies, Christian Schindler, ernst-Abbe Univ. of Applied Sciences Jena

Sapphire Micromachining with UV Nanosecond Lasers (M505)
Jan-Willem Pieterse, JDSU

Analysis of Self-Focusing Phenomenon in Light Absorption Medium Due to Ultrashort Pulse Laser Irradiation and Estimation of Nonlinear Absorption Coefficient (M506)
Etsuji Ohmura, Ryota Nozaki, Osaka Univ.

Laser Micromachining of Transparent Dielectrics - Glass and Quartz Using Nano Short Pulses Nd:YVO_4 Laser Harmonics (M508)
Shiva Gadag, Radovan Kovacevic, Southern Methodist Univ.

LMF Session 6: Laser Processing of Polymers

Wednesday, October 22nd • 9:00am

Session Chair: Sami Hendow, Adaptive Laser Processing, Los Altos, CA, USA

Micromachining of CFRP with Ultra-Short Laser Pulses (M601)
Masayuki Fujita, Toshihiro Somekawa, Institute for Laser Technology; Hiroshi Ohkawa, Masataka Otsuka, Yoshinobu Maeda, Takaomi Matsutani, Kinki Univ.; Noriaki Miyanaga, Institute of Laser Engineering, Osaka Univ.; Yosuke Orii, Koji Inaba, George Okada, Spectronix Corporation

Laser-Based Production of Carbon Fibers (M602)
Philipp Lott, Konrad Wissenbach, Jochen Stollenwerk, Fraunhofer Institute for Laser Technology (ILT) and Chair for the Technology of Optical Systems TOS, RWTH Aachen Univ.

Fabrication of Fresnel Zone Plate and Phase Mask by Index Change in the Bulk of Polymers with Femtosecond Laser Pulses (M603)
H. Desrus, F. Deloison, Rainer Kling, Alphanov

Investigation of the Impact of CO2 Laser Wavelength on the Cutting Efficiency of Polymer Films (M604)
Alan Conneely, Gerard M. O'Connor, National Univ. of Ireland Galway; Jorunn Nilsen, Norner AS

LMF Session 7: Functional Surfaces I

Wednesday, October 22nd • 9:00am

Session Chair: Jarno J.J. Kaakkunen, VTT Technical Research Centre of Finland, Lappeenranta, Finland

Enhancing Luminescent Properties of GaN-Based Light-Emitting-Diode and Improving Optical and Electrical Properties of GaN Epitaxial Wafers with Excimer Laser Irradiation (M701)
Haoqi Tan, Yijian Jiang, Yan Zhao, Beijing Univ. of Technology

Thermal Radiation of Metal Surface Fabricating by Femtosecond Laser (M702)
Song Liu, Haiying Song, Shibing Liu, Beijing Univ. of Technology

Picosecond Laser Fabrication of High Performance Silicon Light Trapping Structures for Photovoltaics (M703)
Lingfei Ji, Institute of Laser Engineering, Beijing Univ. of Technology

EBSD Characterization of Surface Damage Induced with Ultra-Short Laser Pulses (M704)
Václav Ocelík, Univ. of Groningen, Dept. of Applied Physics, Materials Science Group

LMF Session 8: Applications in Renewable Energy Devices II

Wednesday, October 22nd • 10:50am

Session Chair: Rahul Patwa, Fraunhofer USA, Center for Laser Technology, Plymouth, MI, USA

Laser-Based Manufacturing for Renewable Energy (M801) ***Invited***
Mool Gupta, Univ. of Virginia Department of Electrical & Computer Engineering

Precise Selective Scribing of Thin-Film Solar Cells by a Picoseconds Laser (M803)
Xin Zhao, Yung Shin, Purdue Univ.

Laser Processing of Thin Films for Inverted Polymer Solar Cell Application (M804)
Susana Abreu Fernandes, Kerstin Funck, Benjamin Schoeps, Evgeny Gurevich, Andreas Ostendorf, Ruhr-Univ. Bochum

Characterization of Absorptivity in Micro-welding of Copper by Pulsed Green Nd:YAG Laser (M805)
Yasuhiro Okamoto, Shin-ichi Nakashiba, Tomokazu Sakagawa, Norio Nishi, Kataoka Corporation; Takuya Wada, Akira Okada, Okayama Univ.

LMF Session 9: Functional Surfaces II

Wednesday, October 22nd • 10:50am

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

Wettability Conversion of Ultrafast Laser Micro-Nano Structured Copper Surfaces (M901)
Hongjun Zhang, Jiangyou Long, Minlin Zhong, Tsinghua Univ.

Effect of Periodic Nanostructures Produced with Femtosecond Laser on Cell Spreading (M902)
Togo Shinonaga, Masahiro Tsukamoto, Joining and Welding Research Institute, Osaka Univ.; Kazuya Miyagawa, Kazuyuki Hara, Takuya Kawa, Graduate School of Engineering, Osaka Univ.; Peng Chen, Akiko Nagai, Takao Hanawa, Institute of Biomaterials and Bioengineering, Tokyo Medical and Dental Univ.

Micro-Polishing of 38CrMoAl by Using Excimer Laser Irradiation (M903)
Ran Na, Tao Chen, Beijing Univ. of Technology

Ps Laser Fabricating of Micro-Nano Structures for Ultra-Broad-Band-Spectrum Highly Absorptive Surfaces (M904)
Minlin Zhong, Peixun Fan, Tsinghua Univ.

Application of Self-Mixing Interferometry for Depth Monitoring in the Ablation of TiN Coatings (M905)
Ali Gökhan Demir, Barbara Previtali, Department of Mechanical Engineering, Politecnico di Milano; Alessandro Magnani, Alessandro Pesatori, Michele Norgia, Department of Electronics and Information, Politecnico di Milano

LMF Session 10: Medical Applications and Devices

Wednesday, October 22nd • 3:00pm

Laser Assisted Frenectomy Using 980nm Diode Laser (M1003)
Tahrir Nazzal Naif Aldelaimi, College of Dentistry, Anbar Univ.

Systematic Study of the Roughness of Bio-absorbable Polymer Surfaces Processed by Ultra-short Laser Pulses (M1004)
Bernhard Fäßler, Johann Zehetner, Giovanni Piredda, Vorarlberg Univ. of Applied Sciences

Improvements in Economic Micro-Machining of Polymer, NiTi and Stainless Steel Parts with Disk-Based Femtosecond Lasers (M1005)
Stephen Hypsh, Russ Denton, JENOPTIK Laser Technologies LLC; Susanna Friedel, Nikolas von Freyhold, Markus Roehner, Klaus Stolberg, JENOPTIK Laser GmbH

LMF Session 11: Laser Micromachining and Drilling

Wednesday, October 22nd • 3:00pm

Session Chair: Tony Hoult, IPG Photonics, Santa Clara, CA, USA

Laser Drilling for High Aspect Ratio Holes and a High Open Area Fraction for Space Applications (M1101)
Rahul Patwa, Hans Herfurth, Fraunhofer USA; Roman Flaig, RWTH Univ.; Marc Christophersen, Bernard Phlips, U.S. Naval Research Laboratory

Pushing Hole Diameters with High Aspect Ratio Below 50 Microns: a Test Bench for FS Laser and Trepanning Head (M1102)
John Lopez, Univ Bordeaux CNRS CEA CELIA UMR5107; Girolamo Mincuzzi, Rainer Kling, Alphanov

Precise Microscale Disk Fabrication of Metal by Femtosecond Laser and Removing Debris with Dielectrophoresis (Dep) Force (M1103)
Changkyoo Park, Dave Farson, Ohio State Univ.; Hae Woon Choi, Keimyung Univ.

Influence of Particle Shielding and Heat Accumulation Effects onto the Removal Rate for Laser Micromachining with Ultra-Short Pulses at High Repetition Rates (M1104)
Beat Jaeggi, Marc Schmid, Bern Univ. of Applied Sciences Institute for Applied laser, Photonics and Surface Technologies ALPS; Markus Zimmermann, Bern Univ. of Applied Sciences Institute for Mechatronic Systems ifms; Guido Hennig, Daetwyler Grap

Rapid Prototyping of Metallic Structures Based on Laser Micro-Cladding (M1105)
Jesus del Val, Antonio Riveiro, Felipe Arias-González, Rafael Comesaña, Joaquin Penide, Fernando Lusquuiños, Mohamed Boutinguiza, Félix Quintero, Juan Pou, Univ. of Vigo

LMF Session 12: Advances in Lasers and Beam Delivery

Thursday, October 23rd • 8:30am

Session Chair: Magnus Bengtsson, Coherent, Inc., Santa Clara, CA, USA

34W, GHz Repetition Rate Supercontinuum Generation Based on Tunable Actively Mode-Locked Fiber Laser (M1201)
Jing Gao, Tingwu Ge, Hongshen Kuang, Zhiyong Wang, Beijing Univ. of Technology; Wuyi Li, Beijing Univ. of Posts and Telecommunications

Beat-Note Detection in Subharmonic Synchronously Intracavity Pumped OPO (M1202)
Alena Zavadilova, David Vyhlídal, Václav Kubecek, Jan Šulc, Czech Technical Univ. in Prague, FNSPE

High Power 1030 nm Yb-doped Picosecond All Fiber Laser (M1203)
Ruoyu Sun, Dongchen Jin, Yi Cao, Pu Wang, Institute of Laser Engineering, Beijing Univ. of Technology

600 Micro Joule, High Average Power Ultrafast Fiber Laser for Micromachining Applications (M1204)
Clemens Hoenninger, Yoann Zaouter, Florent Guichard, Eric Mottay, Amplitude Systemes; Marc Hanna, Patrick Georges, Institut d'Optique

100 mJ Q-switched Nd:YLF Laser with Intra-Cavity SHG and Optimized YLF Crystal Properties, Applications and Performance Results (M1205)
Joyce Kilmer, Andrea Burzo, Yusong Yin, Photonics Industries

Laser Developments in the Mid Infra-Red Wavelength Regime and Their Applications (M1206)
Tony Hoult, IPG Photonics

Comparison Study: Cutting with the Laser Microjet© vs. Well-Established and New Micro-Machining Technologies for Applications of the Watch Industry (M1207)
Annika Richmann, Bernold Richerzhagen, Synova S.A.

High-Rate Laser Micro Processing Using a Polygon Scanner System (M1208)
Udo Loeschner, Joerg Schille, Andre Streek, Tommy Knebel, Lars Hartwig, Laserinstitut Hochschule Mittweida; Robert Hillmann, Christian Endisch, SITEC Industrietechnologie GmbH

Quality Monitoring System for a Pulsed Micro Welding Process on Aluminum Alloys (M1209)
Daniel Albrecht, Institute of Transport and Automation Technology Leibniz Univ. of Hannover; Philipp von Witzendorff, Oliver Suttmann, Ludger Overmeyer, Laser Zentrum Hannover e.V.

Student Paper Award Contest

Announcing the 16th 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 announced during the Closing Plenary Session of ICALEO on Thursday, October 23rd.

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).

Nano Program Committee:

Craig Arnold, *Princeton Univ., Princeton, NJ, USA*
Tommaso Baldacchini, *Technology and Applications Center, Newport Corporation, Irvine, CA, USA*
Stephan Barcikowski, *Univ. of Duisburg-Essen and Center for Nanointegration (CeNiDE), Essen, Germany*
Boris Chichkov, *Laser Zentrum Hannover e.V., Hannover, Germany*
Nick Fang, *MIT, Cambridge, MA, USA*
Costas Grigoropoulos, *Univ. of California - Berkley, Berkley, 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, *Nagaoko Univ. of Technology, Nagaoko, Japan*
Sungho Jeong, *Gwangji Institute of Science and Technology, Gwangji, South Korea*
Lan Jiang, *Beijing Institute of Technology, Beijing, People's Republic of China*
Yuankun Lin, *Univ. of North Texas, Denton, TX, USA*
Etsuji Ohmura, *Osaka Univ., Suita, Osaka, Japan*
Alberto Piqué, *U.S. Naval Research Laboratory, Washington, DC, USA*
Xinwei Wang, *Iowa State Univ., Ames, IA, USA*
YunShen Zhou, *Univ. of Nebraska - Lincoln, Lincoln, NE, USA*

Conference Chair: **Yongfeng Lu,** *Univ. of Nebraska – Lincoln, Lincoln, NE, USA*

The Nanomanufacturing Conference of ICALEO® presents nanomanufacturing papers relevant to laser technologies. Much progress has been achieved in laser direct writing, laser nanomachining, nanofabrication using ultrafast lasers, and laser-assisted growth and synthesis of nanomaterials and nanoparticles. This conference will highlight research in emerging nanomanufacturing technologies in 3-D micro/nanofabrication, laser spectroscopy and metrology, laser synthesis and diagnostics of carbon nanomaterial, epitaxial growth of graphene for optoelectronics, nanolithography, nanoscale thermal imaging, biophotonics, nanostructured surface coating, laser sintering and laser surface texturing. These studies encompass a variety of applications, including optoelecronics, biology, surface conditioning, sensors and solar cells.

Nano Session 1: 3D Fabrication and Printing

Monday, October 20th • 3:30 PM

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

Ship-in-a-bottle Integration by Hybrid Femtosecond Laser Processing for Fabrication of Highly Functional Biochips (N101)
Koji Sugioka, Dong Wu, Katsumi Midorikawa, RIKEN

Incorporating Nanoelements in Micro-architectures by 3D Printing (N102)
Shaochen Chen, Univ. of California, San Diego

Quality Controlling of the Laser Textures Ablation by Projective Galvanometer Scanning System on 3D Freeform Surface (N103)
Xizhao Wang, Jun Duan, Xiaoyan Zeng, Huazhong Univ. of Science & Technology; Ming Jiang, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science & Technology

Nano Session 2: Micro/Nanoscale Patterning

Tuesday, October 21st • 8:30 AM

Session Co-Chairs: Lin Li, The Univ. of Manchester, Manchester, Great Britain; Yoshiki Nakata, Institute of Laser Engineering, Osaka Univ., Osaka, Japan

Fabrication and Applications of Periodic Nanostructures Formed by Interfering Femtosecond Laser Processing (N201)
Yoshiki Nakata, Naoto Shimada, Yoshiki Matsuba, Noriaki Miyanaga, Osaka Univ.; Keiichi Murakawa, Seiko Instruments Inc.; Tatsuya Shoji, Yasuyuki Tsuboi, Osaka City Univ.

Highly Flexible Laser Interference Patterning for Adaptable Light Management in Thin-Film Silicon Solar Cells (N202)
Tobias Knüttel, IEK5-Photovoltaik at Forschungszentrum Jülich and 4JET Technologies GmbH; Stefan Bergfeld, Cologne Univ. of Applied Sciences and 4JET Technologies GmbH; Karsten Bittkau, Stefan Haas, IEK5-Photovoltaik at Forschungszentrum Jülich

Direct Laser Patterning of Indium Tin Oxide Thin Film on Flexible Substrates (N203)
Taesoon Park, Dongsik Kim, POSTECH

Ultraviolet Nanosecond Pulsed Laser Interference Lithography and Application of Periodic Structured Ag-Nanoparticle Films for Surface Enhanced Raman Spectroscopy (N204)
Shi Bai, Weiping Zhou, Yuanhai Lin, Yan Zhao, Tao Chen, Anming Hu, Beijing Univ. of Technology

Direct Laser Fabrication of Large-Area Graphene: an Engineering Approach to Nano-Materials (N206)
Hongjun Zhang, Minlin Zhong, Xiaohui Ye, Tsinghua Univ.

Laser Materials Processing for Nanostructure Coatings (N208)
Jianhua Yao, Zhejiang Univ. of Technology

Microstructural and Properties Characterization of Stellite6 Coating Prepared by Supersonic Laser Deposition (N209)
Zhihong Li, Zhijun Chen, Lijing Yang, Bo Li, Jianhua Yao, Zhejiang Univ. of Technology

Nanosecond Ultraviolet Laser Modification for Fabricating High-Adhesion Copper Patterns (N210)
Xiaoyan Zeng, Ming Lv, Jianguo Liu, Huazhong Univ. of Science & Technology

Nano Session 3: Spectroscopy and Spectrometry at Nanoscales

Wednesday, October 22nd • 9:00 AM

Session Chair: Craig Arnold, Princeton Univ., Princeton, NJ, USA

Residual Stress Analysis in Σ-Si Multilayer Film Structure by Micro-Raman Spectroscopy (N301)
Wei Qiu, Tianjin Univ.; Univ. of Nebraska-Lincoln

Enhancement of Laser-Induced Breakdown Spectroscopy Using Plasmas Expanding in Flames (N303)
Lisha Fan, Yunshen Zhou, C.F. Zhang, X. Huang, Lei Liu, Yongfeng Lu, Univ. of Nebraska-Lincoln

Micro-/Nanoprocessing of Transparent Materials by Femtosecond Laser Pulses (N304)
Quanzhong Zhou, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

Nano Session 4: Advanced Concepts in Material Processing

Wednesday, October 22nd • 10:50 AM

Session Chair: Anming Hu, Beijing Univ. of Technology, Beijing, Peoples Republic of China

Ablation Efficiency of High-Average Power Ultrafast Laser (N401)
John Lopez, Raphael Devillard, Univ Bordeaux / CNRS; Girolamo Mincuzzi, Rainer Kling, ALPHANOV; Yoann Zaouter, Clemens Hönninger, Eric Mottay, AMPLITUDE SYSTEMES

On- and Off-Resonance Vibrational Excitations of Ethylene Molecules in Laser-Assisted Combustion Diamond Synthesis (N402)
Yunshen Zhou, Yang Gao, Jean-Francois Silvain, M.X. Wang, Lisha Fan, Lei Liu, Yongfeng Lu, Univ. of Nebraska-Lincoln

Effects of Laser Resonant Excitation on the Growth of GaN Films (N403)
Yang Gao, Lisha Fan, Yunshen Zhou, H. Rabiee Golgir, Yongfeng Lu, Univ. of Nebraska-Lincoln

Plasmonic-Enhanced Welding of Metal Nanowire Networks for Direct Integration of Transparent Conducting Layers on Organic Electronic Devices (N405)
Craig Arnold, Princeton Univ.

Nano Session 5: Nanomaterials and Nanostructures

Thursday, October 23rd • 8:30 AM

Session Co-chairs: Xiaoyan Zeng, Huazhong Univ. of Science & Technology, Wuhan, Peoples Republic of China; Jianhua Yao, Zhejiang Univ. of Technology, Hangzhou, Peoples Republic of China

Laser Generation of Nanoparticles for Antibacterial Applications (N501)
Lin Li, The Univ. of Manchester

The Effect of Laser Beam Orientation on the Ablation Quality of the Patterns for 3D Freeform Surface (N502)
Ming Jiang, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science & Technology; Xizhao Wang, Jun Duan, Xiaoyan Zeng, Huazhong Univ. of Science & Technology

Self-Assembly and Laser Sintering of Silver Nanoparticle and Nanowire Films Prepared by Modified Coffee-Ring Effect for Surface Enhanced Raman Scattering (N503)
Weiping Zhou, Shi Bai, Anming Hu, Beijing Univ. of Technology

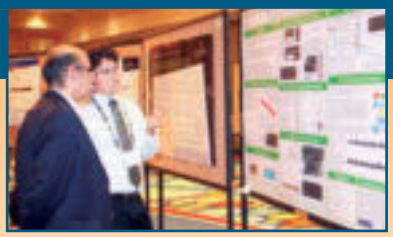
Nanoparticle Structure Evolution Under Picosecond Laser-Induced Stress Wave Compression (N504)
Chong Li, Xinwei Wang, Kelsey Burney, Kevin Bergler, Iowa State Univ.

One-Step 3D Microstructure Fabrication Insidepmma by Using a Femstosecond Laser (N505)
Chong Zheng, Tao Chen, Institute of Laser Engineering, Beijing Univ. of Technology

Deposition Characteristics and Microstructure of Ni60-Ni Composite Coating by Supersonic Laser Deposition (N507)
Lijing Yang, Gang Dong, Zhihong Li, Bo Li, Jianhua Yao, Zhejiang Univ. of Technology

Suppression Effect of a Steady Magnetic Field on Molten Pool During Laser Remelting (N508)
Liang Wang, Qunli Zhang, Yong Hu, Jianhua Yao, Zhejiang Univ. of Technology

Development of Nanoinks and Nanosintering for Printable Electronics (N509)
Anming Hu, Univ. of Tennessee Knoxville; Ruo Zhou Li, Southeast Univ.



POSTER PRESENTATION GALLERY

Tuesday, October 21st and Wednesday, October 22nd

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 8:00am – 9:00am to answer questions. Poster presentations that submit a manuscript will be included in the ICALEO® Proceedings.

Laser Cladding of Honeycomb Structured Bond Coat on Ni-Based Superalloy (P101)
Yuan Qin, Shuai Wang, Haitao Wu, Wenchao Zhang, Seng Yang, Nanjing Univ. of Science and Technology

Surface Hardening of Titanium by Laser Surface Alloying Using Polyvinyl Alcohol Film (P103)
Takuto Yamaguchi, Hideki Hagino, Technology Research Institute of Osaka Prefecture; Atsushi Nakahira, Osaka Prefecture Univ.

An Investigation of the Crack Propagation in Laser Thermal Cleavage on Glass with Straight-Turning Paths (P104)
Jehnming Lin, National Cheng Kung Univ.

Study of Carbide Dissolution into the Matrix During Laser Cladding of Carbon Steel Plate with Tungsten Carbides-Stellite Powders (P105)
Simone Zanzarin, Alberto Molinari, Univ. of Trento; Sven Bengtsson, Höganäs AB

All Fiber Coherent Addition Technology Toward Development of High-Power Fiber Laser (P106)
Minoru Yoshida, Yuta Kambayashi, Kinki Univ.

A New Laser-Hybrid Fabrication Method for 3D Nanoporous MnO_2 Structure and Investigation on its Structure-Function Integration (P107)
Ting Huang, Zhendong Deng, Beijing Univ. of Technology

In-situ Observation of Process Instabilities During Selective Laser Melting of Metallic Powder (P108)
Pierre Vinson, Christophe Colin, Jean-Dominique Bartout, MINES ParisTech - Centre des Matériaux

Adhesion, Proliferation and ALP Activity of Osteoblasts on Porous Ti Processed by Laser Solid Forming (P109)
Haiou Yang, Xin Lin, Northwestern Polytechnical Univ.

Research on Improving Heat Fade Performance of Cast Iron by Laser Peening in Dynamic Strain Aging Temperature Regime (P110)
Xu Feng, Jianzhong Zhou, Shu Huang, Yufen Mei, Weili Zhu, Xiankai Meng, Jiangsu Univ.

Fatigue Performance and Fracture Morphology Analysis of Ti-6Al-4V Titanium Alloy Subjected to Laser Peening with Different Coverage Areas (P111)
Shu Huang, Jianzhong Zhou, Jiangsu Univ.

Review on the Development of Laser Assisted Machining Technique (P112)
Yuanfeng He, Ningbo Industrial Technology Research Institute; Wenwu Zhang, Ningbo Institute of Materials Technology and Engineering (NIMTE), CAS

Hot Corrosion Behavior of IN718 Superalloy Treated by Laser Peening (P113)
Songling Chen, Y.Q. Zang, School of Mechanical Engineering, Jiangsu Univ.; S. Huang, V-Zenith Laser Technology Company, School of Mechanical Engineering, Jiangsu Univ.

Adjustment of Experimental Parameters of Laser Drilling for Reducing Delimination Length of Thermal Barrier Coating on Superalloys (P114)
Matthieu Schneider, Yann Rouchausse, Wilson Nicolas Laguna Delgado, Arts et Métiers

Laser Powder Deposition of Thin-Walled Mesh Structure for Longevity of Thermal Barrier Coating (P115)
Xiaoli Zhang, Huan Qi, Shanghai Jiao Tong Univ.

The Deposition Morphology Evolution of Laser Solid Forming on the Fluctuant Surface (P116)
Hua Tan, Yuanhong Qian, Yu Bai, Weidong Huang, Northwestern Polytechnical Univ.

Experimental Analysis of the Influence of Laser Process Parameters on Thin Cladding Layer Formed on Thin Substrate (P118)
Nobuyuki Abe, Masahiro Tsukamoto, Yoshihiko Hayashi, Hiroyuki Yamazaki, Daichi Tanigawa, Joining and Welding Research Institute, Osaka Univ.; Yoshihiro Tatsumi, Mikio Yoneyama, Osaka Fuji Corporation

Periodic Nanostructure Formation on PET with Femtosecond Laser for Control of Cell Elongation (P119)
Masahiro Tsukamoto, Yuji Sato, Togo Shinonaga, Kazuyuki Hara, Joining and Welding Research Institute, Osaka Univ.; Kazuya MIyagawa, Takuya Kawa, Graduate School of Engineering, Osaka Univ.; Ryuichiro Sasaki, AISIN SEIKI Co., Ltd.

A New Laser Assisted Machining Technology Based on High Speed Pulsation Turning Machine (P120)
Wenwu Zhang, Ningbo Institute of Materials Technology & Engineering Chinese Academy of Sciences

Femtosecond Laser Induced Periodic Nanostructures and Microstructures on Ti Plate for Control of Cell Spreading (P123)
Masahiro Tsukamoto, Togo Shinonaga, Kazuyuki Hara, Peng Chen, Akiko Nagai, Takao Hanawa, Kazuya Miyagawa, Osaka Univ.

Position Welding for Backside Welded Specimen Using Laser-GMA Hybrid Welding (P124)
Youngnam Ahn, Cheolhee Kim, Korea Institute of Industrial Technology

Sub-Milimetric Titanium Parts Generated by Rapid Prototyping Based on Laser Cladding (P125)
Jesús del Val, Rafael Comesaña, Joaquín Penide, Fernando Lusquiños, Félix Quintero, Antonio Riveiro, Mohamed Boutinguiza, Juan Pou, Filipe Arias-González, Univ. of Vigo

Numerical Research of Keyhole Formation in High-Power and High Brightness Laser Welding by MPS Method (P126)
Munehiro Higashigawa, Masami Mizutani, Yousuke Kawahito, Seiji Katayama, Osaka Univ.

Optimization of Laser Drilling of Slate Tiles (P127)
Joaquín Penide, Ramón Soto, Antonio Riveiro, Mohamed Boutinguiza, Felipe Arias-González, Jesús del Val, Rafael Comesaña, Fernando Lusquiños, Félix Quintero, Juan Pou, Univ. of Vigo

Laser Solid State Gas Nitriding of NiTi for Enhancing Wear Resistance (P128)
CH Ng, HC Man, Hong Kong Polytechnic Univ.

Study of the Effect of a Nanosecond Pulsed Laser Machining on Material (P129)
Leila Guenad, EDF R&D; Laurent Berthe, Emile Le Guen, PIMM, Arts et Métiers ParisTech

Laser Transmission Welding of CFRTP Using Filler Material – a Fundamental Study (P130)
Florian Oefele, Stefan Berger, BMW Group; Michael Schmidt, Friedrich-Alexander-Universität Erlangen-Nürnberg, Institute of Photonic Technologies

Phase Composition and Microhardness of Pure AA1200 Laser Alloyed with Premixed Ratio of (Zr+Mo+Stellite 6) (P131)
Patricia Popoola, Damilola Isaac Adebiyi, Tshwane Univ. of Technology

Optimization of Parameters with WC and Ni Based Alloying Powder in Laser Cladding of Steels Using High Power Direct Diode Laser. (P132)
Mohammed Sayeed, Southern Methodist Univ.

Investigation of Laser Welding Phenomenon of Pure Copper by X-Ray Observation System (P135)
Masanori Miyagi, Xudong Zhang, Hitachi, Ltd.

Beam Shaping of Focused Beams for Microprocessing Applications (P136)
Alexander Laskin, Vadim Laskin, AdlOptica GmbH

Experimental Study and Modeling of Hydroxyapatite and Poly (Tetrafluoroethylene) Biocomposite Selective Laser Sintering (P137)
Mohammad Etrati Khosroshahi, Hossein Safaralizadeh, Amirkabir Univ. of Technology

Reliability Assessment for Tailor-Welded Blanks with Hot Press Forming Steel (P138)
Minjung Kang, Cheolhee Kim, Kitech

Longitudinal Bendability of Laser Welded Special Steels in a Butt Joint Configuration (P139)
Jukka Siltanen, Ruukki Metals Oy

Drill-Through Point Detection Via Plasma Spectroscopy (P140)
Stefan Janssen, Ingomar Kelbassa, RWTH Aachen Univ.

Corrosion Behaviour of Laser Surface Alloyed Aisi 1016 Mild Steel with Zn+Al Powders (P141)
Olawale Fatoba, Tshwane Univ. of Technology

Guideline for Profitable Laser Processing, Perspective of Ruukki Metals Steel Service Centre of Uusikaupunki Finland (P142)
Jukka Siltanen, Ruukki Metals Oy

Modeling of Solid-Phase Diffusion of Ag in to Ni Alloys Under Laser Heating (P143)
Thiwanka Wickramasooriya, Ashwani Kaul, Aravinda Kar, Univ. of Central Florida CREOL & FPCE, The College of Optics and Photonics; Raj Vaidyanathan, Advance Materials Processing and Analysis Center AMPAC

Study of the Property for T-Joints of Aluminium-Lithium Alloy 2060 by Fiber Laser Welding (P144)
Li Chen, BAMTRI; En Guang He, Beijing Aeronautical Manufacturing Technology Research Institute

Ultrashort Double Pulse Laser Ablation of Silicon in Air (P145)
Yung Shin, Xin Zhao, Purdue Univ.

Research on Fiber Laser Welding with Filling Wire for 2060 Al-Li Alloy (P146)
Li Chen, Bamtri

Robust Control of Laser Cladding for Direct Manufacturing: From Experimental and Physical to Automatic Control Modelling (P147)
Pascal Aubry, Rezak Mezari, Arts et Métiers ParisTech

Laser Microjet© Cutting of up to 3 mm Thick Sapphire (P148)
Bernold Richerzhagen, Annika Richmann, Synova S.A.; Yury Kuzminykh, Patrik Hoffmann, Empa. Swiss Federal Laboratories for Materials Science and Technology

A Method of High Speed Visualization of CO_2- and Fiber Laser Cutting of Stainless and Mild Steel Plates (P150)
Petr Yudin, Alexander Zaitsev, Oleg Kovalev, Grigory Ermolaev, Khristianovich Institute of Theoretical and Applied Mechanics, Siberian Branch of Russian Academy of Sciences

Laser Welding-Brazing Joint for Aluminum/Steel Dissimilar Metals (P151)
Sen Yang, Nanjing Univ. of Science and Technology

Effects of Laser Radiation on the Wetting and Diffusion Characteristics of Kovar Alloy on Borosilicate Glass (P153)
Jun Chen, Soochow Univ.; Y. Lawrence Yao, Panjawat Kongsuwan, Dakai Bian, Grant Brandal, Columbia Univ. in the New York City; Min Zhang, Soochow Univ. (Suzhou Univ.)

Improvement of Gas Shielding Effect in Vertical-position Laser Micro-welding of Titanium Alloy (P154)
Yasuhiro Okamoto, Kazuo Yokohara, Akira Okada, Kento Shirasaya, Okayama Univ.; Hikotaro Ochiai, Ryousuke Kimura, Shozou Ono, Masayuki Akase, Mitsui Engineering & Shipbuilding Co., Ltd.

A Finite Element Model for an Additive Manufacturing Process: Direct Metal Deposition (P155)
Guillaume Marion, Mines ParisTech; Alexey Gurin, ITAM SB RAS

Optimisation of Processing Parameters of 3D Shape Structures in Ultra-Hard Materials with Picosecond Pulses (P156)
Saulius Mikalauskas, Mikhail Grishin, EKSPLA; Valdemar Stankevic, Artūras Greicius, ELAS; Simonas Indrišiūnas, Gediminas Račiukaitis, Center for Physical Sciences and Technology

Gap Bridging Ability in Laser Beam Welding of Thin Aluminum Sheets (P157)
Thomas Seefeld, Frank Vollertsen, Villads Schultz, BIAS

Thermal Scribing Processes with Long-Pulse and Q-Switch Fiber Lasers (P158)
Christoph Ruettimann, Ulrich Duerr, Raymond Von Niederhaeusern, Rofin-Lasag AG

Lightning II Digital Scanning with Ultra-High Resolution, Adaptive Thermal Management, Innovative Control Algorithm for Laser Micromachining (P159)
Jie Fu, Eric Ulmer, Mustafa Coskun, Amit Shahar, Mark Lucas, Yi Qian, Cambridge Technology Inc.

Robot Based 3D Metal Cutting of Hydroformed Tubes Using a Repositioning Sensor System (P161)
Torsten Scheller, JENOPTIK Automatisierungstechnik GmbH

Laser Transformation Hardening of Steel Sheets (P166)
Hyungson Ki, Sangwoo So, Sanseo Kim, Ulsan National Institute of Science and Technology

Laser Welding of Tailored Blanks with Dissimilar Materials at Different Gauge Ratios (P167)
James Chen, CanmetMATERIALS

Microstructure and Mechanical Properties of Ti-Stainless Steel Laser Welded Dissimilar Butt Joints (P168)
Michelangelo Mortello, Politecnico di Bari

Investigation on the Effects of Laser Offset on the Properties of Laser Welded Dissimilar Butt Joints (P169)
Michelangelo Mortello, Politecnico di Bari

Stresses and Fatique Behaviour of Laser Welds (P171)
Stanislav Nemecek, MATEX PM; Nikolaj Ganev, Kamil Kolarak, ČVUT Praha; Ivo Cerny, Jiri Sis, SVÚM Praha

Q-Switched 2 Micron Fiber Lasers for Materials Processing (P174)
Shibin Jiang, AdValue Photonics, Inc.

Study on High Speed PS Laser Micromachining (P175)
Wenwu Zhang, Junke Jiao, Liang Ruan,Tianrun Zhang, Guokun Zuo, Ningbo Institute of Materials Technology and Engineering (NIMTE), Chinese Acdemy of Science

Biocompatibility and Corrosion Response of Laser Joined NiTi to Stainless Steel Wires (P176)
Grant Brandal, Y. Lawrence Yao, Columbia Univ.; Syed Naveed, Boston Scientific Corp.

Laser-Delayed Double Shock-Wave Generation in Water-Confinement Regime (P177)
Damien Courapied, Laurent Berthe, Patrice Peyre, Frédéric Coste, Laboratoire Procédés et Ingénierie en Mécanique et Matériaux (PIMM), CNRS-ENSAM Paristech; Ji-Ping Zou, Anne-Marie Sautivet, Laboratoire pour l'utilisation des lasers intenses (LULI), Ecole Polytechnique

High-PRF Ultrashort Pulse Laser Micro Processing of Copper (P178)
Joerg Schille, Lutz Schneider, Peter Lickschat, Udo Loeschner, Robert Ebert, Horst Exner, Laserinstitut Hochschule Mittweida

In-Situ Measurement of the Focal Position in One and Ten Micron Laser Cutting (P179)
Ulrich Thombansen, Fraunhofer Institute for Lasertechnology (ILT); Torsten Hermanns, RWTH Aachen, Nonlinear Dynamics of Laser Processing (NLD)

High Throughput Cutting and Drilling of Carbon Fibre Reinforced Polymer with Nanosecond Pulsed Solid State Lasers (P180)
Aos Alwaidh, Nick Hay, Young Key Kwon, Ian Baker, Powerlase Photonics Ltd

Superwetting Surfaces on Metallic Substrates Fabricated by Short Pulse Laser (P181)
Fangfang Luo, Minghui Hong, National Univ. of Singapore; Gnian Cher Lim, Hongyu Zheng, Yingchun Guan, Singapore Institute of Manufacturing Technology; Bojin Qi, Beihang Univ.

Fabrication of Graphene Patterns Directly on SiO2/Si Substrates Using Laser-Induced Chemical Vapor Deposition (P182)
Lisha Fan, W. Xiong, Yunshen Zhou, Yongfeng Lu, Univ. of Nebraska-Lincoln

Laser-Assisted Intensity Enhancement in Atmospheric Mass Spectrometry (P183)
Yao Lu, Yang Gao, Yunshen Zhou, X. Huang, L. Liu, Yongfeng Lu, Univ. of Nebraska-Lincoln

Business Forum & Panel Discussion

Chair: **Klaus Loeffler,** *TRUMPF Laser and Systems GmbH, Ditzingen, Germany*

Tuesday, October 21st • 1:30pm

How to Build a Sustainable Business Based on Your Laser Idea: Listen and Talk to the Experts

This year's business session will build on the successful layout of 2013, on expert advice for the next generation laser business owners. The aim is to motivate the audience to turn a laser based idea into a successful business.

David Belforte will review today's marketplace situation with an outlook of the future. Join successful business owners, Steve Capp, Ron Lalli, Ron Schaeffer and Greg Summers who did it and will talk about their story and lessons learned. A closing round table discussion will allow everyone to ask specific questions to the experts.

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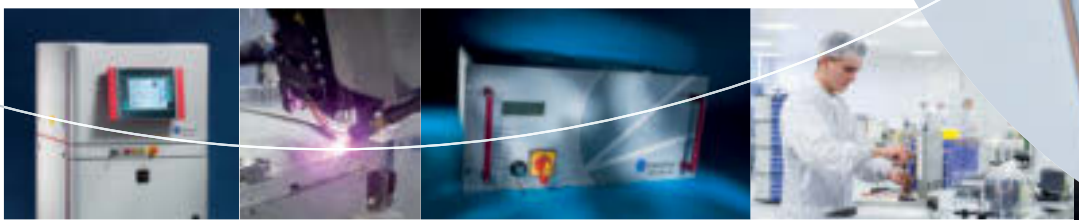

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LASER SOLUTIONS SHORT COURSES

Short Courses Chair: **Kerstin Funck,** *Ruhr Univ. Bochum, Bochum, Germany*

Sunday, October 19th

This year's short courses shall provide insight not only into laser and process technology but also cover system technology aspects. In particular, different technological approaches for beam delivery as well as laser beam diagnostics will be introduced. Beyond that, courses will focus on some of the new technological opportunities such as processing of carbon fiber reinforced plastic, a market which is forecast to have high annual growth for the next couple of years. For the newcomer, talks will help to understand and judge the different aspects that influence a laser process while the more experienced may get new impulses and a view outside the box.

Course 1: When to Bring New Laser Technology in House?

Ronald D. Schaeffer, *Photomaching Inc., Pelham, NH, USA*

USP (femto- and pico-) lasers, fiber lasers, 3D laser manufacturing, UV lasers. The list goes on and on. Many different lasers are now available from a large number of manufacturers with new players entering the field at a rapid pace. Many types of lasers, which only a few years ago were just cool toys in the research lab, are now being used extensively in production environments and allowing the microprocessing of many materials and in many applications. This course will discuss some of the 'newer' technologies and some considerations regarding bringing new laser technology into a production environment.

The objectives for this course are:

1) Understand what types of lasers are currently commercially available and used primarily in Micro Manufacturing.
2) Determine when (and why) a new laser based technology can be brought in house.
3) Understand the financial implications of bringing laser technology in house.
4) Look ahead to the future and understand what may be available as the technology progresses.

Course level: Beginner

Course 2: Technology and Design Considerations for Beam Delivery Systems of Industrial Solid State Lasers

Björn Wedel, *PT Photonic Tools GmbH, Berlin, Germany*

The basis of this short course is general discussion of the requirements on a beam delivery system for solid state lasers. Following this, the presentation will describe the different solid state laser types and their beam delivery system's technology. This will be covering e.g. kW average output power solid state lasers as well as pulsed and ultrafast laser systems. The discussion of the different technological approaches and the description of the components used in the beam delivery systems will conclude the short course.

Course level: Beginner to Intermediate

Course 3: Fundamentals and Applications of a Galvanometer-based Laser Scanning System

Jie Fu, *Cambridge Technology Inc., Bedford, MA, USA*

The applications which benefit from a galvo-based scanning system have increased significantly in recent years. This course will be an overview of the different types of galvo-scanners and provide an understanding of analog and digital scanning system, 3-axis scanning system, control & software and their applications. Participants will learn about the technologies and gain an understanding of the technical terminology behind the products they may use to integrate with galvo-scanner for their applications.

The objectives for this course are:

1) Understand operating principles of galvanometer scanner, review different types of position detectors, and discuss mirror design considerations.
2) Examine galvanometer scanning system distortion and calibration methods.
3) Address the difference between analog and digital scanning system.
4) Discuss the 3-axis scanning systems and its advantages against traditional 2-axis system.
5) Review scanner controller & software and common integration requirements. Compare traditional vs nontraditional control algorithm.
6) Present several application examples in medical, semiconductor, laser additive manufacturing and other fields.

Course level: Beginner to Intermediate

Course 4: Sensor Types for Laser Beam Diagnostics

Volker Brandl, *PRIMES GmbH, Pfungstadt, Germany*

To improve the reliability and the performance of laser processes in industrial applications, the use of different sensors for the detection and qualification of the laser beam is a versatile tool. The technological advances in this field have been significant over the last couple of years. They were driven by the improved performance of laser beam sources and by the growing demands in quality assurance. The latter is critical not only in safety applications like in the aerospace industry, but has also gained large momentum in the field of car manufacturing. Nowadays, high volume applications or processes where high value parts are handled can only be performed in a cost effective way with the aid of beam diagnostic sensors, ranging from rapid power sampling to continuous power measurements, and from tool center point detection to M^2-measurements. Even though virtually all aspects of a laser beam can be sampled by the use of corresponding sensors, the calibration of these sensors still is challenging as National Standards are not always available for other beam parameters than the laser power.

Attendants will learn about the different sensors available, their technological principles, applications and limitations of different sensors and the sophisticated field of calibrations and traceability. Examples of industrial applications will be given.

Course level: Intermediate

Course 5: Laser Machining as an Innovative Solution for the Processing of Continuous Fiber Reinforced Composites

Peter Jaeschke, *Laser Zentrum Hannover, Hannover, Germany*

Continuous glass and carbon fiber reinforced composite structures (FRP) are recognized as having a significant lightweight construction potential for a wide variety of industrial applications. Besides the aerospace sector, FRP are gaining more and more importance in the automotive as well as in the energy sector, including the renewable energy market. Due to the heterogeneous structure of FRP materials as well as the different thermo-mechanical properties of the polymeric matrix and the reinforcing fibers, this class of material is difficult to machine, especially if conventional processing techniques are used. Owing to contact-free machining and the absence of material-related tool wear, laser processing of FRP materials represents a promising alternative.

Attendees will receive an insight of what can lasers do with composites. This comprises laser-based cutting and drilling as well as composites repair, surface preparation and laser transmission welding of composite structures.

The objectives for this course are:

1) Fundamentals of continuous fiber reinforced thermoset and thermoplastic composites
2) Basic understanding of challenges while laser processing of FRP
3) Getting an overview of different laser processing techniques for FRP
4) Specific benefits and drawbacks of different techniques with respect to thermal impact and productivity

Course level: Beginner to Intermediate

Admission to Laser Solutions Short Courses is included with ICALEO registration.

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Laser Industry Vendor Reception & Tabletop Display

Tuesday, October 21st • 4:00pm

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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 Andrew Morrison at *amorrison@lia.org.*

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

Full conference registration Registration includes admission to all Receptions, Plenary Sessions, all Technical Sessions, Laser Solutions Short Courses and Awards Luncheon. Full conference registration includes the ICALEO 2014 Proceedings.

Student registration Registration includes admission to all Receptions, Plenary Sessions, all Technical Sessions, Laser Solutions Short Courses and Awards Luncheon. Full conference registration includes the ICALEO 2014 Proceedings. Valid student ID is required to process registration. Student registration will not be accepted on-site; students must be pre-registered by September 22.

One Day/Two Day registration Registration includes admission to Technical Sessions and Reception on that day only. One Day/Two Day registration includes the ICALEO 2014 proceedings.

Guest tickets Includes Welcome Celebration, President's Reception, Vendor Program Reception, Awards Luncheon and AM-PM breaks. Non-industry guests only.

Early Bird registrants must be paid in full by August 25. Visa, MasterCard, Discover 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 25 to qualify for discount. **Bank transfers must include a $30 wire transfer fee.**

On-site Registration Times

Sunday, October 19	9:00am – 4:00pm
Monday, October 20	7:00am – 5:00pm
Tuesday, October 21	7:30am – 4:00pm
Wednesday, October 22	7:30am – 4:00pm
Thursday, October 23	7:30am – 12:00pm

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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, 1.800.34.LASER, Fax: +1.407.380.5588 or email: *icaleo@lia.org*.

Transportation: Shuttle Service

The Sheraton® San Diego offers complimentary shuttle transportation to and from the San Diego International Airport, which runs every half-hour between 5:00am to 12:00am. Call +1.619.291.2900 to arrange your shuttle transportation.

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(Payment received between September 23 – On-site)
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(Payment received by August 25)
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(Payment received between August 26 – September 22)
$825.....Member
$885.....Non-Member

(Payment received between September 23 – On-site)
$895.....Member
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One Day Conference

(Payment received by August 25)
$445.....Member
$475.....Non-Member

(Payment received between August 26 – September 22)
$475.....Member
$505.....Non-Member

(Payment received between September 23 – On-site)
$510.....Member
$540.....Non-Member

Laser Solutions Short Courses

(Payment received by August 25)
$320.....Member
$350.....Non-Member

(Payment received between August 26 – September 22)
$350.....Member
$380.....Non-Member

(Payment received between September 23 – On-site)
$385.....Member
$415.....Non-Member

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

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 13**.

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 13. Guest Tickets, Proceedings & LIA Membership Dues are all non-refundable.

ICALEO® 2014 CONFERENCE AGENDA*

Sunday, October 19

9:00am ICALEO Registration Desk Open
9:30am Laser Solutions Short Courses
11:30am LIA Board of Directors Meeting
12:00pm LIA Bookstore Open
4:00pm Welcome Celebration

Monday, October 20

7:00am ICALEO Registration Desk & LIA Bookstore Open
7:30am Session Chair Appreciation Breakfast
8:00am Attendee Continental Breakfast
9:00am Plenary Session
10:10am Morning Break
Lunch on own
1:30pm LMP 1: Lasers in Energy Generation
LMF 1: Advanced Beam Delivery for Speed and Precision (Joint Session with Nano)
3:00pm Afternoon Break
3:30pm LMP 2: Cladding I
LMP 3: New Laser Sources
LMF 2: Applications in Renewable Energy Devices I
LMF 3: Processing of Transparent Materials I
Nano 1: 3D Fabrication and Printing
5:00pm ICALEO President's Reception

Tuesday, October 21

7:30am ICALEO Registration Desk & LIA Bookstore Open
8:00am Attendee Continental Breakfast
Poster Presentation Gallery
8:30am LMP 4: Welding of Non-Ferrous Materials
LMP 5: Cladding II
LMP 6: Welding I
LMF 4: Processes and Application in Microelectronics
Nano 2: Micro/Nanoscale Patterning
10:10am Morning Break
Lunch on own
1:30pm LMP 7: CFRP
LMP 8: Emerging Applications
LMP 9: Cutting
LMF 5: Processing of Transparent Materials II
Business Forum & Panel Discussion
4:00pm Laser Industry Vendor Reception & Tabletop Display

Wednesday, October 22

7:30am ICALEO Registration Desk & LIA Bookstore Open
8:00am Attendee Breakfast/Poster Presentation Gallery Q & A
9:00am LMP 10: Optics and Beams
LMP 11: LAM I
LMF 6: Laser Processing of Polymers
LMF 7: Functional Surfaces I
Nano 3: Spectroscopy and Spectrometry at Nanoscales
10:20am Morning Break
10:50am LMP 12: Hybrid Welding
LMP 13: Drilling
LMF 8: Applications in Renewable Energy Devices II
LMF 9: Functional Surfaces II
Nano 4: Advanced Concepts in Material Processing
12:30pm **LIA Annual Meeting & Awards Luncheon**
3:00pm LMP 14: Surface Modification
LMP 15: LAM II
LMP 16: Welding II
LMF 10: Medical Applications and Devices
LMF 11: Laser Micromachining and Drilling
4:40pm Afternoon Break

Thursday, October 23

7:30am ICALEO Registration Desk & LIA Bookstore Open
8:00am Attendee Continental Breakfast
8:30am LMP 17: LAM III
LMP 18: Modelling and Simulation
LMP 19: Welding III
LMF 12: Advances in Lasers and Beam Delivery
Nano 5: Nanomaterials and Nanostructures
10:10am Morning Break
Lunch on own
1:00pm Closing Plenary Session
3:00pm Farewell Break

* *Program subject to minor changes*

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