2006

25TH INTERNATIONAL CONGRESS ON APPLICATIONS OF LASERS & ELECTRO-OPTICS

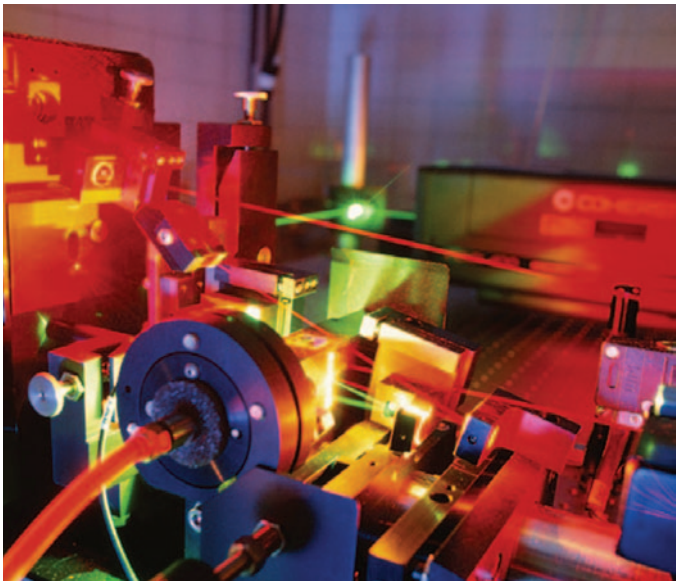
ICALEO®

OCTOBER 30 - NOVEMBER 2 • DOUBLETREE PARADISE VALLEY RESORT • SCOTTSDALE, AZ USA

Congress General Chair: Andreas Ostendorf, Laser Zentrum Hannover e.V., Hannover, Germany

Honorary Congress Chair: Akira Matsunawa, Osaka Univ., Hyogo, Japan

ADVANCE PROGRAM



ICALEO® 25th ANNIVERSARY

Celebrate ICALEO®

Celebrate 25 years

of networking &

knowledge!

FEATURING:

- Laser Materials Processing Conference
- Laser Microprocessing Conference
- Poster Presentation Gallery
- Laser Solutions Short Courses
- Business Development Session
- Networking with Industry Leaders & End Users
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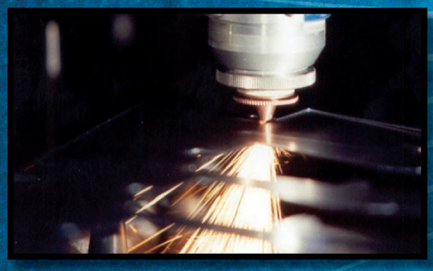

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Coming to a location near you!

General Chair Welcome

Congress General Chair: Andreas Ostendorf, Laser Zentrum Hannover e.V., Hannover, Germany

Welcome to Scottsdale, Arizona, for the 25th International Congress on Applications of Lasers & Electro-Optics (ICALEO®). For this considerable anniversary the conference committee has put together a very interesting programme with a high number of contributions from research groups covering all parts of the world. Don't miss this unique opportunity to improve your knowledge in the field of laser applications and make use of all the different networking opportunities ICALEO® has provided to its participants for a quarter of a century! Although there has been steady progress in laser applications during this 25-year period, the current dynamics in the industrial use of laser systems has never been higher than today. This development is due to laser systems that provide high power, improved beam quality, extended parameter ranges, better efficiency and superior cost advantages. Based on these properties new applications arise almost daily.

The Plenary session has outstanding speakers, who will touch future fields of laser technology. One of the most interesting research fields today is silicon photonics. An overview to this topic will be presented and the future potential will be discussed. As Arizona is well known for its aircraft and space industry, applications of lasers in this field will be examined. The current situation of laser applications and development in the emerging market of Russia will be presented, a topic of high interest especially for those from industry. In addition to the established conferences on Laser Materials Processing and Laser Microprocessing, we have again organized a business development session, which should be of particular interest for all participants who plan to start up their own company. Valuable experience will be presented, and there will be plenty of time to interact with colleagues and experts. The vendor reception, larger than ever, will be an important networking opportunity to discuss individual ideas with representatives from industry. The Laser Solutions Short Courses are ideal for those who want to receive a complete overview on the state-of-the-art in a specific area. With all these opportunities, the 25th ICALEO® will be the pacesetter in the field of laser applications. I would be pleased to be able to meet all of you in Scottsdale!

Andreas Ostendorf

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About LIA

Laser Institute of America (LIA), founded in 1968, is the professional society for Laser Applications and Safety. It is comprised of laser researchers, manufacturers, integrators, and end users working together to increase the use and safe application of laser technologies. LIA individual and corporate members receive significant discounts on all LIA materials, training courses, and conferences.

Fulfilling its mission of fostering lasers, laser applications, and laser safety worldwide, LIA is the secretariat and publisher of the American National Standards Institute (ANSI) Z136 series of laser safety standards. These documents provide a thorough set of guidelines for implementing a safe laser program. The ANSI Z136 series is recognized by OSHA, and is the authoritative series of laser safety documents in the United States. LIA also offers a wide array of products and services to thousands of end users. These include safety and applications publications, training videos, signs and labels, Laser Safety Officer training, and conferences.

Contact LIA for all your laser application and safety needs at 800.34.LASER, 407.380.1553 or www.laserinstitute.org.

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General Chair:
Andreas Ostendorf

Honorary Congress Chair:
Akira Matsunawa

LIA President:
Joseph O'Brien

LIA Executive Director:
Peter Baker

LIA Director of Conferences:
Beth Cohen

ICALEO® 2006 Conference Agenda*

Sunday, October 29

11:00am	Registration Desk Open
12:00pm	LIA Board of Directors Meeting
4:00pm	Meet & Greet Fiesta

Monday, October 30

7:00am	Registration Desk Open
7:15am	Session Chair / Speaker Appreciation Breakfast
9:00am	Plenary Session
Lunch on own	
1:30pm	LMF Session 1: Laser Microprocessing I
1:30pm	LMF Session 2: Ultrafast Laser Processing I
1:30pm	LMP Session 1: Fundamentals of Laser Welding
1:30pm	LMP Session 2: Laser Cladding for Tooling & Moulds & Laser Assisted Deposition
1:30pm	Course 1: The Fundamentals of Beam Quality, Fiber Optic Delivery and Application to Material Processing with High Quality Disk Lasers
5:00pm	Departure for President's Reception / Taliesin West

Tuesday, October 31

7:00am	Registration Desk Open
7:30am	Attendee Continental Breakfast
8:00am	LMF Session 3: Ultrafast Laser Processing II
8:00am	LMP Session 3: Laser Processing in the Aerospace, Defence & Space Industries
8:00am	LMP Session 4: Laser Cutting
8:00am	LMP Session 5: Laser Processing in the Automotive Sector I
8:00am	Course 2: Important Considerations in Founding and Operating a High Tech Business
10:10am	LMF Session 4: Laser Microprocessing II
10:10am	LMP Session 6: Laser Welding of Polymers & Plastics
Lunch on own	
1:30pm	LMF Session 5: Laser Micropackaging I
1:30pm	LMF Session 6: Laser Microprocessing III
1:30pm	LMP Session 7: Process Monitoring & Control I
1:30pm	LMP Session 8: Modelling of Laser Processes
1:30pm	Course 3: Laser Welding Aluminum - Advanced
4:00pm	Vendor Program Reception

Wednesday, November 1

7:00am	Registration Desk Open
7:30am	Attendee Continental Breakfast
8:00am	Poster Presentation Gallery
8:00am	LMF Session 7: Laser Micropackaging II
8:00am	LMF Session 8: Laser Micro-cladding & Welding
8:00am	LMP Session 9: Fibre Laser Processing I
8:00am	LMP Session 10: Laser Cladding
8:00am	Course 4: How Laser Beam Analysis Can Improve Your Process Results
10:20am	LMF Session 9: Laser Micropackaging III
10:20am	LMF Session 10: Laser Micromachining
10:20am	LMP Session 11: Fibre Laser Processing II
10:20am	LMP Session 12: Direct Metal Deposition
1:00pm	Annual Meeting & Awards Luncheon
3:00pm	LMP Session 13: Fibre Lasers III
3:00pm	LMP Session 14: Process Monitoring & Control II
3:00pm	Business Development Session
4:40pm	Attendee Dessert Break

Thursday, November 2

7:00am	Registration Desk Open
7:00am	Attendee Buffet Breakfast / Poster Presentation Gallery Q&A
8:40am	LMF Session 11: Lasers in Nanotechnology
8:40am	LMP Session 15: Lasers in Bio-Medicine
8:40am	LMP Session 16: Laser Surface Treatment
8:40am	LMP Session 17: Laser Processing in the Automotive Sector II
8:40am	Course 5: Development of a Comprehensive Educational Program for Laser Processing Technologies
Lunch on own	
1:30pm	LMF Session 12: Lasers in Diagnostics
1:30pm	LMP Session 18: Rapid Prototyping, Sintering & Powder Bed Technology
1:30pm	LMP Session 19: Hybrid Laser Welding
1:30pm	LMP Session 20: Modelling of Powder Deposition Processes
4:00pm	Farewell Break

* Program subject to minor changes

Plenary Session

"25 Years of Laser Processing - Looking Back to See the Future"

Session Chair: Andreas Ostendorf, Laser Zentrum Hannover e.V., Hannover, Germany
Monday, October 30 • 9:00am

"25 Years of Laser Processing - Looking Back to See the Future"

Look back - celebrate the silver 25th year of ICALEO® with an anniversary speech revisiting the early years. Peer ahead - new developments are continuously emerging in the photonics area opening up novel applications as well as new markets, technically and geographically. Mario Paniccia, director of Intel's Phtotonics Technology Lab will give a presentation on the latest developments in silicon photonics, focused on silicon lasers, and highlighting the outlook and perspectives of integrated silicon optical components. Growing use of laser systems in space and aviation applications in the Phoenix area will make the next presentation attractive to local attendees. Finally, a presentation by Professor Ivan Kovsh, director of the Russian Laser Association, will provide an overview of the Russian laser applications market and research projects dealing with the development and use of high power lasers. As Russia is one of the fastest growing markets, it will be interesting to hear the current situation, and how the laser industry is responding to these opportunities. Don't miss this enlightening Plenary session; looking back to see the future!

President's Reception Taliesin West

Sponsored by:

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Monday, October 30 • 5:00pm departure

The opening day of ICALEO® features an evening reception presided over by LIA President Joe O'Brien. Meet the LIA officers, Board of Directors, ICALEO® General Chair, Andreas Ostendorf; Conference Chairs, Paul Hilton and Yongfeng Lu. Meet the LIA staff, mingle with old friends, and enjoy ICALEO® in the desert.

Frank Lloyd Wright literally created Taliesin West "out of the desert." He and his apprentices gathered rocks from the desert floor and sand from the washes to build this great desert masterpiece. From the beginning, this remarkable set of buildings astounded architectural critics with its beauty and unusual form.

Situated on 600 acres of rugged Sonoran desert at the foothills of the McDowell Mountains in Scottsdale, Arizona, Taliesin West is now a National Historic Landmark. ICALEO® attendees will not see a museum, but rather a remarkably vital and active community of students and architects working together to maintain Wright's vision. Today 70 people live, work and study at Taliesin West.

Taliesin (pronounced TALLY EHSSEN) literally means "shining brow" in Welsh, the nationality of Wright's ancestors. Taliesin in Wisconsin sits on the "brow" of a hill overlooking the valley below while Taliesin West is located on a broad mesa. Enjoy a magical evening in the desert with your fellow attendees.

Invited Plenary Speakers

Silicon Photonics
Mario Paniccia, Intel Corporation, Santa Clara, CA, USA

Lasers in Space-based Applications
Cheryl Asbury, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

CIS Laser Landscape: R&D Activity, Industry and Market Demand
Ivan Kovsh, Laser Association (LAS), Moscow, Russia

GARELAM - Global Alliance for Research and Education in Laser Aided Manufacturing
Jyoti Mazumder, CLAIM, The Univ. of Michigan, Ann Arbor, MI, USA

25 Years of Laser Processing - Looking Back to See the Future
Honourable Anniversary Speaker - Surprise to be announced later!

Meet & Greet Fiesta

Sunday, October 29 • 4:00pm

Sponsored by:

IPG PHOTONICS

Join us Sunday afternoon for a Meet & Greet Fiesta Party! Start ICALEO® off right! See your old friends & colleagues and make new ones. Help us welcome our first time attendees. Casual dress required! Attendees will receive a drink ticket and plenty of Mexican munchies will be available! Don't miss the door prize drawings!

Speaker & Session Chair Appreciation Breakfast

Monday, October 30 • 7:15am

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Speakers, Poster Presenters and Session Chairs are invited to the Kick-Off Breakfast Monday, October 30 at 7:15am. Speakers will be seated within their session and meet the session chairs and other speakers. Audio-Visual tips will be given as well as any last minute updates and an overview of the week. Please plan to arrive in time to attend this important breakfast.

LIA Annual Meeting/Awards Luncheon

featuring the Schawlow Award Presentation

Wednesday, November 1 • 1:00pm

Luncheon Sponsored by:

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The 2006 Arthur L. Schawlow Award is presented to: Dr. Edward Metzbower

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

About Arthur L. Schawlow

Prof. Schawlow received a Nobel Prize for Physics in 1981 for "his contribution to the development of laser spectroscopy." He co-authored, with Prof. 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). Prof. Schawlow was also awarded the Morris N. Liebmann Memorial Prize by the Institute of Electrical and Electronic Engineers (1964). As the first honoree in 1982 of this award, it is fitting that LIA's highest achievement award is given in Prof. Schawlow's name.

Congratulations
to Newly Elected LIA Fellows:

Volodymyr Kovalenko
Reinhart Poprawe
Nathaniel Quick

Student Paper Award Contest

Announcing the 8th Annual ICALEO® Best Student Paper Award! LIA appreciates the importance of student contributions to ICALEO® by offering the opportunity to have their work recognized with this award. Students with accepted papers will be judged by an international panel on the following criteria: Originality of Topic/Material presented, Scientific and Technical Merit, and Presentation Quality. Professors do not judge their own student's papers. Prize winners will be notified after the conclusion of ICALEO® and will be announced through an article in the *LIA TODAY* newsletter featuring conference highlights.

Cash awards will be presented to 1st, 2nd, 3rd place winners
1st place paper will be published in the
Journal of Laser Applications®
(paper will go through peer review process)

Sincere Thanks to the Cooperating Societies

association of industrial laser users

American Welding Society

CLUB LASER ET PROCÉDÉS

JLPS

SME

WLT Wissenschaftliche Gesellschaft Lasertechnik e.V.

Laser Materials Processing Conference

Conference Chair: Paul Hilton, The Welding Institute, Cambridge, UK

Sponsored by: LASAG INDUSTRIAL-LASERS

One of the main themes of last year's ICALEO® LMP programme was the emergence of more results, particularly in the area of laser welding, using high power fibre lasers. These lasers, with their small size, high efficiency, high beam quality and the apparent ease with which very high powers may be achieved, would seem to be the ideal choice for many laser materials processing applications. This year's ICALEO® programme will continue this theme with three sessions devoted to the use of fibre laser sources in materials processing. In parallel to the recent fibre laser developments, particularly advances in beam quality, progress has also been made in the area of disk lasers, with new high power, high beam quality devices, now commercially available. This year's programme also contains some interesting results using high power disc lasers. What is becoming clear, is that very high beam quality, fibre delivered laser light, requires careful control to maximise its processing capability. The increased use of fibre lasers for cutting is also reflected in this year's programme, which has a full session dedicated to laser cutting. This is especially interesting when it is remembered that this particular process was first demonstrated as long ago as 1967! Another topic, very well represented when reviewing the abstracts submitted for this year's conference, is in the area of laser direct metal deposition, both from the practical side and also the theoretical side, the latter in the shape of a full session on modelling of the DMD process. Laser welding also continues to be a main area interest at ICALEO® with sessions this year on fundamental studies, hybrid laser-arc welding and, reflecting the main industrial application of high power lasers for welding, two sessions devoted to applications from the automotive sector. The programme will also feature special sessions on the use of lasers in the aerospace, defence and space industries, and on the use of lasers for bio-medical applications. Whatever your interest in laser materials processing, I am sure ICALEO® 2006 will feature an interesting balance of academic and application specific papers to stimulate the mind!

Program Committee:

Milan Brandt, IRIS, Swinburne Univ. of Technology, Melbourne, Australia
Friedrich Dausinger, Institut für Strahlwerkzeuge, Univ. of Stuttgart, Stuttgart, Germany
Paul Denney, EWI, Columbus, OH, USA
Rémy Fabbro, GIP GERAILP, Arcueil Cedex, France
Jose Greses, AIDO (Technological Institute of Optics, Colour and Image), Valencia, Spain
Anthony Hoult, SPI, Southampton, UK
Alexander Kaplan, Luleå Univ. of Technology, Luleå, Sweden
Lin Li, The Univ. of Manchester, Manchester, UK
Akira Matsunawa, Osaka Univ., Hyogo, Japan
Edward Metzbower, U.S. Naval Research Lab, Washington, DC, USA
Mohammed Naeem, GSI Group, Rugby, UK
William O'Neill, Cambridge Univ., Cambridge, UK
Dirk Petring, Fraunhofer Institute for Laser Technology, Aachen, Germany
Antti Salminen, Lappeenranta Univ. of Technology, Lappeenranta, Finland
William Steen, Univ. of Liverpool, Liverpool, UK
Rui Vilar, Instituto Superior Tecnico, Lisboa Codex, Portugal

LMP Session 1: Fundamentals of Laser Welding
October 30 • 1:30pm

Session Chair: Friedrich Dausinger, Inst. für Strahlwerkzeuge, Stuttgart, Germany

Analysis of Basic Processes inside the Keyhole during Deep Penetration Nd-YAG CW Laser Welding . . . . . **(101)**
Remy Fabbro, Frederic Coste, LALP (CNRS)/GIP GERAILP; Sonia Slimani, Francis BRIAND, Air Liquide-CTAS

Holographic Diffractive Optical Elements Allow Improvements in Conduction Laser Welding of Steels . . . . . **(102)**
James Kell, John Tyrer, Rebecca Higginson, Rachel Thomson, Loughborough Univ.

The Effect of Welding Parameters on Keyhole Behavior in CO2-Laser Welding . . . . . **(103)**
Antti Salminen, Anna Fellman, Lappeenranta Univ. of Technology

Effect of Alloying Elements on Porosity Formation in Laser Welding of Heavy Section Steel Plates . . . . . **(104)**
Susumu Tsukamoto, Goro Arakane, National Institute for Materials Science; Kazuhiro Kojima, Tadayuki Otani, Shigeru Ohkita, Nippon Steel

Avoiding Hot Cracking by Induction Based Change of Thermal Strains during Laser Welding . . . . . **(105)**
Berndt Brenner, Gunther Goebel, Fraunhofer IWS Dresden

Which Laser Process for Steel to Aluminium Joining? . . . . . **(106)**
Guillaume Sierra, Patrice Peyre, David Stuart, CEA/DRT/GERAILP; Frederic Deschaux-Beaume, Gilles Fras, LMGC UMR 5508 CNRS

Laser Joining of Steel-Aluminum Joints in T Configuration . . . . . **(107)**
Jeroen van Tienhoven, Univ. of Twente

LMP Session 2: Laser Cladding for Tooling & Moulds & Laser Assisted Deposition
October 30 • 1:30pm

Session Chair: Milan Brandt, Swinburne Univ. of Technology, Melbourne, Australia

Hard Wear Resistant Metal Surfaces for Industrial Applications through Laser Powder Deposition . . . . . **(201)**
James Sears, South Dakota School of Mines & Technology

Laser Deposition of Stainless and Tool Steel on a Copper-Beryllium Alloy for Plastic Injection Mould Improvement . . . . . **(202)**
Jose Greses, Jesus Mario Sampedro, Jose Antonio Ramos de Campos, AIDO; Vicent Climent, AIMME

Defining Coating Material for Aluminum Die Casting Molds Using a Laser Cladding Process . . . . . **(203)**
Jaby Mohammed, Suraj Alexander, Univ. of Louisville

Advances in 3D Laser Processing for Mold Technology . . . . . **(204)**
Henrikki Pantsar, Reino Ruusu, Petri Laakso, Anssi Jansson, VTT

Repair of Cemented Carbide Tools Using Laser Cladding . . . . . **(205)**
Christ Prakash Paul, Seyed Hamidreja Alemohammad, Ehsan Toyserkani, Amir Khajepour, Stephen Corbin, Univ. of Waterloo

The Development of a Solid State Laser Assisted Material Deposition Process . . . **(206)**
Matthew Bray, Steven Celotto, William O'Neill, Cambridge Univ.

The Structure and Properties of Multilayered Coatings Prepared by Laser Assisted Thermal Spraying . . . . . **(207)**
Jyrki Suutala, Jari Tuominen, Petri Vuoristo, Tampere Univ. of Technology

LMP Session 3: Laser Processing in the Aerospace, Defence & Space Industries
October 31 • 8:00am

Session Chair: Remy Fabbro, LALP (CNRS)/GIP GERAILP, Arcueil Cedex, France

Microstructure and Mechanical Properties of Laser Net Shape Manufactured Inconel 718 and Ti-6Al-6V Components . . . . . **(301)**
Huan Qi, Carl Erikson, GE Global Research Center; Yong Liu, Chuan Lin, GE Global Research Center Shanghai

Diode Laser Metal Deposition: The Effect of Pulsed Beam Parameters on Superalloy Microstructure and Residual Stresses . . . **(302)**
Andrew Pinkerton, Richard Moat, Michael Preuss, Lin Li, Philip Withers, The Univ. of Manchester

Laser Materials Processing Conference

Results on Laser Direct Manufacturing of Graded Materials .....(303)
Pascal Aubry, CEA / GERAILP

Study of Porosity Formation during Laser Welding of Ti6Al4V .....(304)
Konrad Bartkowiak, Ralph Dienemann, Steffen Mueller, Eric Stiles, Fraunhofer USA, Center for Coatings & Laser Applications

Repair Opportunites for Aerospace Components through Laser Powder Deposition ..... (305)
James Sears, South Dakota School of Mines & Technology

Beneficial Pre-Stress in Laser Fabricated, Metallic, Square, Cellular Sandwich Panels .....(306)
Stephen Copley, ARL, The Penn State Univ.; Eduard Ventsel, Peter Vigna, Engineering Science & Mechanics Dept., The Penn State Univ.

Laser-Pulse-Format Effects in Aerospace Hole Drilling .....(307)
Robert Brown, Scott Davis, Steve Maynard, Connecticut Center for Advanced Technology

Laser Percussion Drilling of Aerospace Material ..... (308)
Mohammed Naeem, GSI Group, Inc.

Drilling Routine for Estimating, Analyzing and Modeling of Laser Processing .....(309)
Tom Eppes, Ivana Milanovic, Devdas Shetty, Jason Bornas, Univ. of Hartford

Investigation into the Influence of Pulse Shaping on Drilling Efficiency .....(310)
Paul French, Martin Sharp, Lairdside Laser Engineering Centre; Russell Goff, Patricia Scully, School of Chemical Engineering and Analytical Science; Mohammed Naeem, GSI Group; Ken Watkins, Univ. of Liverpool

LMP Session 4: Laser Cutting
October 31 • 8:00am

Session Chair: William O'Neill, Univ. of Cambridge, Cambridge, UK

An Evaluation of the Cutting Potential of Different Types of High Power Lasers ...(401)
Flemming Olsen, Technical Univ. of Denmark

Inert Cutting of Medium Section Stainless Steel Using a 2.2kW High Brightness Fibre Laser .....(402)
Martin Sparkes, Markus Gross, Steven Celotto, Tao Zhang, William O'Neill, Univ. of Cambridge

Melt Flow in Narrow Thick Section Kerfs. (403)
Markus Gross, William O'Neill, Univ. of Cambridge

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Catherina Wandera, Antti Salminen, Veli Kujanpaa, Catherina Wandera, Lappeenranta Univ. of Technology, Laser Processing Laboratory; Flemming Olssen, Technology Univ. of Denmark, Dept. of Manufacturing Engineering and Management

A New Approach to 3D Laser Cutting ... (405)
Jochen Deile, Greg Lamanna, Trumpf, Inc.; Axel Fischer, Reis Robotics

Laser Cutting of 2024 Aeronautic Aluminum Alloy .....(406)
Antonio Riveiro, Felix Quintero, Fernando Lusquinos, Mariano Perez-Amor, Juan Pou, Univ. de Vigo

Investigation of Laser Cutting Quality of Aluminium .....(407)
George Chryssolouris, Panagiotis Stavropoulos, Aristeidis Stournaras, Laboratory for Manufacturing Systems & Automation\Univ. of Patras

Laser Cutting of Variable Thickness Materials - Understanding the Problem ..... (408)
Mohamed Sobih, Philip Crouse, Lin Li, The Univ. of Manchester

Laser Cutting of Natural Stone Slabs ...(409)
Antonio Riveiro, Mohamed Boutinguiza, Ramon Soto, Fernando Lusquinos, Felix Quintero, Juan Pou, Mariano Perez-Amor, Univ. de Vigo

LMP Session 5: Laser Processing in the Automotive Sector I
October 31 • 8:00am

Session Chair: Mohammed Naeem, GSI Group, Inc. - Laser Division, Rugby, UK

Fault-tolerant Laser Welding in Automotive Industry .....(501)
Florian Albert, Alexander Grimm, Christian Kägeler, Michael Schmidt, Bayerisches Laserzentrum gGmbH

Effect of Processing Parameters on Zero-Gap Laser Welds Made on Zinc-Coated Steel...(502)
Ashish Dasgupta, Jyoti Mazumder, CLAIM, The Univ. of Michigan

Development of a Transient Gap during Overlap Welding of Zinc Coated Steel ...(503)
Raph Pieters, NIMR; Ian Richardson, Delft Univ. of Technology

Nd:YAG Laser Welding of AZ31 Sheet for Car Industry .....(504)
Mok-Young Lee, Woong-seong Chang, Byung-hyun Yoon, RIST

Laser Roll Welding of Dissimilar Metal Joint of Zinc Coated Steel and Aluminum Alloy. ..(505)
Hitoshi Ozaki, Naroya Univ.

LMP Session 6: Laser Welding of Polymers & Plastics
October 31 • 10:10am

Session Chair: Anthony Hoult, SPI, Campbell, CA, USA

Through-Transmission Welding of Polymers: Effects of Particles on Laser Beam Scattering .....(601)
JC Kneip, LTm Laboratory

Optimizing Weld Joint Design for Bond Strength and Functional Properties in Laser Welding of Polymers .....(602)
Robert Mueller, Dofasco Inc.; Hongping Gu, Powerlasers - ATC

A Novel CO2 Laser Welding of Plastics Using a Transparent Solid Heat Sink without Causing Thermal Damage .....(603)
Yasuo Kurosaki, Univ. of Electro-communications; Tomoya Matayoshi, Mitsui Chemicals Inc.; Kimitoshi Sato, Hiroshima Institute of Technology

Laser-Assisted Metal and Plastic (LAMP) Joining ..... (604)
Yousuke Kawahito, Osaka Univ.

Fiber Laser Pick-and-Join Tool for Welding of Thermoplastics .....(605)
Andrei Boglea, Luedger Bosse, Alexander Olowinsky, Fraunhofer Institute for Laser Technology; Silvia Bou, ARC Seibersdorf Research GmbH

LMP Session 7: Process Monitoring & Control I
October 31 • 1:30pm

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

Applicable Sensor for a Multivariate Process Controller .....(701)
Simon Dietrich, Univ. of Erlangen-Nuremberg

Optics Evaluation for Multikilowatt Solid State and Fiber Lasers ..... (702)
Reinhard Kramer, Harald Schwede, Stefan Wolf, Volker Brandl, Otto Märten, PRIMES GmbH

Improving the Analysis of Laser Welding Process by the Reassigned Time-Frequency Representations .....(703)
Giuseppe D'Angelo, Giorgio Pasquettaz, Andrea Terreno, Centro Ricerche FIAT

Advanced Process Control in Laser Materials Processing - Advantages in Combining Various Sensor Technologies ..... (704)
Markus Kogel-Hollacher, Precitec Optronik GmbH

The Study of Use of Machine Vision for Observation of Phenomenon during Laser Hybrid Welding ..... (705)
Anna Fellman, Henri Fennander, Antti Salminen, Ville Kyrki, Lappeenranta Univ. of Technology

Self Guided Laser Welding .....(706)
Boris Regaard, Fraunhofer ILT

LMP Session 8: Modelling of Laser Processes
October 31 • 1:30pm

Session Chair: William Steen, The Univ. of Liverpool, Herts, UK

Experimental Verification of Multi-Physical Modelling of the Keyhole Laser Welding Process .....(801)
Benno Aalderink, Univ. of Twente

Interaction between Laser Beam, Process Effects and Structural Properties during Welding Using Models Based on the FE.. (802)
Loucas Papadakis, Tobias Hornfeck, Michael Zaeh, Institute for Machine Tools and Industrial Management (IWB) TU Muenchen

Laser Materials Processing Conference

Three-dimensional Finite Element Models for the Calculation of Temperature and Residual Stress Fields in Laser Cladding .....(803)
Augusto Deus, Instituto Superior Tecnico; Jyoti Mazumder, CLAIM, The Univ. of Michigan

An Analytical Model of the Combined Powder-Wire Deposition Process .....(804)
Andrew Pinkerton, Waheed Ul Haq Syed, Lin Li, The Univ. of Manchester

Experimental and Computational Investigation of the Geometry, Cooling Rate and Solidification of Steel Welds Fabricated by Hybrid Laser-Gas Metal Arc Welding ...(805)
Rohit Rai, Tarasankar DebRoy, Dept. of Materials Science and Engineering, The Penn State Univ.; Shawn Kelly, Richard Martukanitz, Laser Processing Division, ARL, The Penn State Univ.

Theoretical and Experimental Investigation of Pulsed Laser Grooving Process .....(806)
George Chryssolouris, Panagiotis Stavropoulos, Aristeidis Stournaras, Laboratory for Manufacturing Systems & Automation\Univ. of Patras

LMP Session 9: Fibre Laser Processing I
November 1 • 8:00am

Session Chair: Paul Hilton, TWI Ltd., Great Abington, Cambridge, UK

Laser Beam Welding with High Power Fiber Lasers ..... (901)
Eckhard Beyer, Berndt Brenner, Jens Standfuss, Fraunhofer IWS

Phenomena of Welding with High-Power Fiber Laser .....(902)
Keisuke Kinoshita, Osaka Univ.

Humping in Welding with Single-Mode Fiber Lasers .....(903)
Frank Vollertsen, Claus G Thomy, Thomas Seefeld, Florian Wagner, BIAS Bremer Institut fuer angewandte Strahltechnik GmbH

Plasma Effect on Low Speed Welding of Aluminum Alloy 7075-T6 using a 300 W, Single-Mode, Ytterbium Fiber Laser .....(904)
Alexander Paleocrassas, Jay Tu, North Carolina State Univ.

The Role of Strong Focusability on the Welding Process .....(905)
Berndt Brenner, Friedrich Dausinger, Jan Weberpals, Institut fuer Strahlwerkzeuge; Gunther Göbel, Institut fuer Werkstoff- und Strahltechnik

LMP Session 10: Laser Cladding
November 1 • 8:00am

Session Chair: Rui Vilar, Instituto Superior Tecnico, Lisboa Codex, Portugal

Laser Cladding of Cu-NbC Nanocomposite Coatings ..... (1001)
Amelia Almeida, Sonia Eugenio, Rui Vilar, Instituto Superior Tecnico; Vanessa Livramento, Teresa Marques, Jose Brito Correia, INETI-DMTP

Laser Cladding of Multiple Track Composite Nicrbsi Coatings .....(1002)
Jose Carlos Alvarez, Jose Manuel Amado, Maria Tobar, Armando Yanez, Univ. da Coruna

Laser Cladding in Practice of Valuable Products ..... (1003)
Willem Husslage, HUGE Laser BV

Novel Computer Generated Holographic Optics Used in High Power Fusion of Metal Powders .....(1004)
Mathew Gibson, John Tyrer, James Kell, Loughborough Univ.

Improving Laser Cladding Process Conditions by Inducing Skin Effect through High Frequency Magnetic Field .....(1005)
Jean Pierre Bergmann, Markus Dolles, Johannes Wilden, TU Ilmenau

Comparison of Laser Cladding with Powder and Hot and Cold Wire Techniques .... (1006)
Janne Nurminen, KETEK

LMP Session 11: Fibre Laser Processing II
November 1 • 10:20am

Session Chair: William O'Neill, Univ. of Cambridge, Cambridge, UK

Fiber Laser Welding of 780mpa High Strength Steel ..... (1101)
Zhongjie Liu, Muneharu Kutsuna, Guojian Xu, Nagoya Univ.

Process and Performance Characteristics of the Laser Stir Welding Process ..... (1102)
Israel Stol, Alcoa Technical Center; Jay Tressler, ARL, Penn State Univ.

Working with a Polarized Fiber Laser for Welding and Cutting .....(1103)
Eckhard Beyer, Annett Klotzbach, Lothar Morgenthal, Fraunhofer IWS

Optimization of Parameters for Effective Welding of Aerospace Components ...(1104)
Devdas Shetty, Tom Eppes, Adil Widaatall, Univ. of Hartford

Concrete Pavement Cutting using High Power Fiber Lasers .....(1105)
Brian Gahan, Gas Technology Institute

High Dynamic Beam Deflection Optics for Remote Welding with Fiber Laser .....(1106)
Annett Klotzbach, Fraunhofer IWS Dresden

LMP Session 12: Direct Metal Deposition
November 1 • 10:20am

Session Chair: Lin Li, The Univ. of Manchester, Manchester, UK

Repair of Single Crystal Turbine Blades using Laser Engineered Net Shaping .....(1201)
John DuPont, Lehigh Univ.

Mechanical Performance of Laser Deposition Repairing of IN 738 on Directional Solidified Superalloy Blade .....(1202)
Minlin Zhong, Xiaofeng Zhu, Wenjin Liu, Tsinghua Univ.

Direct Manufacturing of Aeronautical Components by Direct Laser Metal Deposition .....(1203)
Maisonneuve Julie, Centre des Materiaux - Ecole des Mines de Paris

Absorption Coefficient Characterization in Ti-6Al-4V Laser Additive Manufacturing .. (1204)
Anil Chaudhary, Matt Keller, Applied Optimization, Inc.; Shawn Kelly, Laser Processing Division, ARL, The Penn State Univ.; Steven Medeiros, Wright Patterson AFB

Qualification of Nd:YAG Laser Direct Metal Deposition Techniques for Repair of Nickel Superalloy Components .....(1205)
Paul Hilton, TWI Ltd.

Laser Consolidation of Net-Shape Shells for Flextensional Sonar Projectors .....(1206)
Lijue Xue, National Research Council Canada; Chris Purcell, Defence Research and Development Canada- Atlantic

LMP Session 13: Fibre Lasers III
November 1 • 3:00pm

Session Chair: Anthony Hoult, SPI, Campbell, CA, USA

Applications Review: Materials Processing with Fiber Lasers under 1KW .....`(1301)
Vijay Kancharla, IPG Photonics Corporation

High Speed Fiber Laser Welding for Fuel Cell Components ..... (1302)
Stanley Ream, EWI

Investigation of the Transition from Micro-Drilling to Micro-Welding Using a 300W Fiber Laser ..... (1303)
William Harp, Jay Tu, North Carolina State Univ.

Integration of a Flexible, Pulsed High Power Single Transverse Mode Yb-Doped Fiber Laser System ..... (1304)
Tim Lauterborn, Fraunhofer Center for Laser Technology

High Average Power, Low Non-linearity Ytterbium Fiber Amplifier using Spectral Compression .....(1305)
Clemens Hoenninger, Eric Mottay, Zaouter Yoann, Amplitude Systemes

LMP Session 14: Process Monitoring & Control II
November 1 • 3:00pm

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

A Novel Non-Intrusive Technique for CO2 Laser On-line Beam Monitoring ..... (1401)
Martin Sparkes, Markus Gross, Edward Pain, William O'Neill, Univ. of Cambridge

Optical Inspection of Laser Drilled Cooling Holes in Jet Engine Blades ..... (1402)
Devdas Shetty, Tom Eppes, Nikolai Nazaryan, Univ. of Hartford

Laser Materials Processing Conference

Modeling, Sensing and Control of Direct Metal Deposition .....(1403)
Jyoti Mazumder, Lijun Song, CLAIM, The Univ. of Michigan

Camera Based Feedback Control of the Laser Cladding Process ..... (1404)
Johannes Hofman, Univ. of Twente

In Situ Evaluation of Metallic Coatings via Laser Plasma Spectroscopy .....(1405)
Pamela Benicewicz, GE Global Research; Bhupendra Gupta, GE Infrastructure - Aviation

LMP Session 15: Lasers in Bio-Medicine
November 2 • 8:40am

Session Chair: Paul Hilton, TWI Ltd., Great Abington, Cambridge, UK

Microstructure and Mechanical Properties of Laser-Deposited Ti-6Al-4V Scaffold ...(1501)
Guru Dinda, Jyoti Mazumder, Lijun Song, CLAIM, The Univ. of Michigan

Laser Cladding of Marine Wastes for Biomedical Applications .....(1502)
Fernando Lusquiños, Rafael Comesaña, Antonio Riveiro, Juan Pou, Felix Quintero, Univ. de Vigo

Production of Biofibres by Laser Spinning .....(1503)
Juan Pou, Felix Quintero, Antonio Riveiro, Fernando Lusquiños, Univ. de Vigo; Adrian Mann, Rutgers State Univ.

Plasma Spray Hydroxyapatite Coating on Laser Surface Nitrided Ti6Al4V .....(1504)
Hau Chung Man, Hong Kong Polytechnic Univ.

Laser-Induced Wettability Characteristics Modification and the Effect Thereof on Cell Response on a Titanium Alloy .....(1505)
Jonathan Lawrence, Liang Hao, Loughborough Univ.

CO2 Laser Irradiation of a Magnesia Partially Stabilised Zirconia (Mgo-PSZ) Bioceramic and the Subsequent Improvements in Human Osteoblast Cell Adhesion .....(1506)
Liang Hao, Jonathan Lawrence, Loughborough Univ.

Excimer Laser Surface Micro-Texturing of Ti-6Al-4V Substrates for Improved Cell Integration .....(1507)
Nazanin Mirhosseini, The Univ. of Manchester

3-D Biomimetic Micro-Channel Network by Laser Direct Writing ..... (1508)
Donghyuck Kam, Donghyuck Kam, CLAIM, The Univ. of Michigan

LMP Session 16: Laser Surface Treatment
November 2 • 8:40am

Session Chair: Jose Greses, AIDO, Paterna, VT, Spain

Optimisation of Production Rate in Diode Laser Hardening .....(1601)
Edoardo Capello, Moreno Castelnuovo, Barbara Previtali, Politecnico Di Milano

Due Function Laser Surface Treatment Improves Die Casting Die Life .....(1602)
Zhiyue Xu, Claude B. Reed, Argonne National Laboratory

Experimental Analysis of Laser Paint Stripping Effects on Thin Composites .....(1603)
Ted Reutzel, ARL, The Penn State Univ.; Kent Knock, Sikorsky Aircraft Corporation; Mitch Wool, General Lasertronics Corporation

Integrated Heat Treatment - Comparison of Different Machine Concepts ..... (1604)
Steffen Bonss, Jan Hannweber, Udo Karsunke, Marko Seifert, Berndt Brenner, Eckhard Beyer, Fraunhofer IWS

Empirical Modelling of Laser Texturing of 304L Stainless Steel .....(1605)
Adriana Soveja, LTm - IUT Le Creusot

Surface Layer Modification of AlSi6Cu4 Aluminium Alloy via CO2 Laser Treatment .....(1606)
Konrad Bartkowiak, Jacek Borowski, Andrzej Wolynski, Leszek Foltynowicz, Poznan Univ. of Technology

The Cooling Rate Influence on Nodular Iron Laser Boronizing Effects ..... (1607)
Marta Paczkowska, Marta Paczkowska, Wlodzimierz Waligora, Poznan Univ. of Technology

Study of the Surface Morphology and Mechanical Properties of Yttria-Stabilized Zirconia (YSZ) Thin Films Fabricated by Pulsed Laser Deposition .....(1608)
Peng Li, GE-Global Research Center Manufacturing Processes Lab 2E080; Jyoti Mazumder, Joonghan Shin, CLAIM, The Univ. of Michigan

LMP Session 17: Laser Processing in the Automotive Sector II
November 2 • 8:40am

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

Induction Assisted Laser Welding of Advanced High Strength Steels for Increasing the Formability of Welded Automotiv Body Structures .....(1701)
Berndt Brenner, Axel Jahn, Fraunhofer IWS

Laser Beam Brazing of Steel-Aluminium Tailored Hybrid Blanks .....(1702)
Lars Engelbrecht, Lars Engelbrecht, Heinz Haferkamp, Oliver Meier, Andreas Ostendorf, Laser Zentrum Hannover e.V.

Increased Gap Bridging Capabilities using Twin Spot and Hybrid Laser/GMA Welding for AA5182 .....(1703)
Benno Aalderink, Univ. of Twente

An Experimental Investigation of Remote Welding with CO2 and Nd:YAG Laser-Based Systems .....(1704)
George Chryssolouris, Aristeidis Stournaras, George Tsoukantas, Laboratory for Manufacturing Systems & Automation\Univ. of Patras

Process Conditions and Reliability of Laser Beam Welding of Titanium Sheets ....(1705)
Jean Pierre Bergmann, TU Ilmenau

Development of the Laser-Spot-Welded-Stainless-Steel-Panel for Vehicle Body .(1706)
Masahi Oikawa, Tokyu Car Corporation; Katsuhiro Minamida, Nippon Steel Corporation; Hiroyuki Kumehara, Gunma Univ.

Set of a High Power Diode Laser in Order to Enhance Wettability Conditions and Process Speed in a Controlled Short Arc Brazing Process of Zinc Coated Steels .....(1708)
Jean Pierre Bergmann, J. Wilden, TU Ilmenau

LMP Session 18: Rapid Prototyping, Sintering & Powder Bed Technology
November 2 • 1:30pm

Session Chair: Jose Greses, AIDO, Paterna, VT, Spain

Development of Laser Based Techniques for Rapid Prototyping of Printed Wiring Boards .....(1801)
Nicholas Dellas, Suzanne Mohney, Dept. of Engineering Science and Mechanics, The Penn State Univ.; Brock Golesich, Kuchera Defense Industries; Kenneth Meinert, ARL, The Penn State Univ.

Study of the Process of Rapid Prototyping with Laser Beam .....(1802)
Volodymyr Kovalenko, National Technical Univ. of Ukraine; Mykola Anyakin, Pavlo Kondrashov, Oleksiy Mukhoid, Oleksandr Stepura, LTRI NTUU "KPI"

Analysis of the Laser Sintering Process for Direct Manufacturing of Mould .....(1803)
Pascal Aubry, CEA / GERAILP

A Novel Approach to the Consolidation of Plastic Powders Using Computer Generated Holographic Optical Elements (Hoe) ...(1804)
Adrian Haddock, John Tyrer, James Kell, Loughborough Univ.

Selective Laser Melting Technology : Parametric Analysis ..... (1805)
Bertrand Philippe, Enise

A Study on the Selective Dual Laser Sintering Process for the Solid Freeform Fabrication System .....(1806)
Dong Soo Kim, Young Jin Ahn, Sung Woo Bae, Byung Oh Choi, Korea Institute of Machinery & Materials; Kyung Hyun Choi, Cheju National Univ.

Development of Polyamide-6 Powders and Its Effect on the Fabrication by Selective Laser Sintering Process .....(1807)
Dong Soo Kim, Young Jin Ahn, Sung Woo Bae, Chung Hwan Kim, Korea Institute of Machinery & Materials; Hyung Il Kim, Chungnam National Univ.

Laser Materials Processing Conference

LMP Session 19: Hybrid Laser Welding
November 2 • 1:30pm

Session Chair: Paul Denney, EWI, Columbus, OH, USA

Dynamic Behaviour of CO2-Laser GMA Hybrid Welding .....(1901)
Claus G Thomy, Frank Vollertsen, BIAS Bremer Institut fuer angewandte Strahltechnik

Gap Tolerant Joining of Aluminum with Steel Sheets Using the Hybrid Technique ...(1902)
Michael Kreimeyer, BIAS Bremer Institut fuer angewandte Strahltechnik

Production of Sound Deep-Penetration Hybrid Weld in Aluminum Alloy with YAG Laser and MIG Arc .....(1903)
Seiji Katayama, Satoru Uchiumi, Osaka Univ., JWRI; Francis Briand, Air Liquide

Observation of the Phenomena of CO2-MAG Hybrid Welding .....(1904)
Anna Fellman, Antti Salminen, Lappeenranta Univ. of Technology, Dept. of Mechanical Engineering, Laser Processing Laboratory

Hybrid Laser Welding and Friction Stir Welding Applied to 6056 Aluminium Alloy .....(1905)
Jan Gedopt, Eric Geerinckx, Jo Verwimp, VITO; Wim Van Haver, Belgian Welding Institute

Continued Experimental Analysis of Practical Aspects of Hybrid Welding Thick Sections .....(1906)
Edward Reutzel, Shawn Kelly, Ludwig Kern, Jay Tressler, Richard Martukanitz, Laser Processing Division, ARL, The Penn State Univ.

Failure Criteria for Laser and Hybrid Welded Sandwich Panels .....(1907)
Kenneth Meinert, Richard Martukanitz, ARL, The Penn State Univ.; Donald Koss, Dept. of Materials Science and Engineering, The Penn State Univ.

LMP Session 20: Modelling of Powder Deposition Processes
November 2 • 1:30pm

Session Chair: Paul Hilton, TWI Ltd., Great Abington, Cambridge, UK

Finite Element Thermal Modeling of the Direct Laser Metal Deposition Process .....(2001)
Arnaud Longuet, Centre des Materiaux des Mines de Paris

Development of New Material Systems for Direct Laser Generation .....(2002)
Maren Petersen, Claus Emmelmann, TUHH Institute of Laser and System Technologies

Fully Coupled Temperature-Stress Finite Element Analysis for Thermal Stresses in Laser Aided Dmd Process .....(2003)
Joohyun Choi, Suhash Ghosh, Univ. of Missouri - Rolla

Real-Time Prediction of Dilution for an Automated Laser Powder Deposition Process .....(2004)
Alireza Fathi, Ehsan Toyserkani, Amir Khajepour, Univ. of Waterloo

Finite Element Analysis of Laser Assisted Deposition of Pure Titanium .....(2005)
Antonio Crespo, Augusto Deus, Rui Vilar, Instituto Superior Tecnico

Modeling of Weld Pool Geometry and Temperature during Direct Metal Deposition .....(2006)
Xiuli He, Jyoti Mazumder, CLAIM, The Univ. of Michigan

On the 3D Modeling of Geometrical Formation in Laser Solid Freeform Fabrication Process .....(2007)
Masoud Alimardani, Ehsan Toyserkani, Univ. of Waterloo

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Grand Canyon Adventure

Friday, November 3 • 6:45am departure – 8:00pm (approximate return)

Measurements do no justice to the Canyon's grandeur: spanning 277 miles across northern Arizona, it averages 10 miles wide and one mile deep. One must stand on the rim and marvel at its splendor, watching the continuous show of shadows, patterns and colors as the sun moves across the sky. Explore this Natural Wonder of the World as you take off on an incredible day tour of the stunning Grand Canyon!

Begin your day with a journey through the Sonoran Desert en route to the beautiful red rock country of Sedona. Enjoy morning refreshments (not included) among the colorful Red Rocks. Continue on the scenic drive through Oak Creek Canyon, through the pine forests of Flagstaff and arrive at the Grand Canyon in time to enjoy lunch at one of the Grand Canyon Lodges, or picnic along the rim. Your guide will provide you with a 23-mile rim tour with stops at a few of the best viewpoints. You will experience breathtaking views overlooking the wonders of the Grand Canyon.

Your next stop will be at the Cameron Trading post on the Navajo Reservation with the Painted Desert as a magnificent backdrop. While visiting the reservation you will be able to explore the Navajo culture. Return to the hotel with your camera full of majestic memories.

Grand Canyon Adventure $135 per person; gratuity included;
no meals included. LIA may cancel tour and refund money if minimum is not met.

Laser Industry Vendor Program Reception & Table Top Display

Sponsored by: SPI Lasers — inspiring your products & manufacturing

Tuesday, October 31 • 4:00pm

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, share wine, cheese and product ideas with your colleagues and suppliers! Limited space is still available! For more information on participating as a vendor, contact Beth Cohen at 407.380.1553 or e-mail: bcohen@laserinstitute.org. Alphabetical order; Registered as of June 6.

AeroTech, Inc.
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Laser Microprocessing Conference

Conference Chair: YF Lu, Univ. of Nebraska Lincoln, Lincoln, NE

Sponsored by: COHERENT

The challenges and demand for developing new laser technologies for micro/nanofabrication and diagnosis are bigger than ever. Even in difficult economic times many new companies are emerging around the world. The explosion of new ideas in photonics, flat panel displays, microelectronics packaging, and biomedical fields has created a unique need for fabrication and diagnostics at micro/nanoscales. The Laser Microprocessing Conference is a global forum for engineers and scientists from a variety of industry segments and institutes to meet and discuss use of laser micro/nanofabrication and diagnosis as a key technology for various applications. Attendees will find innovative solutions for micro/ nanofabrication in opto- and microelectronics, electronics, microsystems, flat panel displays and biomedical industries. This conference will highlight new and exciting achievements in structuring with highest precision using laser pulses from the nanosecond down to the pico- and femtosecond time regime. Special sessions are dedicated to laser-assisted micropackaging, laser nano-machining and processing, and laser diagnostics, so we may highlight the newest developments and their promising perspectives. Outstanding researchers will give keynote and invited presentations in order to provide a deep insight into the current research work in these fields.

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Xiaoyan Zeng, National Engineering Research Center for Laser Processing, Huazhong Univ. of Science and Technology, Wuhan, China

LMF Session 1: Laser Microprocessing I October 30 • 1:30pm

Session Chair: Kunihiko Washio, Paradigm Laser Research Limited, Machida, Tokyo, Japan

A Microfluidic Bioarray System using Laser-machined Surface Microstructures (Invited Paper) . . . . . .(M101)
Tadatake Sato, Thomas Gumpenberger, Ryozo Kurosaki, Aiko Narazaki, Yoshizo Kawaguchi, Hiroyuki Niino, National Institute of Advanced Industrial Science and Technology (AIST)

Fabrication, Characterization and Simulation of Noval 3-D Photonic Bandgap Structures Prepared by Laser Chemical Vapour Deposition . . . . . .(M102)
H. Wang, Z.Y. Yang, Univ. of Nebraska; Yongfeng Lu, Univ. of Nebraska-Lincoln

Microstructures and Mechanical Properties of Laminated-Structure Nb-Ti-Al Composites Fabricated by Laser Depositon . . . . . .(M103)
Minlin Zhong, Jinjiang He, Wenjin Liu, Tsinghua Univ.

Laser-assisted Combustion-flame Synthesis of Diamond and Diamond-like Carbon Films . . . . . .(M104)
Y.X. Han, Yongfeng Lu, Univ. of Nebraska-Lincoln; H. Ling, Univ. of Nebraska

Analysis of Modified Layer Formation into Silicon Wafer by Permeable Nanosecond Laser . . . . . .(M105)
Etsuji Ohmura, Osaka Univ.; Kenshi Fukumitsu, Naoki Uchiyama, Kazuhiro Atsumi, Masayoshi Kumagai, Hideki Morita, Hamamatsu Photonics K.K.

Laser/Sol Gel Synthesis and Deposition of Nano-Crystalline/Amorphous Tin/Si3N4 Composites . . . . . .(M106)
Tamer Ezz, Philip Crouse, Zhu Liu, Lin Li, Univ. of Manchester

LMF Session 2: Ultrafast Laser Processing I October 30 • 1:30pm

Session Chair: Xinbing Liu, Panasonic Boston Laboratory, Cambridge, MA, USA

3D-laser Nanofabrication: Diffractive Holography Versus Femtosecond Direct Writing (Invited Paper) . . . . . .(M201)
Peter Herman, Univ. of Toronto

Heat Accumulation during Femtosecond Pulsed Laser Ablation . . . . . .(M202)
Max Groenendijk, Univ. of Twente

Femtosecond Laser Structuring of PCL and PET Electrospun Nanofiber Mesh . . . . .(M203)
Hae Woon Choi, Jed Johnson, Dave F Farson, John Lannutti, Ohio State Univ.

High Energy Diode-Pumped Femtosecond Oscillator with 1 µJ Pulse Energy at 9 Mhz Pulse Repetition Rate . . . . . .(M204)
Clemens Hoenninger, Eric Mottay, Amplitude Systemes

Microstructures on Metal Plate Produced with Femtosecond Laser . . . . . .(M205)
Nobuyuki Abe, Yuichi Komizo, Masahiro Tsukmoto, Joining and Welding Research Institute, Osaka Univversity; Keita Asuka, Graduate School of Engineering, Osaka Univ.; Masayuki Fujita, Institute for Laser Technology; Masaki Hashida, Institute for Chemical Research, Kyoto Univ.; Hitoshi Nakano, School of Engineering, Kinki Univ.; Masahito Katto, Cooperative Research Center, Miyazaki Univ.

1mJ, Multi-Khz, Sub-500 Fs Diode-Pumped Ytterbium Laser Amplifier . . . . . .(M206)
Antoine Courjaud, Clemens Hoenninger, Eric Mottay, Amplitude Systemes; Martin Delaigue, Inka Manek-Hoenninger, Univ. Bordeaux 1

LMF Session 3: Ultrafast Laser Processing II October 31 • 8:00am

Session Chair: Peter Herman, Univ. of Toronto, Toronto, ON, Canada

Laser Material Processing with High Average Power Ultrafast Fiber-Lasers . . . . . .(M301)
William Clark, Larry Walker, Clark-MXR, Inc.

Ultrashort Laser Ablation Rates into Vacuum Using Boundary Immobilization . . . . . .(M302)
Cho Lik Chan, Mark Squires, Univ. of Arizona

Picosecond Laser Material Processing - Prospects and Limitations . . . . . .(M303)
Ulrich Klug, Beatrix Kamlage-Rahn, Uwe Stute, Juergen Koch, Boris Chichkov, Laser Zentrum Hannover e.V.

Patterning of ITO on Glass with Picosecond Lasers for OLEDs . . . . . .(M304)
Gediminas Raciukaitis, Marijus Brikas, Gediminas Darcianovas, Mindaugas Gedvilas, Institute of Physics, Vilnius

Post Processing of EDM-Machined Microstructures by Ultra Short Pulsed Laser Ablation . . . . . .(M305)
Juergen Fleischer, Sebastian Haupt, Juergen Schmidt, wbk - Institute of Production Science

Laser Microprocessing Conference

LMF Session 4: Laser Microprocessing II
October 31 • 10:10am

Session Chair: Michael Schmidt, Bayerisches Laserzentrum gGmbH, Erlangen, Germany

Industrial Applications of Laser Micro/Nano Material Processing . . . . . .(M401)
Magdi Azer, Pamela Benicewicz, Marshall Jones, Long Que, Wenwu Zhang, GE Global Research

Compact QCW Laser Arrays for Use in Demanding Environments . . . . . .(M402)
Rajiv Pathak, Chuanshun Cao, Jason Helmrich, Brian Caliva, Feliks Lapinski, Prabhu Thiagarajan, Robert Walker, Mark McElhinney, Lasertel

Microdrilling in SiC Substrate by Pulsed Nd:YAG Laser . . . . . .(M403)
Chong Zhang, Univ. of Central Florida; Nathaniel Quick, AppliCote Associates LLC

Corrosion Behavior of Laser-Oxidized Niti in Hanks' Solution . . . . . .(M404)
Man Hon Wong, Dept. of Applied Physics, The Hong Kong Polytechnic Univ.

KrF Excimer Laser Processing of Human Dental Hard Tissues . . . . . .(M405)
Sivakumar Manickam, Vitor Oliveira, Rui Vilar, IST

LMF Session 5: Laser Micropackaging I
October 31 • 1:30pm

Session Chair: Bo Gu, GSI Group, Inc., Wilmington, MA, USA

Challenges and Future Requirements for Laser Applications in Microelectronic Packaging (Invited Paper) . . . . . .(M501)
Islam Salama, Intel Corporation

Development of DPSS-Laser-Based ITO Patterning System for Large-Scale FPD's (Invited Paper) . . . . . .(M502)
Naoaki Fukuda, Hitachi Zosen Corporation

Nanoscale Analysis of Laser Ablated Thin Films used in Industrial Manufacturing of Flat Panel Displays . . . . . .(M503)
Matt Henry, Jozef Wendland, Paul Harrison, Powerlase Ltd

A Laser Selective Etching Process for Next-Generation Flexible Display . . . . . .(M504)
Kwang-Ryul Kim, LG Electronics Inc.

LMF Session 6: Laser Microprocessing III
October 31 • 1:30pm

Session Chair: Tatsuo Okada, Kyushu Univ., Hakozaki, Fukuoka, Japan

Laser-assisted Microforming with Laser Structured Sapphire Dies . . . . . .(M601)
Katja Samm, Laser Zentrum Hannover e.V.

Development of Laser Forming of Thin Section Materials Using Rapid Scanning Optics for Macro-Applications . . . . . .(M602)
Konrad Bartkowiak, Poznan Univ. of Technology

Laser Drilling of Single Crystal Silicon Carbide Substrates . . . . . .(M603)
Chong Zhang, Univ. of Central Florida College of Optics and Photonics/ CREOL and FPCE

Comparative Study of Symmetric and Asymmetric Deformation of Al Single Crystal Under Micro Scale Laser Shock Peening . . . . . .(M604)
Sinisa Vukelic, Columbia Univ.

Waterjet as Waveguide and Assist Medium. Theoretical and Experimental Investigation of Beam Propagation and Heat Effected Zones in Material Processing with Lasermicrojet.....(M605)
Delphine Perrottet, Synova SA

Laser Direct Write Doping and Metallization Technique for Optoelectronic Devices . . . . . .(M606)
Sachin Bet, Aravinda Kar, CREOL, Univ. of Central Florida; Nathaniel Quick, Applicote Associates, LLC

LMF Session 7: Laser Micropackaging II
November 1 • 8:00am

Session Chair: Islam Salama, Intel Corporation, Chandler, AZ, USA

Advances in Laser Micromachining for Semiconductor and Microfluidic Applications (Invited Paper) . . . . . (M701)
Robert Hainsey, Electro Scientific Industries

Advanced Fiber Laser Marking on Very Small IC Packages and Microprocessing of Very Thin Films (Invited Paper) . . . . . .(M702)
Rakesh Bhandari, Sunx Ltd

Laser Processing for Back-Contacted Silicon Solar Cells . . . . . .(M703)
Peter Engelhart, Rainer Grischke, Ruediger Meyer, Rolf Brendel, ISFH; Andreas Ostendorf, Aart Schoonderbeek, Uwe Stute, LZH

Laser Technology for Cost Reduction in Silicon Solar Cell Production . . . . . .(M704)
Rolf Brendel, Peter Engelhart, Rainer Grischke, Agnes Merkle, Institut fuer Solarenergieforschung in Hameln/Emmerthal (ISFH); Andreas Ostendorf, Aart Schoonderbeek, Uwe Stute, Laser Zentrum Hannover e.V.

LMF Session 8: Laser Micro-cladding & Welding
November 1 • 8:00am

Session Chair: Hyungson "David" Ki, Michigan State Univ., East Lansing, MI, USA

Direct Fabrication of Thermo-sensor by Laser Micro-Cladding Functional Materials . . .(M801)
Xiaoyan Zeng, Huazhong Univ. of Science and Technology

Tribaloy-800 Coatings on Steel Substrates by Means of Laser Cladding. Dilution Effects on the Microstructure and Coating Performance . . . . . .(M802)
Jose Carlos Alvarez, Jose M. Amado, Maria Tobar, Armando Yanez, Univ. Da Coruña

Comparison of Different Process Monitoring Methods for Laser Beam Micro Welding ...(M803)
Jens Gedicke, Kilian Klages, Alexander Olowinsky, Boris Regaard, Stefan Kaierle, Fraunhofer Institute for Lasertechnology

Micro Edge Welding of Thin Ni Based Alloy Foils with Direct Diode Laser Processing and its Application . . . . . .(M804)
Nobuyuki Abe, Masahiro Tsukamoto, Joining and Welding Research Institute, Osaka Univ.; Yoshinori Funada, Industrial Research Institute of Ishikawa

Shadow - New Applications in Electronics and Micromechanics . . . . . .(M805)
Alexander Olowinsky, Jens Gedicke, Arnold Gillner, Kilian Klages, Reinhart Poprawe, Fraunhofer ILT

LMF Session 9: Laser Micropackaging III
November 1 • 10:20am

Session Chair: Klaus Kleine, Laserline Inc., Los Gatos, CA, USA

Laser Trimming - Yesterday, Today, and Tomorrow (Invited Paper) . . . . . .(M901)
Bo Gu, GSI Group, Inc.

Advances in Laser Singulation of Silicon . . . . . .(M902)
Leonard Migliore, Coherent Laser Group

The Effect of Laser Wavelength in Singulation of FPGA Packages . . . . . .(M903)
Leonard Migliore, Coherent Laser Group

Using MEMS in Spectroscopy Applications . . . . . .(M904)
Mouli Ramani, Polychromix

Synova has Re-Invented the Laser: No Heat Damage, No Beam Divergence, No Cutting Gas, No Contamination . . . . . .(M905)
Roy Housh, Delphine Perrottet, Synova SA

LMF Session 10: Laser Micromachining
November 1 • 10:20am

Session Chair: Xiaoyan Zeng, HUST, Wuhan, Hubei, Peoples Republic of China

High Repetition Rate Ps- and Fs- Lasers for Micromachining . . . . . .(M1001)
Gediminas Raciukaitis, Institute of Physics; Mikhail Grishin, Ekspla Ltd; Romualdas Danielius, Light Conversion Ltd.; Linas Giniunas, Jonas Pocius, Laser Research Center, Vilnius Univ.

Effect of Laser Wavelength on Machining Characteristics of Aluminum Nitride in Micro-boring . . . . . .(M1002)
Norio Kataoka, Kataoka Corporation; Yasuhiro Okamoto, Yoshiyuki Uno, Itaru Tanino, Okayama Univ.

Improved Picosecond Laser Radiation for Micro-Machining . . . . . .(M1003)
Thomas Herrmann, Hatim Haloui, Bernhard Henrich, Ralf Knappe, Achim Nebel, Lumera Laser GmbH

Continued on page 14...

Poster Presentation Gallery

Wednesday, November 1 & Thursday, November 2

Attendee Buffet Breakfast Sponsored by:

The Poster Presentation Gallery will be featured on Wednesday and Thursday of the conference. Join Authors Thursday morning for breakfast and sharing of ideas. Authors will be by their posters on Thursday morning from 7:00am - 8:30am to answer questions. All Poster Presentations will be included in the ICALEO® Proceedings.

Laser Bending of Thin Metal Plate .....(P501)
Tadashi Misu, Tsuyoshi Tokunaga, Osamu Yamazaki, Syunrou Yoshioka, Chiba Institute of Technology; Yoshihiro Tanaka, Tokyo Institute Polytechnic Univ.; Toshiyuki Miyazaki, Japan

The Effect of Parameter Changes in CO2 Laser Welding on the Process Spectra .(P502)
Anna Fellman, Antti Salminen, LUT; Ville Heikkinen, Jouni Hiltunen, Birgitta Martinkauppi, Markku Hauta-Kasari, Univ. of Joensuu, Dept. of Information Technology, InFotonics Center

Laser Peening Systems for Preventive Maintenance against Stress Corrosion Cracking in Nuclear Power Reactors ..(P503)
Takuya Uehara, Naruhiko Mukai, Yuji Sano, Masaki Yoda, Itaru Chida, Toshiba Co.

Hot Corrosion Resistant Laser Coatings in Diesel Engine ..... (P504)
Jari Tuominen, Mari Honkanen, Samppa Ahmaniemi, Petri Vuoristo, Tapio Mäntylä, Tampere Univ. of Technology, Institute of Materials Science

Correction of Distortion and Design Shape in Aluminium Structures using Laser Forming .....(P505)
Geoff Dearden, Stuart Edwardson, Emile Abed, Ken Watkins, The Univ. of Liverpool

An Analysis of Crack and Porosity Formation in Laser Surface Treated Magnesia Partially Stabilised Zirconia (Mgo-PSZ) and Methods for Alleviation .....(P506)
David Evans, Jonathan Lawrence, James Kell, John Tyrer, Loughborough Univ.

Precision Adjustment of Spring Contacts Using Laser Forming .....(P507)
Danny MacCallum, Gerald Knorovsky, Jeremy Palmer, Joshua Arvizu, Sandia National Laboratories

Materials Processing using a Diode Laser Pumped Fiber Laser Module .....(P508)
Petri Laakso, VTT, Laser Processing Team; Joona Koponen, Valery Philippov, Liekki Corporation; Henrikki Pantsar, VTT Industrial Systems

Crack Behavior and Characteristics of Laser Clad Layer with Powder Mixture of Co-Based Alloy and WC .....(P509)
Guojian Xu, Nagoya Univ. (Present: LASER X CO. LTD.); Muneharu Kutsuna, Zhongjie Liu, Nagoya Univ.; Leiquan Sun, Chang Chun Institute of Technology (China)

Laser Cutting of Mineral Pigment Coated Papers .....(P510)
Veli Kujanpaa, Heidi Malmberg, Antti Salminen, Antti Salminen, Lappeenranta Univ. of Technology

Mechanism of Anisotropic Stress Generation in Laser Peening Process .....(P511)
Koji Hirano, Atsushi Sugihashi, Hirofumi Imai, Naoya Hamada, Nippon Steel Corporation

Labeling with Individually Addressable Diode Laser Bars .....(P512)
Markus Röhner, Norbert Bönig, Konstantin Boucke, Reinhart Poprawe M.A., Fraunhofer Institute of Laser Technology

Spring-Back Control in Laser Assisted Mechanical Forming of Dual Phase Steels .....(P513)
German J. Rodriguez, Pablo M. Romero, Jorge L. Arias, Joaquin Vazquez, Aimen

Mechanism and Prediction of Laser Wet Cleaning of Marble Encrustation .....(P514)
John R. Lombardi, Fen Xu, City College of New York; Y. Lawrence Yao, Jie Zhang, Columbia Univ.

3D Prototyping from Metallic Powder by Laser Beam .....(P515)
Teruyuki Hayashi, Toshiyuki Miyazaki, Tsuyoshi Tokunaga, Chiba Institute of Technology; Yota Mizukami, Polytechnic Univ.

Laser Engraving Reflective Metals to Create Scanner Readable Barcodes .....(P516)
Paul Harrison, Jozef Wendland, Matt Henry, Powerlase Limited

Research on Sintering Parameter and Prototyping Quality of Polymer Powders .....(P517)
Xiaocheng Li, Pengcheng Wang, Junjie Xiao, Inner Mongolia Univ. of Technology

Diffraction Effects of a Spatial Filter for Laser Drilling .....(P518)
Aravinda Kar, Danyong Zeng, College of Optics & Photonics, Univ. of Central Florida; William Latham, Air Force Research Laboratory, Directed Energy Directorate

The Use of Overlapping Nd:YAG Laser Spot Welds to Butt Weld Metal Polymer Laminates .....(P519)
Heather Gower, Ian Richardson, Raph Pieters, NIMR / TU Delft

Financing Strategies Used by Small and Mid-Sized Firms Using Laser Manufacturing Technology to Supply the Aerospace Industry .....(P520)
Susan Coleman, Devdas Shetty, Tom Eppes, Univ. of Hartford

Research on Laser-produced Metal-matrix Composite Layer Reinforced by In-situ Particles and its Frictional Wear Characteristics .....(P521)
Mingxing Ma, Wenjin Liu, Minlin Zhong, Tsinghua Univ.

Development of Laser Cladding Repair System for Damaged Alloy 600 Heat Exchanger Tubes .....(P522)
Won-Jin Han, Woo-Sung Kim, Sun-Ho Lee, Doosan Heavy Industries Co.

A System for the Removal of Debris Produced during Laser Micromachining .....(P523)
Colin Dowding, Jonathan Lawrence, Loughborough Univ.

Research on Application of DSPC via SLS...(P524)
Pengcheng Wang, Junjie Xiao, Inner Mongolia Univ. of Technology

Application of SLS-RP Technique in Manufacturing Alkali-Corrosion Resisting Valve Pieces .....(P525)
Pengcheng Wang, Fushun Zhu, Inner Mongolia Univ. of Technology

Numerical Modeling for Embedding of Fiber Bragg Grating Sensors within Metallic Structures Using Laser Solid Freeform Fabrication .....(P526)
Hamidreza Alemohammad, Ehsan Toyserkani, Univ. of Waterloo

The Transition from Qualitative Plexiglas Burn-Ins to Quantitative Electronic Data Acquisition for Beam Diagnostics (Evaluation, Benchmark) .....(P527)
Volker Brandl, Otto Märten, PRIMES GmbH

Pit Formation Mechanism during Laser Brazing of Galvanized Steel .....(P528)
Seita Kimura, Joining and Welding Research Institute, Osaka Univ.

The Effects of Laser Forming on Superelastic NiTi Shape Memory Alloys .....(P529)
Andrew J. Birnbaum, Columbia Univ.

Drilling Strategies for Metals with Pulsed YAG Lasers .....(P530)
Rene Liebers, LASAG AG

Laser Drilling of PET-backed Unfired Ceramic .....(P532)
Leonard Migliore, Coherent Laser Group

On the Fly Cutting of Silicon Ribbon ...(P533)
Rob Janoch, Evergreen Solar, Inc.

Multifunctional Hand-held Laser Processing Device .....(P534)
Christian Hennigs, Laser Zentrum Hannover e.V.

Limits and Limitations in Laser Material Processing .....(P535)
Martien Van Dijk

Experimental Study of Magnesium and Aluminum Alloys Absorption and Keyhole Evolution during Nd:YAG Laser Interaction .....(P536)
Nicolas Pierron, LTm - ITU Le Creusot

Fiber Coupled Diode Laser Welding of Lead Alloy .....(P537)
Caroline Decombard, CEA de Valduc

Achieving a Repeatable Laser Process - Controlling the Variables .....(P538)
Daniel Sanborn, Innovative Laser Technologies, Inc.

Fabrication of Fe-Based Bulk Metallic Glass Components Using Laser Additive Manufacturing .....(P539)
Shawn Kelly, ARL, The Penn State Univ.

Laser Surface Modification of NiTi with Mo and Zr .....(P540)
Ng Ka Wai, Hong Kong Polytechnic Univ.

Technical Univ. of Denmark, Dept. for Manufacturing Engineering and Management .....(P542)
Flemming Olsen, Technical Univ. of Denmark

Phase Transformations of Rapidly Solidified Nickel Based Superalloy .....(P543)
Mohammed Kadhim, UOT

Laser Microprocessing Continued …

Laser Micromachining of Thin Zirconia Membrane . . . . . .(M1004)
Xinghua Li, Sean Garner, Corning Incorporated

Machinability of Laser Heated Silicon Nitride Ceramics during Turning Proces . . . . .(M1005)
Marian Jankowiak, Konrad Bartkowiak, Poznan Univ. of Technology

Femtosecond Laser Machining of Dielectric Materials for Biomedical Applications..(M1006)
Hae Woon Choi, Jeremy Steach, Burr Zimmerman, Dave F Farson, L James Lee, Susan V Olesik, Ohio State Univ.

LMF Session 11: Lasers in Nanotechnology
November 2 • 8:40am

Session Chair: Costas Grigoropoulos, UC Berkeley, Berkeley, CA, USA

Nanostructuring in Si using a Femtosecond Laser (Invited Paper) . . . . . .(M1101)
Ming Li, Panasonic Boston Lab

Sintering Nano-particles on Low Temperature Materials . . . . . .(M1102)
James Sears, South Dakota School of Mines & Technology

Direct Laser Pyrolysis of Nanostructured Micro Components . . . . . .(M1103)
Jean Pierre Bergmann, Sebastian Schlichting, Johannes Wilden, TU Ilmenau

Raman Mapping of Single-walled Carbon Nanotubes at Nanoscales . . . . . .(M1104)
K.J. Yi, J. Shi, Univ. of Nebraska; Yongfeng Lu, Univ. of Nebraska-Lincoln

Connection of Macro-sized Double-walled Carbon Nanotube Strands by Laser Irradiation . . . . . .(M1105)
Tao Gong, Yong Zhang, Wenjin Liu, Kunlin Wang, Dehai Wu, Minlin Zhong, Tsinghua Univ.

Aligned Synthesis of Carbon Nanotubes by Laser-assisted Chemical Vapor Deposition . . . . . .(M1106)
J Shi, K.J. Yi, Univ. of Nebraska; Y.F. Lu, Univ. of Nebraska-Lincoln

Light Emission from Multiwalled Carbon Nanotubes under CW CO2 Laser Irradiation . . . . . .(M1107)
Yong Zhang, Tao Gong, Wenjin Liu, Dehai Wu, Minlin Zhong, Tsinghua Univ.

LMF Session 12: Lasers in Diagnostics
November 2 • 1:30pm

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

Laser Based Molecular Sensing and Tissue Imaging (Invited Paper) . . . . . .(M1201)
Zhixiong Guo, Rutgers, The State Univ. of New Jersey

Study of Magnetic Confinement in Laser-induced Plasmas by Optical Emission Spectroscopy and Fast Photography...(M1202)
X.K. Shen, T. Gebre, Univ. of Nebraska; Yongfeng Lu, Univ. of Nebraska-Lincoln

New Experimental Approach to Study Laser Matter Interaction during Drilling in Percussion Regime . . . . . .(M1203)
Laurent Berthe, Remy Fabbro, Schneider Matthieu, GERAILP/LALP

Characteristics of a Laser Vaporization Test Bed for Plasma Research . . . . . .(M1204)
Karl Umstadter, Archimedes Technology Group

Measuring Laser Absorption during Laser Powder Deposition . . . . . .(M1205)
James Sears, South Dakota School of Mines & Technology

Desert Foothills Jeep Tour

Sunday, October 29 • 8:00am – 12:00pm
(approximate times)

Discover the magnificence and mystery of Arizona and the Old West on a tour that you will never forget. Your jeep adventure will lead to majestic views of mountain ranges wrapped in cloaks of ever changing colors. Arizona Jeep guides, experts in geology, history, archeology, and desert ecology provide an outstanding adventure tour of the rugged Sonoran Desert and the Foothills of the mountain wilderness. Traveling along old mining trails, our back country adventure will lead you to a world of captivating cactus and breath-taking mountain views. This is a photo opportunity that you would not want to miss.

Jeep Tour Excursion $75 per person; soft drinks and water included. LIA may cancel tour and refund money if minimum registration is not met.

Business Development Session

November 1 • 3:00pm

Session Chair: William Lawson, New Tech Development, Somerset, WI, USA

Growing Your Business Past the Start-Up
William Lawson, New Tech Development

From Technology to Commercial Success
Mohan Warrior, Alfalight

It is often stated that all start-ups fail, but some during their failure have an opportunity. The good start-ups change course to seize that opportunity. How do you set the early course of technology based companies, what should you expect from venture capital or private equity funding, how do you gain customer traction, manage market risks, and scale with product wins?

If you have managed to start a business, how do you move yourself and your business to the next level? What are the various business stages, transitions, and the CEO's business and personal focuses and characteristics that promote success in each stage?

This unique session features two 40-minute presentations given by Bill Lawson who built a business from his basement to a successful sale and Mohan Warrior who has managed two successful start-ups and is working on his third.

Laser Solutions Short Courses

Laser Solutions Courses Chair: James Sears, South Dakota School of Mines & Technology, Rapid City, SD, USA

Sponsored by:

ICALEO® offers delegates an opportunity for a technical refresher or an insight into a new area of industrial photonics with the chance to attend a number of "hot-topic" solutions courses. A series of 7 short courses taught by industrial photonics experts will address fundamentals related to lasers, optics, material processing, and applications. These short courses have been chosen to complement the other ICALEO® activities and compliment the LIA 'experience'. Conference participants are encouraged to attend these courses - no additional fee is required! We look forward to seeing you in Scottsdale!

Course 1: The Fundamentals of Beam Quality, Fiber Optic Delivery & Application to Material Processing with High Quality Disk Lasers
Monday, October 30 • 1:30pm

David Havrilla, TRUMPF, Inc., Plymouth, MI, USA

Laser beam quality is a critical characteristic of any laser, and in particular, for those used in material processing. Beam quality dictates fiber size, focus spot diameter, and depth of focus, just to list a few. These in turn influence the process parameters such as processing speed, process window, weld/kerf width, maximum weld depth/cut thickness, HAZ/thermal distortion and focal length/ stand-off. The combination of excellent beam quality, fiber optic beam delivery and high power has been an elusive realization until recent years. The disk laser, because of its unique design and proven technology, has given manufacturing engineers the robust, industrial product needed for those applications requiring the enabling benefits of high beam quality (such as high speed welding & cutting, and remote welding), combined with fiber optic delivery.

The objectives for this course are:

1. Define and explain beam quality what it is, what it means, what it affects
2. Describe how laser beams are transmitted through fiber optics and how that impacts beam quality
3. Discuss beam quality and it's influence on focusing characteristics and process parameters
4. Describe the design and operation of the disk laser and illustrate how the disk laser operates
5. Provide processing examples which are enabled by the excellent beam quality of a disk laser

Course level: Intermediate

Course 2: Important Considerations in Founding and Operating a High Tech Business
Tuesday, October 31 • 8:00am

Ronald Schaeffer, Photomachining, Inc., Pelham, NH, USA

Founding and operating a small, high tech company involves many factors including financial, personnel, equipment, real estate, etc. This short course will focus on many of the important factors involved in both starting and also in ongoing operations of a high tech company. This course is intended to give valuable tips that can save time, money and aggravation for the new - or even the experienced - entrepeneur.

The objectives for this course are:

1. Learn considerations for starting your own company
2. Hire the right people and keep them
3. Avoid common mistakes
4. Plan your exit strategy

Course 3: Laser Welding Aluminum - Advanced
Tuesday, October 31 • 1:30pm

Randolph Paura, Dynamic Laser Solutions, Ft. Erie, ON, Canada

This workshop builds upon past sessions and presents additional information and advanced process solutions for laser welding aluminum. New multi-kilowatt power sources such as the thin-disk and fiber lasers with high beam quality enable new opportunities in welding aluminum. This workshop summarizes recent advances in this field, reviews the challenges with laser welding aluminum and presents process solutions for each area. A CD of course notes and supplemental information will be provided.

The objectives for this course are:

1. Gain an understanding of aluminum weld quality challenges
2. Gain an understanding of weld process solutions for laser welding aluminum
3. Understand the influence of high beam quality lasers and the arrangement of focus optics

Course level: Intermediate to Advanced

Course 4: How Laser Beam Analysis Can Improve Your Process Results
Wednesday, November 1 • 8:00am

Volker Brandl, PRIMES GmbH, Pfungstadt, Germany

The participants will learn about the set of fundamental beam parameters characterizing the optical performance of a laser beam, e.g. with material processing, metrology, printing or medical applications. We will discuss available detection methods and measurement strategies for the most relevant beam parameters for different laser wave lengths from CO2-lasers to UV-lasers and power levels from 10 W to 20 kW. The influence of these beam parameters, e.g. polarization, laser power, spot diameter, and beam diffraction ratio, on some laser processes will be discussed. Typical applications of laser beam analysis in industrial processes and process development are outlined.

Course level: Beginner to Intermediate

Course 5: Development of a Comprehensive Educational Program for Laser Processing Technologies
Thursday, November 2 • 8:40am

Richard Martukanitz, ARL, The Penn State University, State College, PA, USA

Laser processing offers a huge potential for improving the national competitiveness; however, there is a dire need within the United States for formal training and education of technologists, engineers, and scientists in this technology. This presentation will describe the development of a comprehensive educational program at the Pennsylvania State University (Penn State) directed at this important subject. A comprehensive educational program in this field requires the introduction of fundamental concepts reinforced by practice for technologists, integration of basic principles and process capabilities into the traditional undergraduate curriculum, and reinforcement of scientific theory and direct application of these principles at the graduate level. The development of specialized senior-level elective courses, a summer intern program, and laboratory exercises integrated into existing courses have been utilized to introduce laser processing to undergraduate students expressing interest in this area. A unique graduate certificate program within the College of Engineering has been developed and encompasses five interdisciplinary courses involving various aspects of laser processing. Formal training provided by these courses is bolstered by thesis research and laboratory practice to provide a broad educational experience for graduate students. Penn State has been active in work-force training and development in laser processing and plans are underway to include these activities into the comprehensive educational program to meet the needs of a wide range of students. The current initiative, which is well under way, is believed to be necessary to foster and cultivate this important technology, which will impact advanced manufacturing processes, materials, and systems. Another important benefit in the development of this program is encouragement of interdisciplinary collaboration throughout the University.

The objectives for this course are:

1. Describe the requirements for a comprehensive educational program
2. Provide details on the multi-faceted approach that Penn State is utilizing to establish a comprehensive program on laser processing
3. Share with the audience lessons that have been learned
4. Investigate potential inter-organizational collaboration in laser processing education

Course level: Beginner to Intermediate

ICALEO® General Information

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http://www.doubletree.com/en/dt/hotels/index.jhtml

The DoubleTree Paradise Valley Resort hotel offers luxury, resort amenities, and visually stunning Sonoran Desert views on 22 acres of lush, tropical paradise, just minutes from historic Old Town Scottsdale and Arizona State University. Located 12 miles from Phoenix Sky Harbor.

ICALEO® rate of $149 + taxes is available prior to October 3 cut-off date. The hotel reservation will need to be guaranteed with a credit card. Reservations should be made by telephoning 408.947.5400 or 800.222.8733 and asking for the "ICALEO" room rate; download a PDF reservation form at www.icaleo.org or log onto www.doubletree.com and enter **group code "LIA"** to make your reservation.

Conference Registration

Registration can be completed in two ways - online or by downloading a PDF registration form from www.icaleo.org. Full congress registration includes admission to the Plenary Session, Receptions (Meet & Greet Fiesta, President's, and Vendor Reception), all technical sessions, Laser Solutions Courses, Awards Luncheon, and a technical digest.

One-Day Registration includes admission to technical sessions, Laser Solution Courses and receptions on that day only, and a technical digest. (Luncheon is not included, but may be purchased separately.)

Student Registration includes admission to the Plenary Session, Receptions, all technical sessions, Laser Solution Courses, and a technical digest. (Luncheon is included.) Valid student ID required to process registration. Student Registration will not be accepted on-site; students must be pre-registered by October 10.

Guests may attend the awards luncheon and all receptions by purchasing tickets. Please pre-register your guest so we may prepare a nametag.

Early Bird registrants should be paid in full by September 12. Visa, MasterCard, and American Express will be accepted. You may send a check (US funds only, drawn on a US bank) payable to Laser Institute of America. Purchase orders must be paid in full by September 12 to qualify for discount. Bank transfers will not be accepted as payment.

Fees

Full Conference - Early Bird Registration
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$655 Member $765 Non-member
$655 Cooperating Society $230 Student
$235 Retired LIA Member

September 13 – October 10
$705 Member $805 Non-member
$705 Cooperating Society $280 Student
$285 Retired LIA Member

October 11 - On-site
$755 Member $855 Non-member

One Day Conference Registration
Early Bird Registration
(payment received by September 12)
$260 Member $285 Non-member

September 13 – October 10
$290 Member $315 Non-member

October 11 - On-site
$320 Member $345 Non-member

On-Site Registration Times

Sunday, October 29 11:00am - 4:00pm
Monday, October 30 7:00am - 5:00pm
Tuesday, October 31 7:00am - 5:00pm
Wednesday, November 1 7:00am - 4:00pm
Thursday, November 2 7:00am - 12:00pm
Purchase orders will not be accepted for on-site registration.

Proceedings

CD-Rom Proceedings will be available on-site (will not be shipped to you). It includes all submitted papers from ICALEO – LMP, Microprocessing, and Poster Presentations.

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$145 Member $180 Non-member

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From Phoenix Sky Harbor Airport – ALL TERMINALS

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Take 44th Street North exit out of airport for 3.5 miles
Right onto Camelback for 3.5 miles
Left onto Scottsdale Road for 1.5 miles
Hotel is on Right at Scottsdale & Jackrabbit

From Phoenix Sky Harbor Airport / CAR RENTAL CENTER

Go North on 24th Street or 44th Street to Camelback for 4.5 miles
Right onto Camelback for 5.5 miles
Follow Directions Above

Transportation

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Super Shuttle needs at least 3 hours advance notice for pick-up. The cost per person is $13 plus a $.50 fuel charge. When calling, have ready your airline name, flight number and time. Super Shuttle requires that they pick you up 2 hours prior to your flight, as they may need to stop at other hotels before arriving at the airport. From the airport, go outside to the Super Shuttle curbside location.

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Substitutions and Cancellations

We understand that circumstances may occur to prevent you from attending the conference. If you find that you cannot 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.*

*Note: Requests for refunds must be made in writing and received on or before September 12. There is a $75.00 processing fee applied to all refunds. No refunds or transfers will be accepted after September 12. No refunds will be given for proceedings or tour package purchases.

Average November Temperatures:

88°F / 31°C High
61°F / 16°C Low

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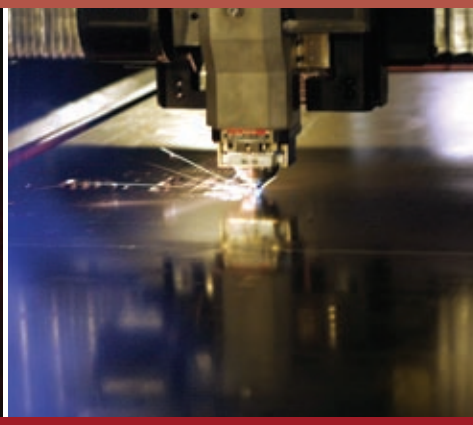

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