



3<sup>rd</sup> Pacific International Conference on Applications of Lasers and Optics

# PICALO

APRIL 16-18, 2008 • CAPITAL HOTEL • BEIJING, CHINA



## ADVANCE PROGRAM

**PICALO General Conference Chair: Minlin Zhong**, Tsinghua University, Beijing, People's Republic of China

**PICALO Laser Materials Processing Conference Chairs:**

**Lin Li**, The University of Manchester, Manchester, UK

**Hau-Chung Man**, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

**PICALO Micro, Nano & Ultrafast Fabrication Conference Chairs:**

**Yongfeng Lu**, University of Nebraska-Lincoln, Lincoln, NE, USA

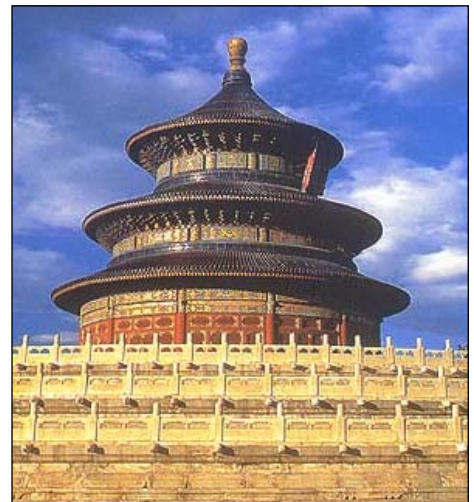
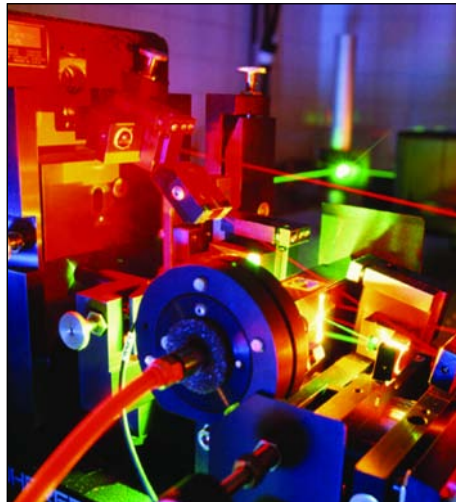
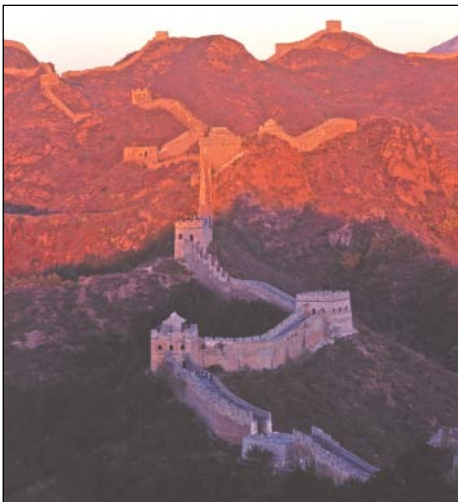
**Xiaoyan Zeng**, Huazhong University of Science & Technology, Wuhan, People's Republic of China

**PICALO International Enterprise Summit - NEW FOR 2008!**

**Globalization: Opportunities & Challenges for Laser Companies in China & the World**

**Bo Gu**, GSI Group, Inc., Wilmington, MA, USA

**Rangda Wu**, Chutianlaser, Wuhan, People's Republic of China



## FEATURING

*Laser Materials Processing Conference*

*Micro, Nano & Ultrafast Fabrication Conference*

*PICALO International Enterprise Summit - NEW FOR 2008!*

*Globalization: Opportunities & Challenges for Laser Companies in China & the World*

*Presented by Laser Institute of America in cooperation with  
Laser Processing Committee of China Optical Society (LPC-COS) and Tsinghua University*



**Laser Institute  
of America**  
*Laser Applications and Safety*



Register on the Web: [www.laserinstitute.org/conferences/picalo](http://www.laserinstitute.org/conferences/picalo)

# PICALO 2008 Conference Agenda

Sunday, April 13 – Monday, April 14

Pre-Conference Wuhan Tour

Wednesday, April 16

- 8:00am Registration Desk Open
- 9:00am Plenary Session
- 12:00pm Lunch in Local Restaurant
- 1:30pm LMP #1: Laser Cutting & Machining  
LMP #2: Surface Modification  
LMP #3: Laser Welding & Joining I  
Micro #1: Fundamental Science in Laser-Material Interactions
- 2:50pm Afternoon Break
- 3:10pm Micro #2: Near-Field Phenomena for Nanoprocessing
- 5:00pm Welcome Reception

Thursday, April 17

- 8:00am Registration Desk Open
- 9:00am LMP #4: Industrial Applications I  
Micro #3: Laser Microfabrication in Industry  
Micro #4: Laser Assisted Device Fabrication  
Laser Materials Processing Poster Presentation Gallery
- 10:20am Morning Break
- 10:40am Micro #5: Laser Microwelding  
Micro #6: Laser Direct Writing
- 12:00pm Lunch in Local Restaurant
- 1:30pm LMP #5: Additive Manufacturing  
LMP #6: Laser Welding & Joining II  
Micro #7: Ultrafast Processes in Materials Processing  
International Enterprise Summit
- 2:50pm Afternoon Break
- 3:10pm Micro #8: Laser Microprocessing for Photonic Devices
- 5:30pm Vendor TableTop Display & Reception

Friday, April 18

- 8:00am Registration Desk Open
- 9:00am LMP #7: Hybrid Welding & Joining  
LMP #8: Modeling & Simulation  
LMP #9: Lasers & Systems  
Micro #9: Lasers in Bio-engineering  
Micro, Nano & Ultrafast Fabrication Poster Presentation Gallery
- 10:20am Morning Break
- 10:40am Micro #10: Laser Micromachining
- 12:00pm Lunch in Local Restaurant
- 1:30pm LMP #10: Industrial Applications II  
LMP #11: Laser Drilling, Forming, & Peening  
LMP #12: Laser Surface Modification  
Micro #11: Laser Synthesis & Sintering of Nanoparticles
- 2:50pm Afternoon Break
- 3:10pm Micro #12: Advanced Laser Applications
- 6:00pm Closing Banquet

Saturday, April 19

Post Conference Tour – Great Wall of China

\*Program subject to minor changes

## Special Thanks to the PICALO 2008 Cooperating Societies

**Association of Laser Users**

**Beijing Optical Society**

**Chinese Journal of Lasers**

**Chinese Society of Non-Traditional Machining**

**Chinese Welding Society**

**European Laser Institute**

**European Optical Society**

**Japan Laser Processing Society**

# PICALO 2008 Conference Chair Welcome



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

Welcome to PICALO 2008 and Beijing -“The Olympics” for international laser materials processing. PICALO 2008 is the third conference focusing on the growth of industrial lasers and applications in the Pacific region. The general aim of PICALO is to bring together researchers, engineers, equipment suppliers and industry personnel to hear the latest developments and progress in lasers and applications and to share knowledge, experiences and visions. PICALO 2008 will feature an exciting laser macro/micro processing program, a unique international enterprise summit and a charming post-conference excursion in Beijing. You will feel the rapid development of the country, the fantastic Chinese culture and long history, the dynamic and modern metropolitan activities and also the Olympic atmosphere -one world, one dream!

The organizing committee will ensure that you get the maximum benefit from the technical program while having a great time during the conference. I would encourage you to take this opportunity to spend time here and enjoy this great country, her great culture, the Great Wall and the delicious Chinese food. PICALO 2008 is presented by Laser Institute of America in cooperation with the Laser Processing Committee of China Optical Society (LPCCOS) and Tsinghua University. LIA will handle all abstract submissions and conference registrations. On behalf of the organizing committee and conference chairs, I would like to formally invite you to attend PICALO in April 2008 in Beijing and be a part of this great event!

**Minlin Zhong**

## Plenary Session

### Extreme Photonic/Laser Processing: Ultra Intense, Ultra-fast & Nano-scale

PICALO 2008 can be called the Olympics for Laser Materials Processing as it will be held in Beijing, the 2008 Olympic host city. “To be higher, stronger and faster” challenges humans to their utmost. Likewise, laser applications have been continuously pushed forward to almost every aspect of science and engineering and to almost every extent of possibility. The PICALO 2008 plenary session highlights “extreme photonic/laser processing,” characterizing extreme high power intensity, extreme short pulse duration and extreme new material and phenomena. This plenary session starts with an impressive report on 150-terawatt power laser-matter relativistic interaction, generation of bright pulses of energetic (keV – MeV) x-rays and charged-particle beams, and unique applications in the physical sciences, biomedicine, defense and homeland security. Follows is an intriguing presentation on Photonic Meta Materials, Nano-scale plasmonics and Super Lens, which may inspire profound impact in wide range of applications such as nano-scale imaging, nanolithography, and integrated nano photonics. The session continues with an interesting report on state-of-the-art high power high brightness laser materials processing with characteristic traits on smaller, cost-effective and processing on-the-fly. The session also highlights a research and development work on a made-in-China 8 kW diode pumped solid state laser and its applications.

#### *Invited Plenary Speakers*

##### *Ultra-intense Laser-matter Interactions with a 150-terawatt Power Laser*

**Donald Umstadter**, University of Nebraska-Lincoln

##### *Photonic Meta Materials, Nano-scale Plasmonics and Super Lens*

**Zhang Xiang**, UC Berkeley

##### *High Power Laser Materials Processing - New Developments and Trends*

**Eckhard Beyer**, Fraunhofer IWS

##### *Research and Development on High Power DPSSL in China*

**Jinmin Li**, Institute of Semiconductor, Chinese Academy of Sciences

#### About Laser Institute of America

Laser Institute of America (LIA) is the international society for laser applications and safety. LIA's mission is to foster lasers, laser applications, and laser safety worldwide. Serving the industrial, medical, research and government communities, LIA offers technical information and networking opportunities to laser users from around the globe.

LIA presents several conferences that are recognized by the global community to be the best forums for exchanging up-to-date technical information on laser technology, applications, and safety. Attracting the best minds from the hottest fields, these forums bring together laser professionals from North America, Europe, Asia, and the Pacific Rim.

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 more. For more information, visit LIA at [www.laserinstitute.org](http://www.laserinstitute.org).

# PICALO Tours

## PICALO Pre-Conference Laser Industry Tour

Wuhan, China

Sunday, April 13 - Monday, April 14

**PICALO attendees have the opportunity to visit historic Wuhan and tour prominent laser companies.**

**Cost: \$150USD per participant**

**Additional to PICALO registration fee; air travel arrangements on own.**

Wuhan, capital of the Hubei province, is known as China's Optical Valley. It is the largest base for the optical electronics and photoelectronics industries in China. The Optical Valley is located in the Wuhan East Lake High-Tech development zone. Wuhan's optical electronics industry encompasses optical communication, power and consumer optical electronics, and relevant software. The industry is on an upswing, with the production value growing by an average of 30 percent a year since 2001. Its fiber-optic cable sector is currently third in the world in terms of manufacturing capability.

Participants who arrive Sunday evening will enjoy dinner and a Yangtze River Evening Cruise. The tour on Monday will feature three companies (National Optical-electronic Laboratory, Huazhong Univ. of Science and Technology, Chutian Laser Processing Company and Huagong Laser Engineering Company), and attendees will interact with executives from each company. Enjoy a driving tour of Wuhan and see the history including including Huanghe Pagoda and East Lake. Conclude the day with a closing dinner banquet including representatives from the featured companies and other area Wuhan laser companies. Don't miss this exciting networking opportunity in Wuhan, China!

See complete itinerary at [www.laserinstitute.org/conferences/picalo](http://www.laserinstitute.org/conferences/picalo).

## PICALO Post Conference Tour: MutianYu Section of the Great Wall of China, Ming Tombs, & the Famous Cloisonné Factory

Saturday, April 19

**Cost: \$110USD per participant (additional to PICALO registration fee)**

**Includes roundtrip transportation from the Capital Hotel, lunch, all admission fees and gratuities.**

### The Great Wall

An hour's drive from Beijing's center is an amazing work of architectural innovation, the Great Wall of China. The Great Wall, the only man made wonder of the ancient world which can be seen from the moon, is a magnificent monument to China's long and rich history.

The PICALO tour will visit a lesser know section of the Wall - MutianYu. Located at Huairou County some 73 kilometers (about 45 miles) northeast of the Beijing urban area, MutianYu Great Wall winds along lofty, cragged mountains from the southeast to the northwest for approximately 2.25 kilometers (about 1.4 miles). Connected with Juyongguan Pass to the west and Gubeikou to the east, this section of the Great Wall holds a prominent place in Chinese military history. Take time to walk up the snaking sections of walls, peek through the watchtowers and enjoy the amazing view.



Participants will have plenty of time to marvel at the sites (approximately 3 hours). Depart the Great Wall and head to lunch at a Chinese style restaurant (included in tour fee).

Depart after Lunch for the Ming Tombs via the "Sacred Way."

### Entrance to Ming Tombs at the Sacred Way

The Ming dynasty was known as the "period of restoration and reorganization" in the 18th century as China, under the Ming era, saw a flourish of the trading business with the rest of the world. With that prosperity, the wealth was splurged on both the living and the dead.

Take a tour of the vast mausoleums of 13 emperors of the Ming Dynasty at the Ming Tombs which lie northwest of Beijing. After taking in the Great Wall (which the Ming emperors were heavily involved in), venture around the magnificent Changling tomb which inhumes Emperor Zhuli and his empresses, some of which were said to be buried alive.

### Cloisonné Factory Visit

End the day with a visit to a cloisonné factory. Cloisonné is a unique combination of copper and porcelain working skills, traditional painting, sculpting, and etching skills. Originating in Beijing during the Yuan Dynasty (1271-1368), Cloisonné is an intricate process that requires many years of training for an artisan to master. Cloisonné pieces can be found in large objects, such as vases and other large utensils and decorative items, as well as small items like earrings, bracelets, chopsticks, or jars.

4 See complete itinerary at [www.laserinstitute.org/conferences/picalo](http://www.laserinstitute.org/conferences/picalo).

# Laser Materials Processing Conference



**Lin Li**  
The University of  
Manchester  
Manchester, UK



**Hau-Chung Man**  
The Hong Kong  
Polytechnic University  
Hung Hom, Kowloon,  
Hong Kong

The PICALO Laser Materials Processing Conference features the latest developments across the world in laser cutting / machining (metals, ceramics and glass, thick section), surface modification (marking, texturing, cladding, sintering, cold spray, melt injection, induction assisted cladding, laser-sol coating, combined cladding/shot peening), welding (alloys, plastics, fibre laser welding, welding dissimilar materials, hybrid welding), additive manufacturing (selective laser melting, direct laser deposition), lasers and systems (fibre laser, diode laser, CO<sub>2</sub> laser, process sensing and control), modelling and simulation (fluid dynamics, temperature fields, FE and analytical modelling), drilling and forming, and industrial applications (aerospace, automotive, petroleum, energy, bio-medical and process industries). The presentations are given in 10 oral sessions with over 80 papers and a poster session. Invited speakers from leading research groups and companies worldwide are presenting their recent findings and future prospects.

A special characteristic of the conference is the large number of participants from Asia, especially from China, providing an opportunity for the laser manufacturers, equipment suppliers as well as various industries and academics for the exploration of commercial and academic collaborations and businesses.

## LMP Session 1: Laser Cutting & Machining Wednesday, April 16 • 1:30pm

**Session Chair: Duncan Hand, Heriot-Watt Univ., Edinburgh, UK**

**Current Challenges to Laser Cutting Application (Invited Paper)...(101)**

Takeji Arai, The Japan Society of Laser Technology

**Applications of a Novel Supersonic Laser Cutting Head (Invited Paper)**

..... (102)  
Juan Pou, Antonio Riveiro, Félix Quintero, Fernando Lusquinos, Rafael Comesaña, Univ. de Vigo

**Reactive Thick Section Cutting with Fibre and Disk Laser. .... (103)**

William O'Neill, Tao Zhang, Univ. of Cambridge

**Study on the Machining Process of a New Laser Crack-free Cutting Technique for Ceramics. .... (104)**

Lingfei Ji, Yong Bao, Yinzhou Yan, Yijian Jiang, Institute of Laser Engineering, Beijing Univ. of Technology

**Laser Machining in Ceramics Manufacture (Invited Paper) ..... (105)**

Duncan Hand, Heriot-Watt Univ.

**High Precision Machining and Cutting of Si Using a Single Mode (Invited Paper) ..... (106)**

William O'Neill, K. Li, Univ. of Cambridge

**Effect of Laser Beam on Machining of Titanium Alloys ..... (107)**

Shoujin Sun, James Harris, Yvonne Durandet, Milan Brandt, Swinburne Univ. of Technology

**A Novel Technology of the Laser Cleaving on Glass Sheets with Multiple Laser Beams. .... (108)**

Yen-Liang Kuo, Jehnming Lin, National Cheng Kung Univ.; Tien-Ching Chen, Geniray Technology Corporation

**The Development of Laser-Chemical Combined Large Scale Etching on Difficult-to-Cut Materials ..... (109)**

Yuan Genfu, Anhui Institute of Architecture and Industry

## LMP Session 2: Surface Modification Wednesday, April 16 • 1:30pm

**Session Co-chairs: Hau-Chung Man, The Hong Kong Polytechnic Univ., Hung Hom, Kowloon, Hong Kong; Minlin Zhong, Tsinghua Univ., Beijing, People's Republic of China**

**A New Method of Laser Beam Induced Surface Modification using the Surfi-Sculpt® Process (Invited Paper) ..... (201)**

Paul Hilton, TWI Ltd.

## Program Committee:

**Pascal Aubry**, CEA / GERALIP, Arcueil, France

**Woong-Seong Chang**, RIST, Pohang, South Korea

**Yanbin Chen**, Harbin Institute of Technology, Harbin, People's Republic of China

**Paul Hilton**, TWI Ltd., Great Abington, Cambridge, UK

**Weidong Huang**, Northwestern Polytechnic Univ., Xian, People's Republic of China

**Takashi Ishide**, Mitsubishi Heavy Industries, Ltd., Takasago, Hyogo, Japan

**Stefan Kaierle**, Fraunhofer ILT, Aachen, Germany

**Seiji Katayama**, Osaka Univ., Ibaraki, Osaka, Japan

**David Low**, SIMTech, Singapore

**Henry Peng**, GE (China) Research & Development Center Co. Ltd., Shanghai, People's Republic of China

**G. Sundararajan**, International Advanced Research Centre for Powder Metallurgy and New Materials, Andhra Pradesh, India

**Kenneth Watkins**, The Univ. of Liverpool, Liverpool, UK

**Lijue Xue**, National Research Council Canada, London, ON, Canada

**Y. Lawrence Yao**, Columbia Univ., New York, NY, USA

**Qingmao Zhang**, South China Normal Univ., Guangzhou, People's Republic of China

**Yongkang Zhang**, Jiangsu Univ., Zhenjiang, People's Republic of China

**Norman Zhou**, Univ. of Waterloo, Waterloo, ON, Canada

**Xiao Zhu**, HUST, Wuhan, People's Republic of China

**Colour Marking of Metals with Fibre Lasers ..... (202)**  
Tony Hoult, Lu Ming, SPI Lasers; Anthony Tse, A & P Instrument Co. Ltd

**Laser Producing Ni-Matrix Composite Reinforced by In-Situ Synthesized Particles. .... (203)**  
Mingxing Ma, Ruiquan Kang, Wenjin Liu, Minlin Zhong, Tsinghua Univ.

**Microstructure and Property of Ni-P-Nano Al<sub>2</sub>O<sub>3</sub> Electroless Plating Layer Produced on Medium Carbon Steel Treated by Laser Technology ..... (204)**  
Fanzhi Kong, Aihuan Dun, Jianhua Yao, Zhejiang Univ. of Technology

**Surface Modification of Dental Hard Tissues using Pulsed UV Lasers (Invited Paper) ..... (205)**  
Victor Oliveira, Rui Vilar, Instituto Superior Técnico

**Numerical and Experimental Investigation of Thermal Stresses and Distortions in the Induction Assisted Laser Cladding. .... (206)**  
Frank Brückner, Dietrich Lepski, Fraunhofer IWS; Eckhard Beyer, Fraunhofer IWS, Dresden Univ. of Technology

**Synthesis and Coating of AlN on Mild Steel by Combined Laser Sol-Gel Technique ..... (207)**  
Philip Crouse, Lin Li, Paul Mativenga, Marimuthu Sundar, The Univ. of Manchester

**A Novel Approach of Surface Modification by Means of Laser Cladding Combined with Laser Shot Peening ..... (208)**  
Suqin Jiang, Jiangsu Univ.

**Direct Diode Lasers for Surface Modification ..... (209)**  
John Haake, Coherent Inc.

## LMP Session 3: Laser Welding & Joining I Wednesday, April 16 • 1:30pm

**Session Co-chairs: Yanbin Chen, Harbin Institute of Technology, Harbin, People's Republic of China; Paul Hilton, TWI Ltd., Cambridge, UK**

**State of the Art of Laser Welding of Aluminum Alloys in China (Invited Paper) ..... (301)**  
Rongshi Xiao, Institute of Laser Engineering, Beijing Univ. of Technology

**Laser Welding of NiTi Shape Memory Alloy ..... (302)**  
Wang Wei, Aviation Univ. of Air Force; Chang Chun, Beijing Aeronautical Manufacturing Technology Research Institute

**Welding Performance of a 2KW Continuous Wave Supermodulated Nd:YAG Laser-increased Weld Speed, Weld Penetration and Reduced Porosity with Supermodulated Output Power. .... (303)**  
Mohammed Naeem, GSI Group, Inc. - Laser Division

- Failure Study on DP and HSLA Steels in Formability Testing . . . (304)**  
M. Xia, Norman Zhou, Univ. of Waterloo; Z. Tian, Central Iron & Steel Research Institute
- Laser Welding of Aeronautic Titanium Alloys (Invited Paper) . . . (305)**  
Shui-li Gong, Wang Hong, BAMTRI
- Laser Welding of Ultra High Strength Steels for Automotive Applications . . . (306)**  
Steve Shi, Steve Westgate, TWI Ltd
- Humping Mechanisms during High-Speed Welding with Brilliant Lasers . . . (307)**  
Axel Hess, Friedrich Dausinger, FGSW Forschungsgesellschaft für Strahlwerkzeuge GmbH
- Through Transmission Laser Welding of Polyurethane . . . (308)**  
Larry Shi, Milt Vardakis, JDSU; Sean Flowers, Marc Stjohn, Candice Mehmetli, EWI
- On the Measurement of Strain-rate Dependent Mechanical Properties of Weld Zone in Laser-welded Blank . . . (309)**  
Chi Ho Cheng, L. C. Chan, The Hong Kong Polytechnic Univ.; C. L. Chow, CLAIM, The Univ. of Michigan

**LMP Session 4: Industrial Applications I**  
Thursday, April 17 • 9:00am

- Session Co-chairs: Jack Gabzdyl, SPI Lasers, Southampton, UK; Lin Li, The Univ. of Manchester, Manchester, UK**
- Advancement in Laser Drilling for Aerospace Gas Turbines . . . (401)**  
Mohammed Naeem, GSI Group, Inc. - Laser Division
- Experience-industrial Laser Surfacing Applications . . . (402)**  
Trevor Anderson, Jarvie Engineering Pty. Ltd.
- Challenges and Opportunities of Laser Rock Drilling for Petroleum Industry Applications . . . (403)**  
Zhiyue Xu, Argonne National Lab
- High-temperature Turbine Applications using Open Porous Metallic Foams with Thermal Barrier Coatings and Cooling Hole Arrays . . . (404)**  
Ernst Wolfgang Kreutz, K. Walther, S. Angel, E. Ratte, W. Bleck, K. Bobzin, E. Lugscheider, Lehrstuhl für Lasertechnik der RWTH; R. Poprawe, Fraunhofer ILT
- Manufacture and Repair of Aero Engine Components using Laser Technology (Invited Paper) . . . (405)**  
Ingomar Kelbassa, Fraunhofer ILT
- Automated, Diodelaser-based Brazing of Carbide Tips for Optimised Saw Blade Fabrication . . . (406)**  
Christian Stahlhut, Laser Zentrum Hannover e.V.
- Applications of Fibre Lasers in Solar Cell Manufacture. . . (407)**  
Jack Gabzdyl, Tony Houlton, SPI Lasers
- Laser-assisted Production of Bioceramic Coatings from Marine Wastes . . . (408)**  
Fernando Lusquinos, Rafael Comesaña, Félix Quintero, Mohamed Boutinguiza, Juan Pou, Antonio Riveiro, Univ. de Vigo

**LMP Session 5: Additive Manufacturing**  
Thursday, April 17 • 1:30pm

- Session Co-chairs: Milan Brandt, Swinburne Univ. of Technology, Melbourne, Australia; Lijue Xue, National Research Council of Canada, London, ON, Canada**
- Analysis of the Powder Bed Laser Melting Process for Direct Manufacturing of Metallic Components (Invited Paper) . . . (501)**  
Pascal Aubry, Olivier Hercher, GIP GERAILP
- Physical Influences of the Plasma during Various Metal Powder Irradiation by using Different Wavelength Laser Systems . . . (502)**  
Konrad Bartkowiak, Fraunhofer IWS; Mikhail Vasilyev, CLAIM, The Univ. of Michigan
- Direct Diode Laser Deposition of Functionally Graded Ti-6Al-4V and Inconel 718 Components . . . (504)**  
Kamran Shah, Andrew Pinkerton, Richard Moat, Lin Li, Michael Preuss, The Univ. of Manchester

- Innovative Laser Consolidation Process for Making Net-Shape Functional Components for Various Industrial Applications (Invited Paper) . . . (505)**  
Lijue Xue, National Research Council Canada
- Quality and Properties of Laser-deposited Metals . . . (506)**  
Richard Grylls, Optomec
- Microstructural Evolution in Laser Rapid Forming of a Graded Nickel-Titanium Alloy . . . (507)**  
Xiaojing Xu, Northwest Polytechnical Univ.
- Selective Laser Melting of Ti-Ni Alloy . . . (508)**  
Yongqiang Yang, Dawei Cheng, Yanlu Huang, Chilin Wang, South China Univ. of Technology
- Influence of Laser DMD Technics on Microstructure of Inconel 718 High-temperature Alloy . . . (509)**  
Jianhua Yao, Qunli Zhang, Zhejiang Univ. of Technology

**LMP Session 6: Laser Welding & Joining II**  
Thursday, April 17 • 1:30pm

- Session Co-chairs: Dirk Petring, Fraunhofer ILT, Aachen, Germany; Andrew Pinkerton, The Univ. of Manchester, Manchester, UK**
- Fibre Laser Welding of Ti6Al4V . . . (601)**  
Jongkol lammi, The Univ. of Nottingham
- Dissimilar Metal Welding Titanium and Steel Sheet by Fiber Laser . . . (602)**  
Seo-Jeong Park, Research Institute of Industrial Science & Technology
- A Comparative Study of Single Mode Fibre Laser and Nd:YAG Laser Welding of Ti-6Al-4V . . . (603)**  
Hui-Chi Chen, Andrew Pinkerton, Lin Li, The Univ. of Manchester; Jonathan Blackburn, Paul Hilton, TWI Ltd
- Studies on the Pulsed Nd:YAG Laser Spot Welding of Magnet/Steel Dissimilar Materials . . . (604)**  
Baohua Chang, Tsinghua Univ.
- Characteristic Melt Pool Hydrodynamic Behaviors for CW Nd:YAG Deep Penetration Laser Welding . . . (605)**  
Rémy Fabbro, LALP (CNRS)/GIP GERAILP
- Gas Jet Effect on the Molten Bath Movements Produced during Deep Penetration Laser Welding . . . (606)**  
El-Hachemi Amara, Advanced Technologies Development Centre (CTA); Rémy Fabbro, LALP(CNRS)/GIP GERAILP
- Study of Laser Welding of Zinc Coated Sheet Steel in Overlap Configuration . . . (607)**  
Yu Pan, Netherlands Institute for Metals Research; Ian M. Richardson, Delft Univ. of Technology
- Laser Welding and Formability of Titanium Tailor-welded Blanks: An Experimental Approach in Warm Forming . . . (608)**  
Chi Ping Lai, Luen Chow Chan, Tai Chiu Lee, HKPU; Chi Loong Chow, CLAIM, The Univ. of Michigan
- Microstructure and Corrosion Behavior of Laser Welds between Dissimilar Stainless Steels . . . (609)**  
Chi Tat Kwok, S.L. Fong, Univ. of Macau; F.T. Cheng, H.C. Man, The Hong Kong Polytechnic Univ.

**LMP Session 7: Hybrid Welding & Joining**  
Friday, April 18 • 9:00am

- Session Co-chairs: Steve Shi, TWI Ltd, Cambridge, UK; Norman Zhou, Univ. of Waterloo, Waterloo, ON, Canada**
- Studies on the Effects of Welding Parameters on Temperature Fields in Laser-Plasma Arc Hybrid Welding of an Al-Li Alloy . . . (701)**  
Baohua Chang, Tsinghua Univ.
- Comparison of Weldability in Nd:YAG-MIG Hybrid Welding of Sus316L and Xn-19 . . . (702)**  
Xudong Zhang, Eiji Ashida, Hitachi Ltd., Materials Research Lab.; Xiangjun Luo, Noriaki Gotou, Hitachi-Ge Nuclear Energy, Ltd.
- Arc Characteristics of Laser-GTAW Double Sides Welding . . . (703)**  
Chen Yan-Bin, Miao Yu-Gang, Li Li-Qun, National Key Laboratory of Advanced Welding Production Technology, Harbin Institute of Technology

**Joining of Magnesium using Laser Assisted Self-pierce Riveting Technology** ..... (704)  
Yvonne Durandet, Wei Song, Brian Dempster, Milan Brandt, CCRC, Swinburne Univ. of Technology; Stuart Blacket, Henrob (UK) Pty Ltd

**Enhancement of Laser Welding Capabilities by Hybridization or Combination of Different Processes** ..... (705)  
Dirk Petring, Fraunhofer ILT

**A Comparison of the Pitting Corrosion Behavior of 304L Stainless Steel by TIG, Laser and Laser-TIG Hybrid Welding** ..... (706)  
Jun Yan, Ming Gao, Qianwu Hu, Xiaoyan Zeng, Huazhong Univ. of Science and Technology

**Guidance and Stabilization of Electric Arc Welding using Nd:YAG Laser Radiation** ..... (707)  
Jörg Hermsdorf, Rainer Kling, Christian Stahlhut, Frank Ziem, Laser Zentrum Hannover e.V.

**Study on Welding Characteristics of Combining Laser Welding and Resistance Seam Welding Joined Ti6Al4V Alloy Lap Joints** ..... (708)  
Xinge Zhang, Liqun Li, Zhenglong Lei, Yanbin Chen, Harbin Institute of Technology

**LMP Session 8: Modeling & Simulation**  
Friday, April 18 • 9:00am

**Session Co-chairs: Rémy Fabbro, LALP (CNRS)/GIP GERALIP, Arcueil Cedex, France; Weidong Huang, Northwestern Polytechnic Univ., Xian, People's Republic of China**

**Research on Fluid Dynamics during Laser Deep Penetration Welding** ..... (801)  
Wang Hong, BAMTRI

**Theoretical and Experimental Research on Temperature Field of Coaxial Powder Flow in Laser Cladding** ..... (802)  
Yang Xichen, Laser Processing Center, Tianjin Polytechnic Univ.

**Integrated Model of Turbulent Fluid Flow, Heat Transfer and Mass Transfer in Laser Cladding Process for Direct Metal Deposition** . (803)  
Yanlu Huang, Yongqiang Yang, Guoqiang Wei, South China Univ. of Technology

**Modeling Utility for Percussion Laser Drilling - Experiment vs Theory** ..... (804)  
Tom Eppes, Univ. of Hartford

**Heat Transfer and Fluid Flow during Double-track Laser Cladding of H13 Tool Steel (Invited Paper)** ..... (805)  
Xiuli He, Jyoti Mazumder, CLAIM, The Univ. of Michigan

**Three-dimensional Analytical and Finite Element Methods for Simulating a Moving Melt Pool with Mass Addition** ..... (806)  
Andrew Pinkerton, Alhaji Kamara, Kamran Shah, Lin Li, The Univ. of Manchester

**3D Finite Element Simulation for the Temperature Field of Direct Metal Laser Sintering Process** ..... (807)  
Xia Ji, Jiangsu Univ.

**The Absorbance of Metal Surfaces to Nd:YAG/Nd:YLF Laser Light** . (808)  
D. Bergstrom, Mid Sweden Univ.; John Powell, Alexander Kaplan, Luleå Univ. of Technology

**LMP Session 9: Lasers & Systems**  
Friday, April 18 • 9:00am

**Session Co-chairs: Stefan Kaierle, Fraunhofer ILT, Aachen, Germany; Bill Shiner, IPG Photonics Corp., Oxford, MA, USA**

**Advances of Fiber Lasers and their Applications (Invited Paper)** .... (901)  
Bill Shiner, IPG Photonics Corp.

**The Design Method of High-efficiency Coupling of Fiber for the High-power Solid Laser** ..... (902)  
Baohua Wang, Menghua Jiang, Yongling Hui, Qiang Li, Kai Pang, Institute of Laser Engineering of Beijing Univ. of Technology

**Reliable High-power Laser Diode Arrays** ..... (903)  
Brad Debok, Ryan Feeler, Northrop Grumman Cutting Edge Optronics

**New Developments in CO2 Laser Technology Enable New Applications** ..... (904)  
Frank Gaebler, Coherent Inc.

**Does High Beam Quality of Solid State Lasers Enhance Laser Material Processing? (Invited Paper)** ..... (905)  
Mohammed Naeem, John Chinn, Bo Gu, GSI Group Inc.

**Process Control on Laser Cladding by Coaxial Vision for Direct Manufacturing of 3D Metallic Structures** ..... (906)  
Pascal Aubry, Mehdi Guiraud, GIP GERALIP

**Advances in Laser-deposition Equipment and Capabilities** ..... (907)  
Richard Grylls, Optomec

**Process Control in Laser Materials Processing - Combined Sensor Technologies for Secure Quality Assurance** ..... (908)  
Markus Kogel-Hollacher, Precitec Optronik GmbH

**LMP Session 10: Industrial Applications II**  
Friday, April 18 • 1:30pm

**Session Co-chairs: Anthony Hoult, SPI Lasers, Santa Clara, CA, USA; Henry Peng, GE (China) Research & Development Center Co. Ltd., Shanghai, People's Republic of China**

**Comparative Study of Techniques for Wear Minimisation of Engine Parts** ..... (1001)  
Martin Dahmen, Stefan Kaierle, Fraunhofer ILT; Wenjin Liu, Dept. of Mechanical Engineering, Qinghua Univ.; Hequiang Wen, Beijing Locomotive Works; Aiping Wu, Beijing Institute of Opto-Electronic Technology

**Reconditioning of Workpieces and Turbine Parts by Laser Metal Deposition of High Temperature Steels and Alloys** ..... (1002)  
Ernst Wolfgang Kreuzt, Stefanie Keutgen, Ingomar Kelbassa, Bernd Burbaum, Lehrstuhl für Lasertechnik; Leping Zhu, Rolls-Royce Deutschland

**The Application Research on Laser Welding Cab-roof of Truck**...(1003)  
Yuan Yao, China FAW Group Corp. R & D Center

**Integrated Heat Treatment - Comparison of Different Machine Concepts** ..... (1004)  
Steffen Bonns, Jan Hannweber, Udo Karsunke, Marko Seifert, Eckhard Beyer, Berndt Brenner, Fraunhofer IWS

**Laser Material Processing in the Aero Engine Industry. Established, Cutting-Edge and Emerging Applications** ..... (1005)  
Karl-Hermann Richter, MTU Aero Engines

**Model-making of Building & Sculpture Based on Laser Rapid Prototyping Technology** ..... (1008)  
Chen Xuehui, Center of Laser Advanced Manufacturing Technology, Anhui Institute of Architecture and Industry

**Nopaltzin Li: The New Laser Machine for Cactus Cleaning with Optical Detection of Spines** ..... (1009)  
Luis Ponce, CICATA-IPN

**LMP Session 11: Laser Drilling, Forming, & Peening**  
Friday, April 18 • 1:30pm

**Session Co-chairs: Mohammed Naeem, GSI Group, Inc. - Laser Division, Rugby, UK; John Powell, Luleå Univ. of Technology, Luleå, Sweden**

**A Novel Hole Geometry Measurement Technique using a Laser Micro-beam** ..... (1101)  
Tom Eppes, Univ. of Hartford

**A Statistical Model for Research on the Focal Position Effect on the Taper of Laser Drilling** ..... (1102)  
Yinzhou Yan, Lingfei Ji, Yong Bao, Yijian Jiang, Institute of Laser Engineering, Beijing Univ. of Technology

**Laser Drilling in Superalloy with 150~550Ns Pulses Train** ..... (1103)  
Zhang Xiaobing, BAMTRI

**Topographic Analysis of Holes Drilled by Pulsed Nd:YAG Laser on DD6 Single-crystal Superalloy** ..... (1104)  
Chen Changjun, Zhang Min, Zhang Shichang, Chang Qingming, Yan Wenqing, Key Laboratory for Ferrous Metallurgy and Resources Utilization of Ministry of Education, Laser Processing Research Center; Zhang Xiaobing, Key Laboratory for High Energy Density Beam Processing Technology

**Analysis of the Formability of Aluminum Alloy Sheet based on Laser Shock Forming** ..... (1105)  
Yinfang Jiang, Yongkang Zhang, Zhiwei Du, Runa Li, Chaoyang Shi, Jiangsu Univ.; Yuanyou Zhu, Nanjing Institute of Technology

**Process Parameters Study of Closed-loop Laser Rapid Forming** .... (1106)  
Jun Yu, Jing Chen, Hua Tan, Xin Lin, Weidong Huang, State Key Laboratory of Solidification Processing, Northwestern Polytechnical Univ.

- The Study on the Laser Compound Forming of Sheet Metal . . . . (1107)**  
YiBin Chen, Jianzhong Zhou, Jiangsu Univ.
- The Fatigue Properties of Laser Shock Processed Aluminum Alloy 7050. . . . . (1108)**  
Zou Shikun, BAMTRI
- Dynamical Simulation and Experimental Study on the Process of Laser Peen Forming of Metal Plate. . . . . (1109)**  
Shu Huang, Jianzhong Zhou, Jiangsu Univ.

- Mechanism Analysis on Dry-friction Abrasive Wear Resistance of Particulate Reinforced MMC Coatings by Laser Deposition for Corrugate Rollers. . . . . (1204)**  
Zhaoyong Qian, Minlin Zhong, Wenjin Liu, Tsinghua Univ.
- Metal Matrix Nano H-BN Self-lubricating Composite Coating Synthesized by Nd:YAG Laser Cladding. . . . . (1205)**  
A.H. Wang, Huazhong Univ. of Science and Technology

- Study on the Deposition of Nickel Base Waspaloy Powder via High Power Fiber Laser . . . . . (1206)**  
Guijun Bi, Xuefeng Zhang, Ian Pashby, School of Mechanical, Materials and Manufacturing Engineering, Univ. of Nottingham; Jeff Allen, Rolls Royce PLC

- Laser Melt Injection of Monocrystalline WC Particles into Ti-6Al-4V . . . . . (1207)**  
Dejian Liu, Fuquan Li, Yanbin Chen, Liqun Li, Harbin Institute of Technology

- Residual Stress Distribution in Laser Alloying Zone with FeCsib Powder . . . . . (1208)**  
Zhengyang Li, Haiyan Zhao, Bin Zhang, Yu Gu, Minlin Zhong, Wenjin Liu, Dept. of Mechanical Engineering, Tsinghua Univ.; Qiulin Wu, Beijing Beiyue Functional Materials Co.Ltd.

- Corrosion Properties of Laser Surface-treated Nickel Titanium . . . . . (1209)**  
Ng Ka Wai, The Hong Kong Polytechnic Univ.

**LMP Session 12: Laser Surface Modification**  
Friday, April 18 • 1:30pm

**Session Co-chairs: Yijian Jiang, Institute of Laser Engineering, Beijing Univ. of Technology, Beijing, People's Republic of China; Rui Vilar, Instituto Superior Técnico, Lisboa Codex, Portugal**

- Improving Physical Properties of Functional Materials by Laser Irradiation (Invited Paper) . . . . . (1201)**  
Yijian Jiang, Institute of Laser Engineering, Beijing Univ. of Technology

- Recent Developments of the Laser-assisted Cold Spray Process and Deposit Characterisation . . . . . (1203)**  
Matthew Bray, Andrew Cockburn, William O'Neill, Univ. of Cambridge

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**Laser Industry Vendor Program Reception & TableTop Display**

**Thursday, April 17 • 5:30pm**

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 refreshments 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 December 15.

- Beijing Purple Light Laser**  
**Beijing University of Technology**  
**Chutian Laser**  
**Coherent, Inc.**  
**Del Mar Photonics, Inc.**  
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**GSI Group, Inc.**  
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# Micro, Nano & Ultrafast Fabrication Conference



**Yongfeng Lu**, Univ. of Nebraska-Lincoln  
Lincoln, NE, USA



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

New laser technologies for micro/nano/ultrafast fabrication and diagnosis continue to be the focus of academic research and industry applications. The explosion of new ideas in the photonics, material processing, microelectronics packaging, and biomedical fields has created a unique need for fabrication and diagnostics at micro/nanoscales using continuous wave, nanosecond, picosecond, and femtosecond lasers. The Laser Micro, Nano, and Ultrafast Fabrication Conference at PICALO 2008 is a global forum for engineers and scientists from a variety of industry segments and institutes to meet and discuss use of laser micro/nano/ultrafast fabrication and diagnosis as a key technology for various applications. Attendees will find innovative ideas and solutions for micro/nano/ultrafast fabrication in opto- and microelectronics, electronics, microsystems, material processing 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 fundamental science in laser-material interactions, near-field phenomena for nanoprocessing, laser microfabrication and micromachining, laser microwelding, laser-assisted device

fabrication, laser direct writing, ultrafast processes in materials processing, laser synthesis and sintering of nanoparticles, and lasers application in bio-engineering. In this way, 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.

## Micro Session 1: Fundamental Science in Laser-Material Interactions Wednesday, April 16 • 1:30pm

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

**Fundamental Issues Concerning Material Removal by Laser Irradiation from Insulating Materials (Invited Paper)** ..... (M101)  
Tom Dickinson, Washington State Univ.

**Processing of Polymer and Organic Materials using Tunable Ultrafast Mid-infrared Lasers (Invited Paper)** ..... (M102)  
Richard Haglund, Vanderbilt Univ.

**Laser Micro-fabrication of Custom Micro-optics for Beam Brightness Enhancement of High Power Diode Lasers (Invited Paper)** . . . . (M104)  
D.R. Hall, H.J. Baker, R. McBride, E. Mendez, School of Engineering and Physical Sciences, Heriot-Watt Univ.

## Micro Session 2: Near-Field Phenomena for Nanoprocessing Wednesday, April 16 • 3:10pm

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

**Nanoscale Laser Processing and Diagnostics (Invited Paper)** . . . (M201)  
Costas Grigoropoulos, Univ. of California

**High Transmission Nanoscale Ridge Apertures and Its Application in Laser-based Nanomanufacturing (Invited Paper)** . . . . . (M203)  
Xianfan Xu, Purdue Univ.

**Sub-wavelength Laser Direct Write Patterning (Invited Paper)**... (M204)  
Euan Mcleod, Craig B. Arnold, Princeton Univ.

**Tuning the Near-field Focusing of Particle Lens for Surface Nanofabrication** . . . . . (M205)  
Zengbo Wang, Laser Processing Research Centre; Wei Guo, David Whitehead, Lin Li, Laser Processing Research Centre, School of Mechanical, Aerospace and Civil Engineering; Lukyanchuk Boris, Data Storage Institute; Zhu Liu, Corrosion and Protection Centre, School of Materials

## Micro Session 3: Laser Microfabrication in Industry Thursday, April 17 • 9:00am

**Session Chair: Hai-Lung Tsai, Univ. of Missouri-Rolla, Rolla, MO, USA**

**Progress in R&D on Ultrafast Laser Processing and Prospect of Industrial Applications (Invited Paper)** . . . . . (M301)  
Xinbing Liu, Panasonic Boston Lab.

## Program Committee:

- Craig Arnold**, Princeton Univ., Princeton, NJ, USA  
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**Hai-Lung Tsai**, Univ. of Missouri-Rolla, Rolla, MO, USA  
**Kunihiko Washio**, Paradigm Laser Research Ltd., Machida, Tokyo, Japan  
**Xianfan Xu**, Purdue Univ., West Lafayette, IN, USA

**Innovative Laser Technology for Semiconductor Manufacturing - Stealth Dicing (Invited Paper)** . . . . . (M302)  
Etsuji Ohmura, Osaka Univ.; Masayoshi Kumagai, Hideki Morita, Hamamatsu Photonics K.K.

**High Quality Micro Machining with Tailored Short and Ultra Short Laser Pulses** . . . . . (M303)  
Arnold Gillner, Claudia Hartmann, Andreas Dohrn, Fraunhofer ILT

**Single Step Micro Laser Cladding of Nanophased Powders** . . . . (M304)  
Henrik Mewes, Sonja Dudziak, Nils Weidlich, Oliver Meier, Laser Zentrum Hannover e.V.; Stefan Czerner, Microls

## Micro Session 4: Laser Assisted Device Fabrication Thursday, April 17 • 9:00am

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

**3D Microstructuring of Glass by Femtosecond Laser for Lab-on-a-Chip Applications (Invited Paper)** . . . . . (M401)  
Koji Sugioka, Yasutaka Hanada, Katsumi Midorikawa, RIKEN

**Fabrication of Electrodes for the Application of Microbatteries (Invited Paper)** . . . . . (M402)  
Lu Li, National Univ. of Singapore

**Nd:YAG Laser and Micropen Integrated Fabrication of Mim Thick Film Capacitors** . . . . . (M403)  
Yu Cao, Xiaoyan Zeng, HUST

**Experimental Micromachining Results using a UV Laser with the Laser Microjet®** . . . . . (M404)  
John Stay, Synova SA

## Micro Session 5: Laser Microwelding Thursday, April 17 • 10:40am

**Session Chair: Koji Sugioka, RIKEN, Saitama, Japan**

**Ultrafast Laser Microprocessing and Microwelding (Invited Paper)** . . . . . (M501)  
Kazuyoshi Itoh, Osaka Univ.; Takayuki Tamaki, Nara National College of Technology

**Microwelding Performance Comparison Between a Low Power (125W) Pulsed Nd:YAG Laser and a Low Power (200W) Single Mode Fiber Laser** . . . . . (M502)  
Mohammed Naeem, GSI Group, Inc. - Laser Division

**Development and Application of Miniaturized Scanners for Laser Beam Micro Welding** ..... (M503)  
Felix Schmitt, Fraunhofer ILT

**Parameter Studies of Fibre Laser Micro-welding of SS316L using Taguchi Method** ..... (M504)  
Chan Chi Wai, H.C. Man, T.M. Yue, AMT Research Center, Dept. of ISE, The Hong Kong Poly Univ.

**Micro Session 6: Laser Direct Writing**  
Thursday, April 17 • 10:40am

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

**Recent Progress of Femtosecond Laser Micro-nano Fabrication (Invited Paper)** ..... (M601)  
Wenhao Huang, USTC

**Picosecond Lasers in Industrial Micromachining Applications (Invited Paper)** ..... (M602)  
Rainer Kling, Laser Zentrum Hannover e.V.

**Laser Direct-write using Air-drying Conductive Paste (Invited Paper)** ..... (M603)  
Daniel Perkins, Texas Christian Univ.; Jason Stegall, David Willis, Southern Methodist Univ.

**Direct Fabrication of Micro Temperature Sensor Arrays by Laser Micro-cladding Functional Materials on Ceramic Substrates** ... (M604)  
Cai Zhixiang, Li Xiangyou, Zeng Xiaoyan, Wuhan National Lab. for Optoelectronics

**Micro Session 7: Ultrafast Processes in Materials Processing**  
Thursday, April 17 • 1:30pm

**Session Chair: Wenhao Huang, Univ. of Science and Technology of China, Hefei, People's Republic of China**

**Multiscale Modeling of Ultrafast Laser-material Interactions (Invited Paper)** ..... (M701)  
Lan Jiang, Beijing Institute of Technology; Hai-Lung Tsai, Univ. of Missouri-Rolla

**Novel Aspects of Microprocessing by Ultrafast Lasers: From Electronic to Biological and Cultural Heritage Applications (Invited Paper)** ..... (M702)  
Costas Fotakis, FORTH CRETE

**Femtosecond Fabrication of Nonlinear Photonic Crystals** ..... (M703)  
Min Gu, Swinburne Univ. of Technology

**Direct Measurement of Temperature Distribution in Silicon by Ultrashort Laser Pulses** ..... (M704)  
Hong Yu Zheng, Singapore Institute of Manufacturing Technology

**Micro Session 8: Laser Microprocessing for Photonic Devices**  
Thursday, April 17 • 3:10pm

**Session Chair: Tatsuo Okada, Kyushu Univ., Motoooka, Fukuoka, Japan**

**5-D Microscopy and 3-D Nanoprocessing for Femtosecond Laser Photonics Fabrication (Invited Paper)** ..... (M801)  
Peter Herman, Univ. of Toronto

**Laser-induced Bandgap Engineering of Quantum Well Wafers: A Quest for Monolithically Integrated Photonic Devices (Invited Paper)**... (M802)  
Jan J. Dubowski, Univ. de Sherbrooke

**Selective Area Bandgap Engineering of AlGaAs/GaAs Quantum Well Microstructures with a Laser Rapid Thermal Annealing Technique** ... (M803)  
Radoslaw Stanowski, Jan J. Dubowski, Univ. de Sherbrooke; H.H. Tan, C. Jagadish, The Australian National Univ.

**Fabrication, Characterization and Simulation of Large-scale 3-D Photonic Crystals Using Laser-assisted Fabrication Techniques**... (M804)  
H. Wang, Yongfeng Lu, Univ. of Nebraska - Lincoln

**Design and Experimental Realization of 3D Photonic Components Via Two-photon Polymerization** ..... (M805)  
Mark Boyle, Andre Neumeister, Johannes Zinn, Laser Zentrum Hannover e.V.; Andrei Lavrinenko, Technical Univ. of Denmark; Reinhold J. Leyrer, Wendel Wohlleben, Basf Aktiengesellschaft

**Micro Session 9: Lasers in Bio-engineering**  
Friday, April 18 • 9:00am

**Session Chair: Jan J. Dubowski, Univ. de Sherbrooke, Sherbrooke, QC, Canada**

**Optical-driven Nano Machines with Real-time Force Sensing and Biochemical IC Chip Family Fabricated by Two/Single Photon Micro Stereolithography (Invited Paper)** ..... (M901)  
Koji Ikuta, Nagoya Univ.

**USP Laser Dissemination and Separation of Tissues (Invited Paper)**... (M902)  
Zhixiong Guo, Huan Huang, Xiaoliang Wang, Rutgers, The State Univ. of New Jersey

**Laser Device for Elemental Determination in Human Skin** . . . . (M904)  
Luis Ponce, CICATA-IPN

**Micro Session 10: Laser Micromachining**  
Friday, April 18 • 10:40am

**Session Chair: Li Lu, National Univ. of Singapore, Singapore**

**Manufacturing of Shaped Holes in Multi-layer Plates by Laser-drilling** ..... (M1001)  
Kurt Walther, Mihael Brajdic, Jens Dietrich, Martin Hermans, Martin Witty, Alexander Horn, Ingomar Kelbassa, Reinhart Poprawe, Lehrstuhl für Lasertechnik, RWTH

**Practical Issues in Laser Micro/Nano Machining** ..... (M1002)  
Wenwu Zhang, Jeffrey Shaw, Brian Farrell, GE Global Research

**Laser-assisted-hot Embossing of Microstructures** ..... (M1003)  
Jens Holtkamp, Fraunhofer ILT

**Laser Assisted Micro and Nano Replication** ..... (M1004)  
Qin Hu, William O'Neill, Institute for Manufacturing, Dept. of Engineering, Univ. of Cambridge

**Micro Session 11: Laser Synthesis & Sintering of Nanoparticles**  
Friday, April 18 • 1:30pm

**Session Chair: Xianfan Xu, Purdue Univ., West Lafayette, IN, USA**

**Laser Fabrication of Nanoparticles and Crystals in Solution (Invited Paper)** ..... (M1101)  
Hiroshi Masuhara, Osaka Univ.

**Fabrication of Nanomaterials by Laser Irradiation Process in Liquid Phase (Invited Paper)** ..... (M1102)  
Naoto Koshizaki, National Institute of Advanced Industrial Science and Technology

**Flash Lamp Curing of Nano-particulates for Passive Device Fabrication (Invited Paper)** ..... (M1103)  
James Sears, South Dakota School of Mines & Technology

**Fabrication of Micro-structured Components by Laser Micro-deposition** ..... (M1104)  
Huan Qi, Magdi Azer, GE Global Research

**Micro Session 12: Advanced Laser Applications**  
Friday, April 18 • 3:10pm

**Session Chair: Hongyu Zheng, SIMTech, Singapore**

**Aligned Growth of ZnO Nanowires by Laser Ablation and Their Applications (Invited Paper)** ..... (M1201)  
Tatsuo Okada, Kyushu Univ.

**Laser Micro Adjustment Technology - Possibilities and Challenges for Novel Applications (Invited Paper)** ..... (M1202)  
Michael Schmidt, Bayerisches Laserzentrum GmbH

**Fabrication of Carbon Nanotube Interconnections by Current-assisted Laser Irradiation** ..... (M1203)  
Tao Gong, Yong Zhang, Wenjin Liu, Minlin Zhong, Tsinghua Univ.

**Laser Treating of Carbon Nanotube Solar Cell** ..... (M1204)  
Tao Gong, Yong Zhang, Wenjin Liu, Minlin Zhong, Tsinghua Univ.

**Fabrication of Micro-machine Elements by Five-axis Laser Processing System** ..... (M1205)  
Souta Matsusaka, Takehiro Watanabe, Kensuke Iijima, Chiba Univ.

# Laser Materials Processing Poster Presentation Gallery

## Thursday, April 17

- Patent Analysis of Laser Cutting Technique** ..... (P101)  
Bingkun Xiang, Nanjing Univ. of Aeronautics and Astronautics
- Effects of Rare Earth Oxide on the Nucleation of Carbide Particles in Laser Cladded MMCP Coating.** ..... (P102)  
Caofeng Wu, Mingxing Ma, Wenjin Liu, Minlin Zhong, Tsinghua Univ.
- Laser Beam Shaping and Surface Treatment of Ze41A-T5 Magnesium Alloy** ..... (P103)  
Yvonne Durandet, Shoujin Sun, Milan Brandt, Swinburne Univ. of Technology; R.K. Singh Raman, Monash Univ., Dept. of Mechanical Engineering; Darren Gerrard, Bruce Hinton, Defence Science and Technology Organization
- Study on the Pore Control of 5083 Aluminum Alloy by Dual-beam Laser Welding.** ..... (P104)  
Kai Chen, Rui Huang, Rongshi Xiao, Xudong Zhao, Song Zhang, Beijing Univ. of Technology
- Microstructure of Laser Joints of Az31B Wrought Magnesium Alloy** ... (P105)  
Shan Ji-guo, Lei Xiang, Tan Wen-Da, Chen Wu-Zhu, Dept. of Mechanical Engineering, Tsinghua Univ.
- Study on the Surface Treatment for Controlling the Aluminum-lithium Alloy Weld Porosity of Laser Welding** ..... (P106)  
Yang Jing, Chen Li, Gong Shuili, BAMTRI; Li Xiaoyan, BJUT
- Single Mode Fibre Laser Welding of Dissimilar Aerospace Alloys...**(P107)  
Hui-Chi Chen, Andrew Pinkerton, Ziu Liu, Lin Li, The Univ. of Manchester
- Laser Ablation of Al<sub>2</sub>O<sub>3</sub> Ceramic in NaOH Medium.** ..... (P108)  
Shao Feng, Anhui Institute of Architecture & Industry
- Investigation in Laser Colorful Marking in Stainless Steel by Pulsed Fiber Laser** ..... (P109)  
Ji-Min Chen, Hong-Liang Zhao, Sonoro Zhao, Institute of Laser Engineering, Beijing Univ. of Technology
- Laser Sintering of (K<sub>0.5</sub>Na<sub>0.5</sub>Nb<sub>3</sub>)-Li<sub>3</sub> TaO<sub>3</sub> Lead-free Ceramics with Novel Piezoelectric Properties** ..... (P110)  
Lingfei Ji, Xinyu Du, Yijian Jiang, Institute of Laser Engineering, Beijing Univ. of Technology
- Laser Cladding of Ti-Base Composite Coatings on Ti-6Al-4V Substrate** .. (P111)  
Wei-fu Wang, Maocai Wang, Fengjiu Sun, Northeastern Univ.
- Application and Performance Evaluation for the New Material in the Industrial SFF System using a SLS Process.** ..... (P112)  
Dong Soo Kim, Sung Woo Bae, Chung Hwan Kim, Byung Oh Choi, Korea Institute Machinery & Materials; Young Kil Bang, Lionchemtech Co., Ltd.
- Experimental Research on Functional Graded Cladding Layer of Titanium Alloy** ..... (P113)  
Fangyou Hu, NAEA
- The Rapid Solidification Characteristics of Ni-Based Alloy Fabricated by Laser Engineered Net Shaping** ..... (P114)  
Fei Qunxing, BAMTRI
- The Research on the Parameter Thresholds of Titanium Alloy Laser Welding.** ..... (P115)  
Chen Li, BAMTRI
- An Experimental Study on Welding Parameters for Laser Welding of NiTi Shape Memory Alloys** ..... (P116)  
Wang Wei, Aviation Univ. of Air Force; Chang Chun, BAMTRI
- Effect of Beam Factors on Beam-focusing Characters and Laser Penetration Welding** ..... (P117)  
Hong Chen, Institute of Laser Engineering, Beijing Univ. of Technology
- Spectroscopic Investigation of Laser-induced Plasma in Co<sub>2</sub> Laser Welding Aluminum Alloy** ..... (P118)  
Junfeng Qi, Beijing Univ. of Technology
- Study on Laser Repair Welding to Brazing Bead of 6063 Aluminum Alloy** ..... (P119)  
Zhao Xudong, Chen Kai, Xiao Rong-Shi, Beijing Univ. of Technology
- Experimental Study on the Quality of Material Surface Applied Laser-chemical Combined Etching** ..... (P120)  
Yao Yansheng, Anhui Institute of Architecture and Industry
- Technological Study of Oxygen Aided Laser Cutting Silicon Steel** ... (P121)  
Hong Lei, Shanghai Maritime Univ.
- Investigation on Nd:YAG Laser-TIG Hybrid Welding with Filler Wire** ..... (P123)  
Wu Shikai, Zhang Song, Chen Kai, Xiao Rongshi, Beijing Univ. of Technology
- Repairing of Metal Components with Laser Cladding** ..... (P125)  
Qilin Deng, Shanghai Jiaotong Univ.
- New Development of Far Distance Coaxial Powder Feeding System** ..... (P126)  
Yang Xichen, Yang Xichen, Laser Processing Center, Tianjin Polytechnic Univ.
- Robust Sensing and Control of Direct Metal Deposition** ..... (P127)  
Lijun Song, Jyoti Mazumder, CLAIM, The Univ. of Michigan
- Seam Tracking during Laser Beam Welding of Tailored Blanks with Vision Sensor** ..... (P128)  
Yuanyuan Zou, Mingyang Zhao, Lei Zhang, Chunying Jiang, Shenyang Institute of Automation, Chinese Academy of Sciences
- High-power Laser Processing System for 3D Cutting and Welding of Automotive Panels.** ..... (P129)  
Menghua Jiang, Wang Baohua, Hui Yongling, Liubo, Liqiang, Pangkai, Institute of Laser Engineering of Beijing Univ. of Technology
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# General Information

## Hotel Accommodations

### Capital Hotel

3 Qian Men East Street  
Beijing 100006, People's Republic of China  
Hotel Reservations will need to be made directly through GTB Destination Management to receive the PICALO 2008 rate of \$118 USD.  
Hotel Reservations Deadline: February 20  
Make your hotel reservations online at [www.gtborientholidays.com/PICALO/booking\\_form\\_working1.html](http://www.gtborientholidays.com/PICALO/booking_form_working1.html)

## Conference Registration

Registration can be completed in two ways - online or by downloading a PDF registration form from [www.laserinstitute.org/conferences/picalo](http://www.laserinstitute.org/conferences/picalo).

Full Conference Registration includes: Plenary Session, Technical Sessions, Welcome Reception (Wednesday evening), Vendor Program Reception (Thursday evening) and a Technical Digest. Conference Proceedings are available for an additional fee. Registration also includes morning and afternoon coffee service, Chinese style lunch at an area restaurant, and the PICALO Closing Banquet (Friday evening).

One Day Conference Registration includes admission to sessions and receptions on that day only. Conference Proceedings are available for an additional fee.

Student Registration includes Plenary Session, Technical Sessions, Welcome Reception (Wednesday evening), Vendor Program Reception (Thursday evening) and a Technical Digest. Conference Proceedings are available for an additional fee. Registration also includes morning and afternoon coffee service, Chinese style lunch at an area restaurant, and the PICALO Closing Banquet (Friday evening).

Please Contact the LIA Conference Department at [conferences@laserinstitute.org](mailto:conferences@laserinstitute.org) for information about Guest Tickets.

## Proceedings

CD-Rom Proceedings will be available on-site (will not be shipped to you). It includes all submitted papers from PICALO – Laser Materials Processing, Micro, Nano & Ultrafast Fabrication, and Poster Presentations.

**Payment received by February 1** \$105

**February 2 – On-site** \$115

\*Please note: all payments will be processed in US Dollars.

## Special Needs

If you have any special needs that we can address to make your participation more enjoyable, please contact LIA by Phone: + 407.380.1553, Fax: + 407.380.5588 or E-mail: [picalo@laserinstitute.org](mailto:picalo@laserinstitute.org)

## Substitutions and Cancellations

We understand that circumstances may occur to prevent you from attending the conference. If you find that you cannot attend PICALO, 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 February 1. There is a \$75.00 processing fee applied to all refunds. All refunds will be processed after the conference. No refunds will be accepted after February 1. No refunds will be given for proceedings or tour package purchases.

### Average April Temperatures:

62°F / 17°C High  
42°F / 7°C Low

## Fees

### Full Conference - Early Bird Registration

(payment received by February 1)  
\$595 USD Member                      \$655 USD Non-member  
\$595 USD Cooperating Society      \$325 USD Student  
\$185 USD (1,400 CNY) Chinese Citizen  
\$160 USD (1,200 CNY) Chinese Citizen Student

### February 2 – March 3

\$645 Member                              \$705 Non-member  
\$645 Cooperating Society              \$375 Student  
\$225 USD (1,700 CNY) Chinese Citizen  
\$200 USD (1,500 CNY) Chinese Citizen Student

### March 4 - On-site

\$695 Member                              \$755 Non-member  
\$695 Cooperating Society              \$425 Student  
\$255 USD (1,900 CNY) Chinese Citizen  
\$225 USD (1,700 CNY) Chinese Citizen Student

### One Day Conference Registration Early Bird Registration

(payment received by February 1)  
\$220 USD each day  
\$110 USD (830 CNY) Chinese Citizen

### February 2 – March 3

\$250 USD each day  
\$130 USD (980 CNY) Chinese Citizen

### March 4 - On-site

\$285 USD each day  
\$150 USD (1,135 CNY) Chinese Citizen

### On-site Registration Times

Wednesday, April 16                      8:00am – 5:00pm  
Thursday, April 17                          8:00am – 4:00pm  
Friday, April 18                              8:00am – 12:00pm

\*Purchase orders will not be accepted for on-site registration.

## Globalization: Opportunities & Challenges for Laser Companies in China & the World

**Chairs:** Bo Gu, GSI Group, Inc., Wilmington, MA, USA  
Rangda Wu, Chutianlaser, Wuhan, People's Republic of China

### East meets West

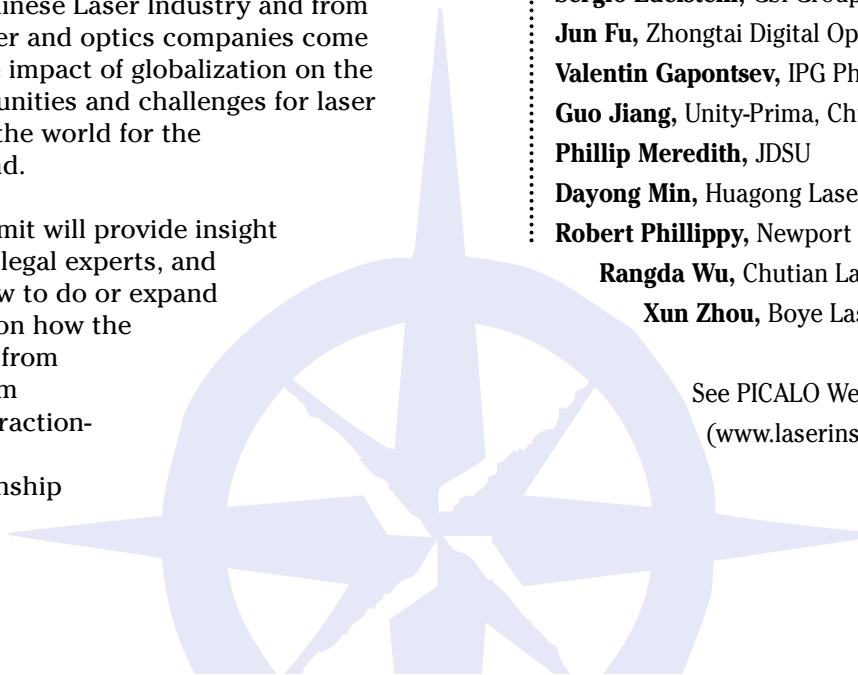
Executives from the Chinese Laser Industry and from leading world-class laser and optics companies come together to discuss the impact of globalization on the laser industry - opportunities and challenges for laser business in China and the world for the next decade and beyond.

This PICALO 2008 Summit will provide insight from industry experts, legal experts, and decision makers on how to do or expand business in China and on how the laser industry benefits from globalization. The forum allows face to face interaction - a great prospect for networking and relationship building. Don't miss this innovative East meets West event!

### Invited Industry Executives

John Ambroseo, Coherent  
Günther Braun, Rofin-Sinar Technologies Inc.  
Qingming Chen, Golden Sky Laser, China  
Sergio Edelstein, GSI Group  
Jun Fu, Zhongtai Digital Optoelectronic Equipment, China  
Valentin Gapontsev, IPG Photonics  
Guo Jiang, Unity-Prima, China  
Phillip Meredith, JDSU  
Dayong Min, Huagong Laser, China  
Robert Phillippy, Newport  
Rangda Wu, Chutian Laser Group, China  
Xun Zhou, Boye Laser, China

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Telephone (Home): \_\_\_\_\_ E-mail: \_\_\_\_\_

Emergency Contact: Name \_\_\_\_\_ Phone: \_\_\_\_\_

**Note: All above information must be provided in order to process registration**

Special Dietary Needs:  Vegetarian  Other \_\_\_\_\_

## A. Full Registration

Includes admission to the Plenary Session, Technical sessions, Lunch each day, Welcome Reception, Vendor Program Reception, Closing Banquet & Technical digest.

Check member status: Member of  LIA  AILU  Beijing Optical Society  Chinese Journal of Lasers  Chinese Society of Non-Trad Machining  
 Chinese Welding Society  ELI  European Optical Society  JLPS Membership # \_\_\_\_\_

	LIA member / Cooperating Society	Non-member	Student*
Payment received by February 1	<input type="checkbox"/> \$595USD	<input type="checkbox"/> \$655USD	<input type="checkbox"/> \$325USD
Payment postmarked or received February 2 – March 3	<input type="checkbox"/> \$645USD	<input type="checkbox"/> \$705USD	<input type="checkbox"/> \$375USD
Payment postmarked or received March 4 – On-site	<input type="checkbox"/> \$695USD	<input type="checkbox"/> \$755USD	<input type="checkbox"/> \$425USD

\*Student registration – full time students only. Student registration will not be processed without a copy of your valid Student Identification. Please fax to +407.380.5588 Attn: PICALO.

## B. One / Two Day Registration

Includes lunch and admission to events on that day only.

Date(s) must be checked to process registration:  Wednesday, April 16  Thursday April 17  Friday, April 18

Payment Received by February 1	<input type="checkbox"/> \$220USD One Day	<input type="checkbox"/> \$440USD Two Day
Payment Postmarked or Received February 2 - March 3	<input type="checkbox"/> \$250USD One Day	<input type="checkbox"/> \$500USD Two Day
Payment Postmarked or Received March 4 - On-site	<input type="checkbox"/> \$285USD One Day	<input type="checkbox"/> \$570USD Two Day

## C. Guests

Includes lunch each day, coffee breaks, welcome reception, vendor reception, & closing banquet.

\$130USD PP Name of guest: \_\_\_\_\_

## D. Proceedings

CD-Rom Proceedings will be available on-site (will not be shipped to you). Includes all submitted manuscripts. Received by February 1  \$105USD February 2 - On-site  \$115USD

## E. Pre & Post Conference Tours

Optional - Not included with registration fee.

Monday, April 14 - Pre-Conference Wuhan Tour (airfare not included)  \$150USD x \_\_\_\_\_ (# of guests = \$ \_\_\_\_\_)

Saturday, April 19 - Post-Conference Great Wall Tour  \$110USD x \_\_\_\_\_ (# of guests = \$ \_\_\_\_\_)

## F. Method of Payment

Payment must accompany registration form to be processed. Confirmation e-mail will be sent within two weeks of receipt. (Please include registrant's name and PICALO on check.)

**Refund policy:** No refunds will be made on cancellations received after February 1. All requests for refunds must be made in writing. There will be a \$75USD processing fee for all refunds. See general information for detailed substitution and cancellation terms. Excursion Tours and Proceedings will not be refunded. **Pre-register and pay in full and save! After March 3 increased registration rates will apply. Sorry, no telephone registration**

Authorized Signature \_\_\_\_\_

Check or Money Order enclosed, Payable to LIA in U.S. Funds, Drawn on a U.S. Bank

VISA  Mastercard  AMEX Card Security Code:\*

\*The card security code (CSC) is a 3- or 4- digit number (not part of the credit card number) that appears on the back of the credit card (Security Code appears on the front of American Express). Payment will not be processed without CSC code.

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Please check here if you have any special needs and LIA will contact you.

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## Laser Industry Vendor Reception & TableTop Display • Thursday, April 17

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 refreshments 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: [picalo@laserinstitute.org](mailto:picalo@laserinstitute.org).

## Who should attend PICALO?

Anyone interested in lasers and materials processing from the basic understanding of the interaction between a laser beam and a material, to those interested in how a process can be integrated and optimized for an application. The organizing committee's goal for PICALO is to bring both academic and industry people together who may benefit from laser technology. This includes researchers and end-users as well as engineers and technicians engaged in developing laser technology.



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