

SLPC2016

The Second Smart Laser Processing Conference 2016

May 17 – 19, 2016

Pacifico Yokohama, Yokohama, Japan

<http://www.jlps.gr.jp/slpc2016/>

SLPC2016 Advance Program

updated April 18, 2016

<i>Conference Chairs</i>	Yasuhiro Okamoto	<i>Okayama University, Japan</i>
	Reinhart Poprawe	<i>Fraunhofer Institute for Laser Technology, Germany</i>
<i>Program Committee Chair</i>	Masahiro Tsukamoto	<i>Osaka University, Japan</i>
<i>Steering Committee Chair</i>	Kunihiko Washio	<i>Paradigm Laser Research Ltd., Japan</i>

Program

Oral Session

Day 1: Tuesday, May 17

Room 416+417

Opening

09:00 Opening remark, Yasuhiro Okamoto (Okayama University, Japan)

Room 416+417

Session 1: Plenary Keynotes

Chairs: Reinhart Poprawe (Fraunhofer Institute for Laser Technology, Germany)
Yasuhiro Okamoto (Okayama University, Japan)

9:15 SLPC1-PL-1 **Plenary** A069
Advanced smart laser processing technologies for improving quality of life and environment, Lin Li¹, ¹Laser Processing Research Centre, The University of Manchester, UK

9:45 SLPC1-PL-2 **Plenary** A055
The current status and future perspective of metal additive manufacturing in Japan, Hideki Kyogoku¹, ¹Faculty of Engineering, Kindai University, Japan

10:15 Break

Room 416+417

Session 2: Beam Sources and Components for Smart Laser Processing

Chairs: Eric Mottay (Amplitude Systemes, France)
Hitoshi Nakano (Kindai University, Japan)

10:45 SLPC2-I-1 **Invited** A067
Ultrashort pulse laser sources and components for precise processing – results of a recent German research initiative, Stefan Nolte^{1,2}, ¹Friedrich Schiller University, Institute of Applied Physics, Germany, ²Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Germany

11:15 SLPC2-I-2 **Invited** A065
High power CO lasers: New application potential for smart laser processing, Andrew Held¹, Jeff Franks¹, ¹Coherent, Inc., USA

11:45 SLPC2-C-3 A021
High power, air-cooled, nanosecond, single mode SHG green laser oscillator, Koichi Inoue¹, Masatoshi Saito¹, ¹Laser Development Division, AMADA MIYACHI CO., LTD, Japan

12:00 SLPC2-C-4 A040
Copper nanostructures forming during laser-induced synthesis exhibit catalytic activity, Vladimir A Kochemirovsky¹, Dmitry I Gordeychuk¹, Lev S Logunov¹, Aleksey G Kuzmin², Irina A Balova¹, ¹Saint-Petersburg University, Russia, ²Russian Academy of Sciences, Russia

12:15 Lunch time

Room 416+417

Session 3: Additive Manufacturing

Chairs: Hideki Kyogoku (Kindai University, Japan)
Masahiro Tsukamoto (Osaka University, Japan)

13:15 SLPC3-I-1 **Invited** A050

Development of a hybrid multi-tasking machine tool: Integration of laser metal deposition technology with CNC machining, Taku Yamazaki¹, ¹Yamazaki Mazak Corporation, Japan

13:45 SLPC3-C-2 A060

High speed and high accuracy LMD 3D printer, Naotada Okada¹, Yasutomo Shiomi¹, Hiroshi Ohno¹, Yasushi Fukase², Shinpei Fujimaki², Satoshi Fukuyama², ¹Toshiba Corp., Japan, ²Toshiba Machine Co. Ltd., Japan

14:00 SLPC3-C-3 A062

Diode lasers in new applications high speed cladding and tailored blank welding, Thomas Schopphoven¹, Andres Gasser¹, Konrad Wissenbach¹, Reinhart Poprawe², Andre Eltze³, Markus Ruetering³, ¹Fraunhofer-Institute for Laser Technology, Germany, ²Chair for Laser Technology, RWTH Aachen University, Germany, ³Laserline GmbH, Germany

14:15 SLPC3-C-4 **Student** A031

Development of center nozzle laser coating system and its coating characteristics, Daichi Tanigawa¹, Tetsuya Nakaaze¹, Nobuyuki Abe², Masahiro Tsukamoto², Hiroyuki Yamazaki², Yoshihiko Hayashi², Masanori Sengoku³, Minoru Yoshida³, Yoshinori Funada⁴, Sotohiro Muratani⁴, ¹Graduate School of Engineering, Osaka University, Japan, ²Joining and Welding Research Institute, Osaka University, Japan, ³Graduate School of Science and Engineering, Kinki University, Japan, ⁴Industrial Research Institute of Ishikawa, Japan, ⁵Muratani Machine Inc., Japan

14:30 SLPC3-C-5 A039

Sensory properties of copper microstructures obtained by laser-induced deposition from water-based solution, Ilya I Tumkin¹, Maxim S Panov¹, Alexandra V Smikhovskaya¹, Sergey S Ermakov¹, ¹Saint-Petersburg University, Russia

14:45 SLPC3-C-6 **Student** A028

Spray-coating of CuO nanoparticles for femtosecond laser reduction patterning on nonplanar substrates, Yasuaki Ito¹, Mizue Mizoshiri¹, Junpei Sakurai¹, Seiichi Hata¹, ¹Department of Micro-Nano Systems Engineering, Graduate School of Engineering, Nagoya University, Japan

15:00 SLPC3-C-7 A024

Cu micropatterning on poly(dimethylsiloxane) using femtosecond laser reduction of CuO nanoparticles, Mizue Mizoshiri¹, Yasuaki Ito¹, Junpei Sakurai¹, Seiichi Hata¹, ¹Graduate School of Engineering, Nagoya University, Japan

15:15 Coffee break

Room 416+417

Session 4: Micro & Nano Processing

Chairs: Beat Neuenschwander (Bern University of Applied Sciences, Switzerland)
Masayuki Fujita (Institute for Laser Technology, Japan)

15:45 SLPC4-I-1 **Invited** A066

Ultrafast lasers interacting on different material surfaces, Evgeny L. Gurevich¹, Andreas Ostendorf¹, ¹*Ruhr-University Bochum, Germany*

16:15 SLPC4-C-8 A036

Direct writing of sub-100 nm Cr particles by laser induced forward transfer (LIFT) using an annular fs-laser beam, Takahiro Nakamura¹, Koki Omachi¹, Shunichi Sato¹, ¹*Institute of multidisciplinary research for advanced materials, Tohoku University, Japan*

16:30 SLPC4-C-3 A058

Find out the best pulse duration to do effective micro laser process with ultra fast pulse lasers, Yosuke Nakamura¹, Matthias Koitzsch², Bastian Becker², Christof Siebert², Simone Russ³, ¹*TRUMPF Corporation, Japan*, ²*TRUMPF Laser- und Systemtechnik GmbH, Germany*, ³*TRUMPF Laser GmbH + Co. KG, Germany*

16:45 SLPC4-C-4 A057

Industrial femtosecond lasers for micromachining applications with highest quality and efficiency, Daniel Achenbach¹, Frank Hendricks¹, Victor Matylitsky¹, ¹*Spectra-Physics, Austria*

17:00 SLPC4-C-5 **Student** A025

Structure evolution of metal nanowire gratings to nanodots by femtosecond laser irradiation, Yasutaka Nakajima¹, Nikolay N Nedyalkov², Akihiro Takami¹, Mitsuhiro Terakawa¹, ¹*Keio University, Japan*, ²*Bulgarian Academy of Sciences, Bulgaria*

17:15 SLPC4-C-9 **Student** A009

Femtosecond laser processing of poly(lactic-co-glycolic acid) at 800, 400, and 266 nm wavelengths, Akimichi Shibata¹, Shuhei Yada¹, Mitsuhiro Terakawa^{1,2}, ¹*School of Integrated Design Engineering, Keio University, Japan*, ²*Department of Electronics and Electrical Engineering, Keio University, Japan*

17:30 SLPC4-C-7 **Student** A034

Fabrication of bi-anisotropic optical metamaterials for infra-red spectral range by direct laser write technique, Ihar Faniayeu^{1,2}, Vyngantas Mizeikis¹, ¹*Research Institute of Electronics, Shizuoka University, Japan*, ²*Department of General Physics, Francisk Skorina Gomel State University, Belarus*

17:45 To Reception (Room 419)

Room 419

SLPC2016 Reception

18:15 SLPC2016 Reception

20:15

Day 2: Wednesday, May 18

Room 501+502

Plenary Sessions of OPIC'16

09:00 Greetings

09:15 Keynote lectures of OPIC'16

12:10 Lunch time

Room 301

Session 5: LIC+PLD+SLPC Joint Session 1

Chair: Kunihiro Washio (Paradigm Laser Research, Japan)

13:30 Introduction (LIC, PLD, SLPC)

13:45 SLPC5j-I-1 Invited A056

Optimized design and performance of laser ablation systems for paint and coating removal for manufacturing and maintenance of vehicles and airplanes, Young Kwon¹,
¹*Powerlase Photonics, UK*

14:15 PLDj-I-1 Invited A070

High performance interference coatings for near infrared high energy lasers, Carmen Menoni¹, Drew Schiltz, Dinesh Patel, Brendan Reagan, ¹*Colorado State University, USA*

14:45 PLDj-I-2 Invited A071

Modeling of laser-induced damage and optic usage at National Ignition Facility, Zhiming Liao¹, Mike Nostrand, Jeff Bude, Tayyab I. Suratwala, ¹*Lawrence Livermore National Laboratory, USA*

15:15 Break

Room 301

Session 6: LIC+PLD+SLPC Joint Session 2

Chair: Kunihiro Washio (Paradigm Laser Research, Japan)

15:45 SLPC6j-I-1 Invited A063

Fiber delivery of ultrafast lasers, Eric Mottay¹, ¹*Amplitude Systemes, France*

16:15 LICj-I-1 Invited A072

The latest technology demand of the internal processing type laser dicing technology, Naoki Uchiyama¹, Toru Takahashi¹, ¹*Hamamatsu Photonics K.K., Japan*

16:45 LICj-I-2 Invited A073

From analytics to material processing: The versatile microlaser and its applications, Antoine Kevorkian¹, ¹*Team Photonics, France*

17:15 Closing Remarks, Kunihiro Washio (Paradigm Laser Research, Japan)

17:20 To Reception (on foot from 3F to 5F)

Room 501+502

OPIC 2016 Reception

18:00 OPIC 2016 Reception

20:00 End

Day 3: Thursday, May 19

Room 416+417

Session 7: Surface Structuring and Modification

Chairs: Andreas Ostendorf (Ruhr-University Bochum, Germany)
Takahiro Nakamura (Tohoku University, Japan)

8:30 SLPC7-I-1 Invited A068

Process parameter optimization for high speed and high quality surface structuring of metals with 100 W of average power and ultra-short pulses, B. Jaeggi¹, M. Zimmermann¹, B. Neuenschwander¹, G. Hennig², R. Streubel³, B. Goekce³, S. Barcikowski³, ¹*Institute for Applied Laser, Photonics and Surface Technology ALPS, Bern University of Applied Sciences, Switzerland*, ²*Daetwyler Graphics AG, Switzerland*, ³*Technical Chemistry I and Center for Nanointegration, Duisburg-Essen (CENIDE), University of Duisburg-Essen, Germany*

9:00 SLPC7-C-2 A019

Shape change of periodic nanostructures produced with ultrashort pulsed laser on titanium surface, Togo Shinonaga¹, Shono Kinoshita¹, Yasuhiro Okamoto¹, Akira Okada¹, ¹*Okayama University, Japan*

9:15 SLPC7-C-3 A064

Femtosecond laser peening of 2024 aluminum alloy without sacrificial overlay under atmospheric conditions, Tomokazu Sano¹, Takayuki Eimura¹, Ryota Kashiwabara¹, Tomoki Matsuda¹, Akio Hirose¹, Seiichiro Tsutsumi², Kazuto Arakawa³, Kiyotaka Masaki⁴, Yuji Sano⁵, ¹*Division of Materials and Manufacturing Science, Osaka University, Japan*, ²*Joining and Welding Research Institute, Osaka University, Japan*, ³*Shimane University, Japan*, ⁴*Okinawa National College of Technology, Japan*, ⁵*Toshiba Corporation (Japan Science and Technology Agency - ImPACT at present), Japan*

9:30 SLPC7-C-6 A048

Fabrication of nano-periodic structures with holographic line-shaped vector beams, Satoshi Hasegawa¹, Yoshio Hayasaki¹, ¹*Center for Optical Research and Education (CORE), Utsunomiya University, Japan*

9:45 SLPC7-C-7 Student A047

In-process debris removal based on dual polarizations with optical time delay and holographic beam shaping, Tetsuya Abe¹, Satoshi Hasegawa¹, Hidetomo Takahashi², Yoshio Hayasaki¹, ¹*Center for Optical Research and Education (CORE), Utsunomiya University, Japan*, ²*AISIN SEIKI CO., LTD., Japan*

10:00 *Break*

Room 416+417

Session 8: Cutting and Welding

Chairs: Lin Li (The University of Manchester, UK)
Yuji Sato (Osaka University, Japan)

10:30 SLPC8-I-1 **Invited** A052

High-quality processing of CFRP with kilowatt average power short-pulse lasers, Rudolf Weber¹, Christian Freitag¹, Margit Wiedenmann¹, Thomas Graf¹, ¹IFSW, University of Stuttgart, Germany

11:00 SLPC8-C-2 A012

Wavelength and pulsewidth dependences of laser processing of CFRP, Masayuki Fujita¹, Hiroshi Ohkawa², Toshihiro Somekawa¹, Masataka Otsuka², Yoshinobu Maeda², Takaomi Matsutani², Noriaki Miyanaga³, ¹Institute for Laser Technology, Japan, ²Kinki University, Japan, ³Institute of Laser Engineering, Osaka University, Japan

11:15 SLPC8-C-3 A008

Examination of structuring patterns for laser-based polymer-metal-connections, Kira van der Straeten¹, Felix Haschke¹, Alexander Olowinsky¹, Arnold Gillner¹, ¹Fraunhofer Institute for Laser Technology ILT, Germany

11:30 SLPC8-C-4 **Student** A046

Influence of spatial power modulation on pore and crack formation in laser beam welding of aluminum, Paul Heinen¹, Felix Eichler², Mirko Aden¹, André Haeusler³, Alexander Olowinsky¹, Arnold Gillner¹, Reinhart Poprawe³, ¹Fraunhofer-Institut für Lasertechnik ILT, Germany, ²Chair for Technology of Optical Systems TOS of RWTH Aachen University, Germany, ³Chair for Laser Technology LLT of RWTH Aachen University, Germany

11:45 SLPC8-C-5 A043

Experimental characterization of energy transfer from large-diameter Kilowatt cw laser beams to metal samples, Jens Osterholz¹, Dominic Heunoske¹, Johannes Horak¹, Bernd Lexow¹, Martin Lueck¹, Matthias Wickert¹, ¹Fraunhofer EMI, Germany

12:00 SLPC8-C-6 A001

An interactive real-time simulation tool for laser cutting and laser drilling of metals, Torsten Hermanns¹, Wolfgang Schulz², ¹RWTH Aachen University, Germany, ²Fraunhofer Institute for Laser Technology ILT, Germany

12:15 Lunch Time

Exhibition Hall A

Session 9 : Poster Session & Exhibition

Chair: Togo Shinonaga (Okayama University, Japan)

13:30 **Poster Session**

15:00 *Break*

Room 416+417**Session 10: Industrial Applications**

Chairs: Christian Freitag (Institut für Strahlwerkzeuge (IFSW), Universität Stuttgart, Germany)
Kunihiko Washio (Paradigm Laser Research, Japan)

15:30 SLPC10-I-1 **Invited** A015

Large area flexible electronics manufacture at high speed using an integrated ps fiber laser and 3D scanner, Timothy S. McComb¹, Kenneth E. Gross¹, Jay Small¹, Tyson L. Lowder¹, Dennis M. McCal¹, Michael Atchley¹, Robert J. Martinsen¹, Joe Debartolo¹, ¹*nLIGHT Corporation, USA*

16:00 SLPC10-C-2 A010

Laser cleaning technique using laser-induced acoustic streaming for silicon wafers, Chwan-Huei Tsai¹, ¹*Department of Mechatronic Engineering, Huafan University, Taiwan*

16:15 SLPC10-C-3 A006

Inline inspection of micro and macro welds, Markus Kogel-Hollacher¹, Martin Schönleber¹, Jochen Schulze¹, Thibault Bautze², ¹*Precitec Optronik GmbH, Germany*, ²*Precitec GmbH & Co. KG, Germany*

16:30 SLPC10-C-4 A054

Examples of laser applications in the automotive industry, Andrey Andreev¹, ¹*TRUMPF Corporation, Japan*

16:45 SLPC10-I-5 **Invited** A053

Outlook of advanced industrial laser applications for smart factories, Reinhart Poprawe¹, Christian Hinke², ¹*Fraunhofer-Institute for Laser Technology ILT, Germany*, ²*Chair for Lasertechnology LLT at RWTH Aachen University, Germany*

17:15 *End*

Room 416+417**Closing**

17:15 Closing remark, Masahiro Tsukamoto (Osaka University, Japan)

17:30 *End*

Poster Session

SLPC2016 Poster Session

13:30-15:00, Thursday, May 19 at Exhibition Hall A

Chair: Togo Shininaga (Okayama University, Japan)

Drilling, Cutting and Welding

SLPCp9-P-1 *Student* A007
Effective shielding gas supplying method of wide area in vertical-position laser welding of pure titanium, Kazuo Yokohara¹, Yasuhiro Okamoto¹, Akira Okada¹, Hikotaro Ochiai², Ryosuke Kimura², Shozo Ono², Masayuki Akase², ¹*Graduate school of Natural Science and Technology, Okayama University, Japan*, ²*Mitsui Engineering & Shipbuilding Co., Ltd., Japan*

SLPCp9-P-2 A016
Laser drilling assisted by a coaxial discharged plasma torch, Jin-Chen Hsu¹, Yan-Ru Jheng¹, Chao-Ching Ho^{1,2}, Yuan-Jen Chang¹, Chia-Lung Kuo¹, ¹*Department of Mechanical Engineering, National Yunlin University of Science and Technology, TAIWAN*, ²*Department of Mechanical Engineering, National Taipei University of Technology, TAIWAN*

SLPCp9-P-3 A023
Polymeric materials drilling by longitudinally excited CO₂ laser, Kazuyuki Uno¹, Masaya Kato¹, Tetsuya Akitsu¹, Takahisa Jitsuno², ¹*University of Yamanashi, Japan*, ²*Institute of Laser Engineering, Osaka University, Japan*

Beam Sources and Components for Smart Laser Processing

SLPCp9-P-5 *Student* A041
The investigation of aging in writing inks using Raman spectroscopy, Kseniya O Gorshkova¹, Lubov A Mund¹, Ilya I Tumkin¹, Vladimir A Kochemirovsky¹, ¹*Saint-Petersburg University, Russia*

SLPCp9-P-6 A017
Sintering of silver nanoparticle inks on a polymer substrate using a laser with different polarizations, Cung-Wei Cheng¹, Wei-Cheng Chang¹, Yu-Hui Chen², ¹*National Chiao Tung University, Taiwan*, ²*Industrial Technology Research Institute, Taiwan*

SLPCp9-P-7 A044
Picosecond laser texturing of multi-crystalline silicon wafer for solar cells, Seung hyun Ha¹, Hee soo Kim¹, Ji hyeon Kim¹, Sang joon Park¹, ¹*Department of Chemical & Biological Engineering, Gachon University, South Korea*

SLPCp9-P-8 *Student* A027
Effects of nitrogen doping in 4H-SiC by laser ablation of a SiN_x film and its diffusion mechanism, Ryota Kojima¹, Hiroshi Ikenoue¹, Akira Suwa¹, Akihiro Ikeda¹, Daisuke Nakamura¹, Tanemasa Asano¹, Tatsuo Okada¹, ¹*Graduate School of Information Science and Electrical Engineering, Kyushu Univ., Japan*

SLPCp9-P-9 A042
UV laser-assisted micro-porous patterning on the polyimide surface, Jae Yong Oh¹, Sang Zoon Lee¹, Kwang H. Oh¹, Moon Suk Kang², Yong Won Ma², Bo Sung Shin², ¹*Laser Advanced System Industrialization Center, Jeonnam Technopark, South Korea*, ²*Department of Cogno-mechatronics Engineering, Pusan National University, South Korea*

SLPCp9-P-10 A059
A laser-based method for facile fabrication of high-quality carbonized polyimide film with a chamber, Yong-Won Ma¹, Jun Han Park², Hyesu Kim², Danhee Yun³, Bo Sung Shin^{1,2,3}, ¹*Engineering Research Center for Net Shape and Die Manufacturing (ERC/NSDM), Pusan National University, Korea*, ²*Department of Cogno-Mechatronics Engineering, Pusan National University, Korea*, ³*Department of Optics and Mechatronics Engineering, Pusan National University, Korea*

Additive Manufacturing

SLPCp9-P-13 *Student* A018

Single line multi-layered metal microstructures fabricated by selective laser melting, Chung-Wei Cheng¹, Siang-Yang Wu¹, Yao-Wen Liu¹, Mi-Ching Tsai², ¹*National Chiao Tung University, Taiwan*, ²*National Cheng Kung University, Taiwan*

SLPCp9-P-14 *Student* A061

Properties of cobalt base alloy coating by laser cladding with center nozzle powder feeding, Kohei Asano¹, Daichi Tanigawa¹, Nobuyuki Abe², Masahiro Tsukamoto², ¹*Graduate School of Engineering, Osaka University, Japan*, ²*Joining and Welding Research Institute, Osaka University, Japan*

SLPCp9-P-15 *Student* A011

Pulsed laser irradiation used to change in electrical conductivity of indium gallium zinc oxide thin films, Yoshihiro Ogawa¹, Toshiyuki Sameshima¹, Masahiko Hasumi¹, Yasunori Ando², Shigeaki Kishida², Yoshitaka Setoguchi², ¹*Tokyo University of Agriculture and Technology, Japan*, ²*Nissin Electric Co., Ltd., Japan*

Surface Structuring and Modification

SLPCp9-P-16 A002

Accuracy improvement of microparts bending by femtosecond laser peen forming, Yoshihiro Sagisaka¹, Kiyomitsu Yamashita¹, Hiroyasu Ueta¹, ¹*Hamamatsu Technical Support Center, Industrial Research Institute of Shizuoka Prefecture, Japan*

SLPCp9-P-17 *Student* A038

Effect of water flow layer for plasma confinement on laser peening, Nayoya Ehara¹, Daiki Nishikawa¹, Ippei Kitawaki¹, Manabu Heya², Miho Tsuyama¹, Hitoshi Nakano¹, ¹*Faculty of Science and Engineering, Kindai University, Japan*, ²*Faculty of Engineering, Osaka Sangyo University, Japan*

Micro & Nano Processing

SLPCp9-P-19 *Student* A033

Fundamental study on separation method of gallium nitride with internal modified layer by ultrashort pulsed laser, Motoki Ota¹, Yasuhiro Okamoto¹, Togo Shinonaga¹, Akira Okada¹, ¹*Graduate School of Natural Science and Technology, Okayama University, Japan*

SLPCp9-P-20 *Student* A032

Insulation characteristics and visibility of transparent conductive film containing silver nanowires by nanosecond pulsed laser, Masafumi Oshita¹, Norio Nishi^{1,2}, Yasuhiro Okamoto¹, Togo Shinonaga¹, Akira Okada¹, ¹*Graduate School of Natural Science and Technology, Okayama University, Japan*, ²*Kataoka Corporation, Japan*

SLPCp9-P-22 *Student* A026

Cu-based micropatterning using femtosecond laser reduction of copper nitrate in a polymer, Yukinari Kondo¹, Mizue Mizoshiri¹, Junpei Sakurai¹, Seiichi Hata¹, ¹*Department of Micro-Nano Systems Engineering, Graduate School of Engineering, Nagoya University, Japan*

SLPCp9-P-23 A005

Laser micromachining of PEDOT:PSS /graphene thin films by using beam shaping technology, Shih-Feng Tseng¹, Wen-Tse Hsiao¹, Chien-Kai Chung¹, Donyau Chiang¹, J. Andrew Yeh^{2,3}, ¹*Instrument Technology Research Center, National Applied Research Laboratories, Taiwan*, ²*Institute of Nanoengineering and Microsystems, National Tsing Hua University, Taiwan*, ³*Department of Power Mechanical Engineering, National Tsing Hua University, Taiwan*

SLPCp9-P-24 A030

Properties of AgNW-ITO hybrid transparent conductive films ablation using nanosecond laser pulses, Wen-Tse Hsiao¹, Chih-Chung Yang¹, Shih-Feng Tseng¹, Chien-Kai Chung¹, Kuo-Cheng Huang¹, Kehmoh Lin², Ming-Fei Chen³, ¹*Instrument Technology Research Center, National Applied Research Laboratories, Taiwan, R.O.C., Taiwan*, ²*Department of Mechanical Engineering, Southern Taiwan University of Science and Technology, Taiwan, R.O.C., Taiwan*, ³*Department of Mechatronics Engineering, National Changhua University of Education, Taiwan, R.O.C., Taiwan*

SLPCp9-P-27

A029

Shape evaluation of microgrooves fabricated with laser-induced etching using the optical analysis, Kwang H. Oh¹, S. Z. Lee¹, S. H. Jeong², ¹*Laser Center, Jeonnam Technopark, Stiftung, Republic of Korea,* ²*Department of Mechatronics, Gwangju Institute of Science and Technology, Republic of Korea*

SLPCp9-P-28 **Student**

A045

Optical emission spectroscopy and pulsed laser deposition of amorphous carbon films in air and oxygen, Seong Shan Yap, Teck Yong Tou, Chen Hon Nee, ¹*Multimedia University, Malaysia*

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