

PROCEEDINGS OF SPIE

Advanced Laser Processing and Manufacturing VI

**Rongshi Xiao
Minghui Hong
Jianhua Yao
Yuji Sano**
Editors

**5–11 December 2022
ONLINE, China**

Sponsored by
SPIE
COS—Chinese Optical Society

Cooperating Organizations

Tsinghua University (China) • Peking University (China) • University of Science and Technology of China (China) • Zhejiang University (China) • Tianjin University (China) • Beijing Institute of Technology (China) • Beijing University of Posts and Telecommunications (China) • Nankai University (China) • Changchun University of Science and Technology (China) • University of Shanghai for Science and Technology (China) • Capital Normal University (China) • Huazhong University of Science and Technology (China) • Beijing Jiaotong University (China) • China Jiliang University (China) • Shanghai Institute of Optics and Fine Mechanics, CAS (China) • Changchun Institute of Optics, Fine Mechanics and Physics, CAS (China) • Institute of Semiconductors, CAS (China) • Institute of Optics and Electronics, CAS (China) • Institute of Physics, CAS (China) • Shanghai Institute of Technical Physics, CAS (China) • China Instrument and Control Society (China) • Optical Society of Japan (Japan) • Optical Society of Korea (Republic of Korea) • Australian and New Zealand Optical Society • Optics and Photonics Society of Singapore (Singapore) • European Optical Society

Supporting Organizations

China Association for Science and Technology (CAST) (China)
Department of Information of National Nature Science Foundation, China (NSFC) (China)

Published by
SPIE

Volume 12312

Proceedings of SPIE 0277-786X, V. 12312

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Advanced Laser Processing and Manufacturing VI, edited by Rongshi Xiao, Minghui Hong,
Jianhua Yao, Yuji Sano, Proc. of SPIE Vol. 12312, 1231201
© 2022 SPIE · 0277-786X · doi: 10.1117/12.2668940

Proc. of SPIE Vol. 12312 1231201-1

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIDigitalLibrary.org.

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Advanced Laser Processing and Manufacturing VI*, edited by Rongshi Xiao, Minghui Hong, Jianhua Yao, Yuji Sano, Proc. of SPIE 12312, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510656901
ISBN: 9781510656918 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2022 Society of Photo-Optical Instrumentation Engineers (SPIE).

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE. DIGITAL LIBRARY

SPIDigitalLibrary.org

Paper Numbering: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

Contents

v *Symposium Committee*
ix *Conference Committee*

ULTRAFAST LASER PROCESSING/LASER MICRO AND NANO FABRICATION

- 12312 03 **Ultrashort pulse laser drilling of the ceramic substrate** [12312-2]
- 12312 06 **Multiscale modeling of femtosecond laser processing quartz crystal** [12312-5]
- 12312 08 **Properties of femtosecond laser modified e-beam deposited SiO₂ films and their resistance to nanosecond ultraviolet lasers** [12312-7]

LASER SOURCES AND OPTICAL COMPONENTS

- 12312 09 **Intra-cavity mode control in a Nd:YAG laser by optimizing the single-mode power factor with a spatial light modulator** [12312-8]
- 12312 0B **Design of an adjustable working distance Bessel lens for femtosecond laser cutting** [12312-10]
- 12312 0C **Tight focusing properties of vector polarized partially coherent vortex beams** [12312-11]
- 12312 0D **The spherical-aberration-free 3D beam forming inside materials via the modified Ewald cap** [12312-12]

LASER ADDITIVE MANUFACTURING AND 3D PROCESSING

- 12312 0I **Oscillating laser-arc hybrid additive manufacturing of AZ31 magnesium alloy** [12312-16]
- 12312 0K **Research on laser selective intelligent processing based on coaxial spectral monitoring** [12312-18]
- 12312 0N **Burnout mechanism and control methods in laser soldering** [12312-36]
- 12312 0O **Method for determining the rational shape of the front surface of cutting inserts for computer-aided manufacturing system of laser ablation** [12312-24]
- 12312 0P **System of machining using computer-aided design of three-tooth drills** [12312-25]

12312 0Q **Evaluation of surgical laser optical feedback on uneven surfaces using robotic manipulator**
[12312-35]

POSTER SESSION

12312 0S **Numerical research on Inconel718 laser additive repairing** [12312-27]

12312 0V **Effect of secondary aberration induced by actual objective lens on 3D direct laser writing**
[12312-30]

12312 0X **Weld characteristics of narrow gap oscillating laser welding of dissimilar aluminum alloys with hot wire** [12312-33]

12312 0Y **Research on the formation mechanism of thermal crack for laser welding of IC 10 alloy**
[12312-34]

12312 0Z **Microstructure and mechanical properties of TiB₂ reinforced Al2319 matrix composites produced using laser-arc hybrid additive manufacturing** [12312-37]

12312 10 **Computer-aided design system based on spline interpolation of micromills for high-speed processing of products manufactured by laser ablation and grinding** [12312-31]

Symposium Committees

General Chairs

Anita Mahadevan-Jansen, *President*, SPIE (United States) and
Vanderbilt University (United States)

Qihuang Gong, *President*, Chinese Optical Society (China) and
Peking University (China)

General Co-chairs

Guangcan Guo, *Past President*, Chinese Optical Society (China) and
University of Science and Technology of China (China)

Zejin Liu, *Vice President*, Chinese Optical Society (China) and
National University of Defense Technology (China)

Technical Program Chairs

Ruxin Li, *Vice President*, Chinese Optical Society (China) and
Shanghai Institute of Optics and Fine Mechanics (China)

Xingde Li, Johns Hopkins University (United States)

Technical Program Co-chairs

Tianchu Li, National Institute of Metrology (China)

Wei Huang, Northwestern Polytechnical University (China)

Ying Gu, *Vice President*, Chinese Optical Society (China) and Chinese
People's Liberation Army General Hospital (China)

Huilin Jiang, Changchun University of Science and Technology
(China)

Wenqing Liu, *Vice President*, Chinese Optical Society (China) and
Anhui Institute of Optics and Fine Mechanics (China)

Guobin Fan, China Academy of Engineering Physics (China)

Suotang Jia, *Vice President*, Chinese Optical Society (China) and
Shanxi University (China)

Xiaomin Ren, *Vice President*, Chinese Optical Society (China) and
Beijing University of Posts and Telecommunications (China)

Qingming Luo, Hainan University (China)

Xiangang Luo, Institute of Optics and Electronics (China)

Ninghua Zhu, Institute of Semiconductors (China)

Organizing Committee

Suotang Jia, *Vice President*, Chinese Optical Society (China) and Shanxi University (China)
Wenjie Wang, *Vice President*, Chinese Optical Society (China) and Sunny Optical Technology Group (China)
Ping Jia, Changchun Institute of Optics, Fine Mechanics and Physics (China)
Yudong Zhang, Chengdu Branch, Chinese Academy of Sciences (China)
Ninghua Zhu, Institute of Semiconductors (China)
Yongtian Wang, Beijing Institute of Technology (China)
Xiaocong Yuan, Shenzhen University (China)
Limin Tong, Zhejiang University (China)
Weimin Chen, Chongqing University (China)
Yidong Huang, Tsinghua University (China)
Tiegen Liu, Tianjin University (China)
Zhiping Zhou, Peking University (China)
Changhe Zhou, Jinan University (China)
Yiping Cui, Southeast University (China)
Zhongwei Fan, Aerospace Information Research Institute (China)
Xiaoying Li, Tianjin University (China)
Yan Li, *Deputy Secretary General*, Chinese Optical Society (China) and Peking University (China)
Caiwen Ma, Xi'an Institute of Optics and Precision Mechanics (China)
Xinliang Zhang, Huazhong University of Science and Technology (China)
Jianxin Chen, Fujian Normal University (China)
Yanqing Lu, Nanjing University (China)

Secretaries-General

Xu Liu, *Secretary General*, Chinese Optical Society (China) and Zhejiang University (China)
Yan Li, *Deputy Secretary General*, Chinese Optical Society (China) and Peking University (China)
Bo Gu, *Deputy Secretary General*, Chinese Optical Society (China)
Hong Yang, *Deputy Secretary General*, Chinese Optical Society (China) and Peking University (China)
Tianrui Zhai, *Deputy Secretary General*, Chinese Optical Society (China) and Beijing University of Technology (China)

Local Organizing Committee Chair

Yan Li, *Deputy Secretary General*, Chinese Optical Society (China) and Peking University (China)

Local Organizing Committee Co-chairs

Hong Yang, Deputy Secretary General, Chinese Optical Society
(China) and Peking University (China)
Quan Sun, Peking University (China)
Kebin Shi, Peking University (China)

Local Secretaries

Wei Xiong, Chinese Optical Society (China)
Xiaowen Gu, Peking University (China)
Yu Xiang, Peking University (China)

Local Organizing Committee

Jian Xu, Peking University (China)
Hailin Wang, Peking University (China)
Shuting Jiang, Peking University (China)
Xiaoyan Zhang, Peking University (China)
Yuhua Cao, Peking University (China)
Quanquan Zheng, Peking University (China)
Xiao Li, Chinese Optical Society (China)
Jianxin Sun, Chinese Optical Society (China)

Technical Organizing Committee

Mohammad Hossein Asghari, Loyola Marymount University
(United States) and Tachyonics Inc. (United States)
Liangcai Cao, Tsinghua University (China)
P. Scott Carney, University of Rochester (United States)
Benyong Chen, Zhejiang University of Science and Technology
(China)
Qionghai Dai, Tsinghua University (China)
Gerd Ehret, Physikalisch-Technische Bundesanstalt (Germany)
Xinyu Fan, Shanghai Jiao Tong University (China)
Zheyu Fang, Peking University (China) and Rice University
(United States)
Ying Gu, Chinese People's Liberation Army General Hospital (China)
Sen Han, University of Shanghai for Science and Technology (China)
and Suzhou H&L Instruments LLC (China)
Ingmar Hartl, Deutsches Elektronen-Synchrotron (Germany)
Qiongyi He, Peking University (China)
Werner Hofmann, Technische Universität Berlin (Germany)
Minghui Hong, National University of Singapore (Singapore)
Shibin Jiang, AdValue Photonics, Inc. (United States)
Tina Kidger, Kidger Optics Associates (United Kingdom)

Dai-Sik Kim, Ulsan National Institute of Science and Technology
(Republic of Korea)

Wei Li, Institute of Semiconductors (China)

Baojun Li, Jinan University (China)

Xingde Li, Johns Hopkins University (United States)

Ming Li, Institute of Semiconductors (China)

Chuan-Feng Li, University of Science and Technology of China
(China)

Jun Liu, Shanghai Institute of Optics and Fine Mechanics (China)

Qingming Luo, Hainan University (China)

Gang-Ding Peng, The University of New South Wales (Australia)

Ting-Chung Poon, Virginia Polytechnic Institute and State University
(United States)

Yuji Sano, Institute for Molecular Science (Japan)

Kebin Shi, Peking University (China)

Tsutomu Shimura, The University of Tokyo (Japan)

Samuel Stranks, University of Cambridge (United Kingdom)

Yikai Su, Shanghai Jiao Tong University (China)

Takuo Tanaka, RIKEN (Japan)

Masahiko Tani, University of Fukui (Japan)

Limin Tong, Zhejiang University (China)

Kazumi Wada, Massachusetts Institute of Technology (United States)

Jianpu Wang, Nanjing University of Technology (China)

Yongtian Wang, Beijing Institute of Technology (China)

Rengmao Wu, Zhejiang University (China)

Rongshi Xiao, Beijing University of Technology (China)

Minghong Yang, Wuhan University of Technology (China)

Jianhua Yao, Zhejiang University of Technology (China)

Hiroshi Yoshikawa, Nihon University (Japan)

Changyuan Yu, The Hong Kong Polytechnic University
(Hong Kong, China)

Xiao-Cong Yuan, Shenzhen University (China)

Xuping Zhang, Nanjing University (China)

Xinliang Zhang, Wuhan National Research Centre for Optoelectronics
(China)

Xi-Cheng Zhang, University of Rochester (United States)

Cunlin Zhang, Capital Normal University (China)

Zhenrong Zheng, Zhejiang University (China)

Haizheng Zhong, Beijing Institute of Technology (China)

Changhe Zhou, Shanghai Institute of Optics and Fine Mechanics
(China)

Zhiping Zhou, Peking University (China)

Rui Zhu, Peking University (China)

Dan Zhu, Huazhong University of Science and Technology (China)

Conference Committee

Conference Chairs

Rongshi Xiao, Beijing University of Technology (China)
Minghui Hong, Xiamen University (China)
Jianhua Yao, Zhejiang University of Technology (China)
Yuji Sano, Institute for Molecular Science (Japan)

Conference Program Committee

Jing Chen, Northwestern Polytechnical University (China)
Liang Guo, Southern University of Science and Technology of China (China)
Anming Hu, The University of Tennessee Knoxville (United States)
Yongxiang Hu, Shanghai Jiao Tong University (China)
Ting Huang, Beijing University of Technology (China)
Hiroyuki Kokawa, Tohoku University (Japan)
Jian Liu, PolarOnyx, Inc. (United States)
Tomokazu Sano, Osaka University (Japan)
Xiahui Tang, Huazhong University of Science and Technology (China)
Peng Wen, Tsinghua University (China)
Haibin Zhang, ESI, Inc. (United States)
Wenwu Zhang, Ningbo Institute of Materials Technology and Engineering (China)
Jianzhong Zhou, Jiangsu University (China)

