PROCEEDINGS OF SPIE

Advanced Laser Processing and Manufacturing III

Rongshi Xiao Minghui Hong Jian Liu Jianhua Yao Yuji Sano Editors

21–22 October 2019 Hangzhou, 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) • Japan Optical Society (Japan) • Korea Optical Society (Korea, Republic of) • Australia Optical Society (Australia) • Singapore Optical Society (Singapore) • European Optical Society

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

Published by SPIE

Volume 11183

Proceedings of SPIE 0277-786X, V. 11183

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

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 SPIEDigitalLibrary.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 III, edited by Rongshi Xiao, Minghui Hong, Jian Liu, Jianhua Yao, Yuji Sano, Proceedings of SPIE Vol. 11183 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510630833 ISBN: 9781510630840 (electronic)

Published by **SPIE** P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445 SPIE.org Copyright © 2019, Society of Photo-Optical Instrumentation Engineers.

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 copying fees. The Transactional Reporting Service base fee for this volume is \$21.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online 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. The CCC fee code is 0277-786X/19/\$21.00.

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.



Paper Numbering: Proceedings of SPIE follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article 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

- vii Symposium Committees
- xi Conference Committee

LASER MICRO/NANOFABRICATION AND ULTRAFAST LASER PROCESSING I

11183 05 Investigation on UV solid-state nanosecond laser micromachining of microstructures on sapphire wafer [11183-4]

LASER MICRO/NANOFABRICATION AND ULTRAFAST LASER PROCESSING II

- 11183 07 Laser-induced backside wet/dry etching microstructures on transparent and brittle materials (Invited Paper) [11183-6]
- 11183 09 Laser-induced hierarchically-structured materials from block copolymer self-assembly [11183-10]
- 11183 0A Fabrication and testing of the smallest "flute" on syringe needles [11183-9]

LASER MACRO PROCESSING

- 11183 0B Fabrication of high strength and lightweight dissimilar material joints by laser: a review (Invited Paper) [11183-11]
- 11183 0D Numerical simulation of fiber laser cutting CFRP with different resin matrix contents [11183-13]
- 11183 0F Research on the effect of microtexturing pretreatment on laser welding of CFRTP and aluminum alloy [11183-15]

LASER ADDITIVE MANUFACTURING AND LASER PEENING I

11183 01 AlCrFeMnNi high-entropy alloy fabricated by laser additive manufacturing under direct-current electric field controlled [11183-18]

11183 OR	Research on picosecond laser processing technology of ceramic materials involving incident angle [11183-8]
11183 OT	The anti-icing characteristics of micro/nano surface of stainless steel prepared by femtosecond laser [11183-28]
11183 OU	Fast formation of hybrid periodic surface structures on Hf thin-film by focused femtosecond laser beam [11183-29]
11183 OW	Laser and electrochemical hybrid machining (LECM) based on internal total reflection effect [11183-31]
11183 OX	Simulation and experimental verification of water-guided laser processing by a water-gas shrinkage laminar flow method [11183-32]
11183 OY	Effect of energy input on laser welded AlSi10Mg parts fabricates by selective laser melting [11183-33]