

PROCEEDINGS OF SPIE

# ***Laser Applications in Microelectronic and Optoelectronic Manufacturing (LAMOM) XXV***

**Gediminas Račiukaitis**

**Carlos Molpeceres**

**Jie Qiao**

**Aiko Narazaki**

*Editors*

**3–5 February 2020**

**San Francisco, California, United States**

*Sponsored by*

SPIE

*Cosponsored by*

Okamoto Optics Works (Japan)

Plymouth Grating Laboratory (United States)

*Published by*

SPIE

**Volume 11267**

Proceedings of SPIE 0277-786X, V. 11267

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 [SPIDigitalLibrary.org](http://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 *Laser Applications in Microelectronic and Optoelectronic Manufacturing (LAMOM) XXV*, edited by Gediminas Račiukaitis, Carlos Molpeceres, Jie Qiao, Aiko Narazaki, Proceedings of SPIE Vol. 11267 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510632974

ISBN: 9781510632981 (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](http://SPIE.org)

Copyright © 2020, 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](http://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/20/\$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.

**SPIE. DIGITAL  
LIBRARY**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

---

**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

v *Authors*  
vii *Conference Committee*

---

## LASER PROCESSING OF POLYMERS

---

- 11267 06 **Optical waveguide on silicon made by zone melting method** [11267-42]  
11267 09 **High speed laser printing and sintering of flexible RFID antennas and fingerprint sensors**  
[11267-47]

---

## ULTRAFAST LASER-INDUCED MODIFICATIONS IN TRANSPARENT MATERIALS: JOINT SESSION WITH 11267 AND 11270

---

- 11267 0B **Laser induced modifications in transparent materials using azimuthally modulated axicon  
beams** [11267-9]

---

## LASER-BASED PROCESSES FOR ELECTRONICS

---

- 11267 0F **Surface functionalization of flexographic printing forms using a femtosecond laser for  
adjustable material transfer in MID production processes** [11267-13]  
11267 0H **Laser processing of titanium: oxide formation for electronic applications** [11267-15]

---

## LASER NANOPROCESSING

---

- 11267 0I **Nanoparticle synthesis via femtosecond laser reduction in liquid (Invited Paper)** [11267-16]  
11267 0J **Energy generation on an array of nanoparticles on a surface** [11267-17]  
11267 0L **Effect of front-contact laser texturing in thin-film solar cells** [11267-19]

---

## UPSCALING LASER PROCESSING UTILIZING ADVANCED BEAM SHAPING

---

- 11267 0P **High-precision ultrashort pulsed laser processing of metal foils using an advanced multibeam  
optic (Best Student Paper Award)** [11267-23]

11267 OR      **Scaling percussion drilling processes by ultrashort laser pulses using advanced beam shaping**  
[11267-25]

---

**TOWARDS HIGH-EFFICIENT LASER ABLATION**

---

11267 OT      **Machining metals and silicon with GHz bursts: surprising tremendous reduction of the specific removal rate for surface texturing applications** [11267-27]

11267 OV      **Micromachining flexibility by tunable ultrashort pulse duration, pulse-on-demand, and hybrid processing from single pulse to GHz burst with TruMicro Series 2000** [11267-29]

---

**ULTRAFAST LASER PROCESSING OF GLASS, CERAMICS AND SEMICONDUCTORS**

---

11267 OW      **Ultrafast and precision processing of glass by selective absorption of fiber-laser pulse into femtosecond-laser-induced filament (Invited Paper)** [11267-30]

11267 OZ      **Micro laser assisted single point diamond turning of brittle and hard materials** [11267-33]

---

**MODELLING AND PROCESS CONTROL**

---

11267 10      **High-precision laser ablation using OCT closed-loop control (Invited Paper)** [11267-35]

11267 13      **Position observer based galvanometer scanner and XY stage synchronization for large area processing** [11267-38]

---

**INTEGRATION OF DEVICES INSIDE BULK TRANSPARENT MATERIALS**

---

11267 14      **3D glass nanofluidics fabricated by femtosecond laser processing for study of cancer cell metastasis and invasion (Invited Paper)** [11267-39]

11267 17      **From proof of principle to 98.5% yield of a high-speed laser processing tool (Invited Paper)**  
[11267-44]

---

**POSTER SESSION**

---

11267 1B      **Fabrication of sub-micrometer periodic nanostructures using pulsed laser interference for efficient light trapping in optoelectronic devices** [11267-46]