

PROCEEDINGS OF SPIE

Advanced Fabrication Technologies for Micro/Nano Optics and Photonics XVI

Georg von Freymann
Eva Blasco
Debashis Chanda
Editors

29–31 January 2023
San Francisco, California, United States

Sponsored by
SPIE

Co-sponsored by
Nanoscribe (Germany)
e-skin Displays Incorporated (United States)
Opti-Cal GmbH (Germany)

Published by
SPIE

Volume 12433

Proceedings of SPIE 0277-786X, V. 12433

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

Advanced Fabrication Technologies for Micro/Nano Optics and Photonics XVI, edited by Georg von Freymann,
Eva Blasco, Debashis Chanda, Proc. of SPIE Vol. 12433, 1243301
© 2023 SPIE · 0277-786X · doi: 10.1117/12.2675517

Proc. of SPIE Vol. 12433 1243301-1

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 Fabrication Technologies for Micro/Nano Optics and Photonics XVI*, edited by Georg von Freymann, Eva Blasco, Debashis Chanda, Proc. of SPIE 12433, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510659711
ISBN: 9781510659728 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2023 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 *Conference Committee*

METASURFACES

12433 02 **Novel fabrication method for highly conformable THz metasurfaces
(3D Printing Best Paper Award in OPTO) [12433-3]**

MICROPTICS I

12433 03 **Laser direct writing of interfacing structures for short-distance optical interconnections
(Invited Paper) [12433-6]**

12433 04 **Direct laser writing of micrograting arrays using a spatial light modulator [12433-7]**

PHOTONICS

12433 05 **Tailoring optical birefringence of polymers using 3D femtosecond laser structuring
(Best Paper Award) [12433-10]**

12433 06 **Temperature compensated strain sensor in fused silica by femtosecond laser inscription
[12433-11]**

12433 07 **Creating fiber-embedded photonic circuitry by liquid-phase structuring of multi-material cores
(Best Student Paper Award) [12433-12]**

MICROPTICS II

12433 08 **A novel fabrication method for high-precision polymer aspherical lenses (Invited Paper)
[12433-13]**

12433 09 **Reprogrammable diffractive micro-optical elements [12433-15]**

12433 0A **A bi-axially accelerating Airy beam for miniaturized light-sheet microscopy [12433-16]**

VOLUMETRIC AND GREYSCALE PRINTING

12433 0B **Sub-100 nm feature sizes realized by cost-effective microscope projection photolithography** [12433-21]

NOVEL MATERIALS AND MULTIMATERIAL PRINTING

12433 0C **Multiphoton polymerization using upconversion nanoparticles for adaptive high-resolution 3D printing** [12433-27]

12433 0D **Multi-material additive manufacturing based on μ -dispenser technology for tailored polymer micro-optics** [12433-28]

12433 0E **All-printed SU8-perovskite DFB laser** [12433-30]

QUALITY CONTROL FOR MICRO/NANO FABRICATION: JOINT SESSION WITH CONFERENCES 12433 AND 12412

12433 0F **Manufacturing acceleration of free-form micro-optical arrays (FMOAs) with CAD algorithms** [12433-32]

POSTER SESSION

12433 0G **Integration of UV-nanoimprint lithography with two-photon polymerization for scalable production** [12433-40]

12433 0H **Investigation of plasma etching for interlayer dielectric planarization in high-efficiency deep-ultraviolet nanowire LEDs** [12433-41]

12433 0I **Large-area scatterometry for nanoscale metrology** [12433-42]

12433 0J **Two-photon 3D-nanostructuring in metal-organic frameworks** [12433-46]

12433 0K **High-efficiency fill factor recovery using refractive microlens arrays imprinted on 0.5-256 kpixel front-side illuminated SPAD imagers** [12433-48]

Conference Committee

Symposium Chairs

Sonia M. García-Blanco, Universiteit Twente (Netherlands)
Bernd Witzigmann, Friedrich-Alexander-Universität Erlangen-Nürnberg
(Germany)

Symposium Co-chairs

Ulrich T. Schwarz, Technische Universität Chemnitz (Germany)
Karin Hinzer, University of Ottawa (Canada)

Program Track Chairs

Ali Adibi, Georgia Institute of Technology (United States)
Holger Becker, Microfluidic ChipShop GmbH (Germany)
Georg von Freymann, Technische Universität Kaiserslautern
(Germany)

Conference Chairs

Georg von Freymann, Technische Universität Kaiserslautern
(Germany)
Eva Blasco, Ruprecht-Karls-Universität Heidelberg (Germany)
Debashis Chanda, University of Central Florida (United States)

Conference Program Committee

Andrea Alù, The City University of New York Advanced Science
Research Center (United States)
Cornelia Denz, Westfälische Wilhelms-Universität Münster (Germany)
Lingjie Jay Guo, University of Michigan (United States)
Ruth Houbertz, ThinkMade Engineering & Consulting (Germany)
Saulius Juodkazis, Swinburne University of Technology (Australia)
Stephen M. Kuebler, University of Central Florida (United States)
Mangirdas Malinauskas, Vilnius Universitetas (Lithuania)
Virgilio Mattoli, Istituto Italiano di Tecnologia (Italy)
Robert R. McLeod, University of Colorado, Boulder (United States)
Hernán R. Míguez García, Instituto de Ciencia de Materiales de
Sevilla (Spain)
Christophe Moser, École Polytechnique Fédérale de Lausanne
(Switzerland)
Aaron J. Pung, Sandia National Laboratories (United States)
Junsuk Rho, Pohang University of Science and Technology
(Korea, Republic of)

Raymond C. Rumpf, The University of Texas at El Paso (United States)
Winston V. Schoenfeld, CREOL, The College of Optics and Photonics,
University of Central Florida (United States)
Thomas J. Suleski, The University of North Carolina at Charlotte
(United States)
Michael Thiel, Nanoscribe GmbH & Company KG (Germany)
Augustine M. Urbas, Air Force Research Laboratory (United States)
Sandra Wolff, Rheinland-Pfälzische Technische Universität
Kaiserslautern-Landau (Germany)