## PROCEEDINGS OF SPIE

# Advanced Fabrication Technologies for Micro/Nano Optics and Photonics XVII

Georg von Freymann Eva Blasco Debashis Chanda Editors

28–31 January 2024 San Francisco, California, United States

Sponsored by SPIE

Cosponsored by Opti-Cal GmbH (Germany)

Published by SPIE

**Volume 12898** 

Proceedings of SPIE 0277-786X, V. 12898

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 XVII, edited by Georg von Freymann, Eva Blasco, Debashis Chanda, Proc. of SPIE Vol. 12898, 1289801 · © 2024 SPIE · 0277-786X · doi: 10.1117/12.3030034

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 Fabrication Technologies for Micro/Nano Optics and Photonics XVII, edited by Georg von Freymann, Eva Blasco, Debashis Chanda, Proc. of SPIE 12898, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510670563

ISBN: 9781510670570 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2024 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.



**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**

vii Conference Committee

	SURFACE ENGINEERING AND MAPPING
12898 02	Low-loss 800nm-thick PECVD silicon nitride photonic platform on 300-mm wafer [12898-2]
	COUPLERS, META- AND MICROLENSES
12898 03	Advanced illumination quality improvement of micro lens array diffuser by randomizing shape error [12898-8]
	3D PRINTED OPTICAL DEVICES
12898 04	Laser-based 3D printing of novel optical devices (Invited Paper) [12898-11]
12898 05	X-photon 3D nanolithography [12898-12]
12898 06	Design and fabrication of deterministic, pseudo-randomly distributed, binary phase nanostructures for reflectivity suppression [12898-14]
12898 07	<b>3D</b> laser printed form birefringent phase retarders for visible wavelengths [12898-15]
	PRINTING ON FIBERS
12898 08	Additive manufactured and electrically deformed lenses on optical fibers for improved coupling [12898-18]
	PHOTONIC INK AND SENSORS
12898 09	Eco-friendly soft nanoimprinting of TiO2 nanostructures with a large range of pattern heights [12898-20]

# **NOVEL METHODS AND MATERIALS**

12898 0A	Two photon polymerization on ultrathin polymeric films: a route toward conformable optical meta-surfaces and sensors (Invited Paper) [12898-23]
12898 OB	Flexible manufacturing of optical structures with low surface roughness in fused silica using selective laser etching [12898-24]
	3D PRINTING II: JOINT SESSION WITH CONFERENCES 12876 AND 12898
12898 0C	A 3D-printed bistable electromagnetic microlens actuator (Best Student Paper Award) [12898-29]
	ADVANCED MANUFACTURING USING A DMD OR OTHER SLM I: JOINT SESSION WITH CONFERENCES 12898 AND 12900
12898 OD	Continuous laser printing of surface relief microstructures on photomechanically-responsive azopolymer films using structured optical polarization [12898-33]
12898 OE	Generalized projection optimization model for tomographic volumetric additive manufacturing [12898-35]
	VOLUMETRIC ADDITIVE MANUFACTURING I
12898 OF	Multicolor tomographic volumetric printing: property modulation and beyond (Invited Paper) [12898-37]
12898 0G	Multi-material integration in light-based volumetric bioprinting: pathways to enhanced precision and complexity in scaffold fabrication [12898-38]
12898 OH	HoloTile: a novel digital holographic light sculpting modality for volumetric 3D printing (Invited Paper) [12898-40]
	VOLUMETRIC ADDITIVE MANUFACTURING II
12898 01	Manufacturing of metallic components via computed axial lithography and hydrogel infusion additive manufacturing [12898-4]

### **VOLUMETRIC ADDITIVE MANUFACTURING III** 12898 OJ Shadow-mask evaporation for the fabrication of optical filters with spatially tailored thickness [12898-49] REPLICATION AND NANO-IMPRINT-LITHOGRAPHY 12898 OK UV-replicated monolithic polymer components towards high-volume applications (Invited Paper) [12898-50] 12898 OL Combining nano-scale imprint lithography and reactive ion etching to fabricate high-quality surface relief gratings [12898-52] 12898 OM Non-destructive multi-parameter investigation of nanoimprinted structures [12898-53] 12898 ON Manufacturing of phase gratings using nanoimprint lithography [12898-54] **POSTER SESSION** 12898 00 Honey quality assurance: innovative fiber Bragg grating sensor for accurate glucose adulteration detection [12898-55] 12898 OP Enhancement of simulation and design for ideal overlay with target asymmetry using COMSOL multiphysics [12898-59] Place and bend assembly: towards production of substrates in high volume technologies 12898 0Q [12898-60] **3D-printed aspherical lens with moth-eye anti-reflection structure** [12898-62] 12898 OR 12898 OS Versatile multilayered all-polymer metasurfaces on optical fiber apex [12898-63]

#### **Conference Committee**

Symposium Chairs

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

Symposium Co-chairs

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

**Program Track Chairs** 

**Georg von Freymann**, Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau (Germany)

Conference Chairs

**Georg von Freymann**, Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau (Germany)

**Eva Blasco**, Ruprecht-Karls- Universität Heidelberg (Germany) **Debashis Chanda**, University of Central Florida (United States)

Conference Co-chair

**Christophe Moser**, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

Conference Program Committee

**Andrea Alù**, The City University of New York Advanced Science Research Center (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 University (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)

Aaron J. Pung, Sandia National Labs. (United States)
Junsuk Rho, Pohang University of Science and Technology
(Korea, Republic of)

**Winston V. Schoenfeld**, CREOL, The College of Optics and Photonics, University of Central Florida (United States)

Michael Thiel, Nanoscribe GmbH & Company KG (Germany)

Augustine M. Urbas, Air Force Research Laboratory (United States)