

PROCEEDINGS OF SPIE

Integrated Optics: Devices, Materials, and Technologies XXVII

Sonia M. García-Blanco

Pavel Cheben

Editors

30 January – 2 February 2023

San Francisco, California, United States

Sponsored and Published by
SPIE

Volume 12424

Proceedings of SPIE 0277-786X, V. 12424

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

Integrated Optics: Devices, Materials, and Technologies XXVII, edited by Sonia M. García-Blanco,
Pavel Cheben, Proc. of SPIE Vol. 12424, 1242401 · © 2023 SPIE
0277-786X · doi: 10.1117/12.2678600

Proc. of SPIE Vol. 12424 1242401-1

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 *Integrated Optics: Devices, Materials, and Technologies XXVII*, edited by Sonia M. García-Blanco, Pavel Cheben, Proc. of SPIE 12424, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

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

ISBN: 9781510659537
ISBN: 9781510659544 (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

ix *Conference Committee*

UV-VIS INTEGRATED PHOTONIC PLATFORMS

- 12424 02 **Low-loss photonic integrated circuits for UV applications (Invited Paper)** [12424-2]
- 12424 03 **Low-loss sputter coated aluminum nitride waveguides** [12424-3]
- 12424 04 **Prototyping of silicon nitride photonic integrated circuits for visible and near-infrared applications** [12424-4]

SUBWAVELENGTH INTEGRATED PHOTONICS

- 12424 05 **Optomechanical cavities in silicon-on-insulator (Invited Paper)** [12424-6]

COMPLEX PHOTONIC INTEGRATED CIRCUITS I

- 12424 06 **Enabling advanced photonic architectures using state-of-the-art silica-on-silicon planar lightwave circuit platform** [12424-10]
- 12424 07 **Cascaded directional coupler-based polarization splitter/combiner on commercial silicon photonics integration platform** [12424-11]

COMPLEX PHOTONIC INTEGRATED CIRCUITS II

- 12424 08 **Photo-thermal tuning of graphene oxide coated integrated optical waveguides** [12424-13]
- 12424 09 **On-chip silicon nitride optical phased array as a broadband near-infrared spectrometer** [12424-14]
- 12424 0A **Fully integrated Laser Doppler Vibrometer (LDV) based on hybrid 3D integration of silicon nitride and polymer photonic circuits with operation in the kHz regime** [12424-15]
- 12424 0B **Astrophotonics: photonic integrated circuits for astronomical instrumentation (Invited Paper)** [12424-17]

INTEGRATED PHOTONIC DESIGN

- 12424 0C **Inverse design of robust photonic components (Invited Paper)** [12424-19]
- 12424 0D **Design enablement methodology for silicon photonics-based photonic integrated design** [12424-20]

INTEGRATED SOURCES I

- 12424 0E **Erbium-doped tellurium oxide distributed Bragg reflector lasers on silicon nitride chips** [12424-23]
- 12424 0F **THz generation by beating of self-running Er-based ion-exchanged DFB lasers co-integrated on one single chip** [12424-24]

INTEGRATED SOURCES II

- 12424 0G **139 nm tuning range, high speed wavelength modulation, and high output power up to 60 mW from a single gain, two-ring vernier external cavity laser** [12424-26]
- 12424 0H **Using hybrid integrated InP-Si₃N₄ diode lasers for the generation of sub-GHz repetition rate frequency combs** [12424-29]

QUANTUM INTEGRATED PHOTONICS

- 12424 0I **Ion trap quantum computing using integrated photonics (Invited Paper)** [12424-33]
- 12424 0J **Integrating large numbers of superconducting nanowire single-photon detectors with nanophotonic waveguides (Invited Paper)** [12424-34]

INTEGRATED PHOTONICS FOR MACHINE LEARNING/AI

- 12424 0K **Direct image classification using an on-chip photonic deep neural network (Invited Paper)** [12424-36]
- 12424 0L **Design and testing of silicon photonic 4F system for convolutional neural networks** [12424-37]

NON-LINEAR INTEGRATED PHOTONICS I

- 12424 0M **Hybrid lithium niobate-on-silicon nitride platform for mid-IR supercontinuum generation** [12424-41]

NON-LINEAR INTEGRATED PHOTONICS II

- 12424 ON **Dispersion engineered SiON ring resonators for integrated photon sources** [12424-44]
- 12424 OO **Graphene oxide for enhanced self-phase modulation in silicon nitride waveguides** [12424-45]

NOVEL FABRICATION TECHNOLOGIES

- 12424 OP **Laser-based, on-chip fabrication of glass-based core-cladding waveguides** [12424-46]
- 12424 OQ **Photonic wire bonding via two-photon polymerization laser lithography for hybrid integration** [12424-47]
- 12424 OR **The effect of etched air cavities underneath the finite bottom oxide cladding of silicon nitride single-strip optical waveguides** [12424-48]

INTEGRATED OPTICAL SENSORS

- 12424 OS **Miniaturized photonic sensors based on micro-interferometers (Invited Paper)** [12424-49]
- 12424 OT **Sorting and sensing of dielectric microparticles by a multiphysics approach: integrated electro-opto-fluidic function for environmental application** [12424-52]

POSTER SESSION

- 12424 OU **Cascaded ring resonator-based wide stop-band filter fabricated in AIM photonics technology at Albany Nanotech Complex** [12424-12]
- 12424 OV **More than optical interconnects: employing self-written waveguides to create optical networks and multi-functional sensing elements** [12424-58]
- 12424 OW **Silicon-based polarization-insensitive optical antennas** [12424-59]
- 12424 OX **Output beam engineering with 2-step ridge etching** [12424-60]
- 12424 OY **Monolithically integratable broad-band anti-reflection stacks for Si photonics platforms** [12424-61]
- 12424 OZ **Characterization of mid-infrared optical loss and nonlinear refractive index in InP based waveguides** [12424-63]
- 12424 IO **A low-loss 3D printed rib waveguide using stereolithography** [12424-67]

- 12424 1I **Amorphous germanium waveguides for medical diagnostics using mid-infrared spectroscopy** [12424-70]
- 12424 1J **Compact atto-joule-per-bit bus-coupled photonic crystal nanobeam switches** [12424-72]
- 12424 1K **Experimental observation of the exceptional point in a nanocylinder-loaded silicon microring** [12424-74]
- 12424 1L **Reduction of Ge-on-Si waveguide propagation loss by laser and hydrogen annealing** [12424-77]
- 12424 1M **Whispering gallery mode excitation in microresonator integrated in deep seated negative axicon for volatile gas sensing** [12424-78]
- 12424 1N **Demonstration of photonic temperature sensor for RTM-6 composite manufacturing process (180°C) integrated with PMOC system** [12424-79]
- 12424 1O **3D shape-sensor based on integrated optics in ultra-thin glass** [12424-80]
- 12424 1P **Silicon nitride arrayed waveguide grating structures for sensing applications** [12424-81]
- 12424 1Q **Micro-ring resonator optimization for efficient integrated entangled photon sources** [12424-82]
- 12424 1R **Utilizing inverse design to create plasmonic waveguide devices** [12424-83]
- 12424 1S **Integrated photonic slow light Michelson interferometer bio sensor** [12424-85]
- 12424 1T **Fresnel zone plate metalens using silicon subwavelength gratings** [12424-86]
- 12424 1U **Optimized silicon antennas for optical phased arrays** [12424-90]
- 12424 1V **Tailoring the directive nature of optical waveguide antennas** [12424-91]
- 12424 1W **Correction of phase errors in multimode interference couplers using rectangular surface relief grating** [12424-93]
- 12424 1X **Silicon carbide photonic crystal optimized by artificial bee colony algorithm** [12424-94]
- 12424 1Y **Metamaterial cladding for bending loss reduction in silicon nitride waveguide** [12424-95]
- 12424 1Z **Flexible polymer packaged high-Q WGM resonators for displacement detection** [12424-98]
- 12424 2A **Production of dielectric filters with low defect levels for integrated optical devices** [12424-99]
- 12424 2B **Silicon nitride hybrid-integrated diode laser at 637 nm** [12424-100]

- 12424 1L **Numerical analysis of the propagation modes of photo-switching PDMS-arylazopyrazole optical waveguide and thin-film spectroscopic characterization** [12424-101]
- 12424 1M **Widely tunable C-band laser and module with short tuning and narrow linewidth** [12424-105]

DIGITAL POSTER SESSION

- 12424 1N **Mid-infrared polarization independent tapered waveguide based multianalyte sensor: a theoretical study** [12424-71]
- 12424 1O **Reconfigurable resonator based on five times self-coupled photonic waveguide for versatile functionalities** [12424-73]
- 12424 1P **Polarization-independent dual-channel broadband wavelength demultiplexer design by inverse method** [12424-76]
- 12424 1Q **Long period waveguide grating filters on lithium niobate** [12424-88]

Conference Committee

Symposium Chairs

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

Symposium Co-chairs

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

Program Track Chairs

Yakov Sidorin, Quarles & Brady LLP (United States)
Jean-Emmanuel Broquin, Université Grenoble Alpes (France)

Conference Chairs

Sonia M. García-Blanco, Universiteit Twente (Netherlands)
Pavel Cheben, National Research Council Canada (Canada)

Conference Program Committee

Carlos A. Alonso-Ramos, Centre de Nanosciences et de
Nanotechnologies (France)
Daniel Benedikovic, Žilinská univerzita v Žiline (Slovakia)
Pierre Berini, University of Ottawa (Canada)
Romeo Bernini, Istituto per il Rilevamento Elettromagnetico
dell'Ambiente (Italy)
Andrea Blanco-Redondo, Nokia Bell Labs (United States)
Alexandra Boltasseva, Purdue University (United States)
Jean-Emmanuel Broquin, Université Grenoble Alpes (France)
Florenta A. Costache, Fraunhofer-Institut für Photonische
Mikrosysteme IPMS (Germany)
Xudong Fan, University of Michigan (United States)
Robert Halir, Universidad de Málaga (Spain)
Gualtiero Nunzi Conti, Istituto di Fisica Applicata "Nello Carrara" (Italy)
Alessia Pasquazi, University of Sussex (United Kingdom)
François Royer, Université Jean Monnet Saint-Etienne (France)
Jens H. Schmid, National Research Council Canada (Canada)
Yakov Sidorin, Quarles & Brady LLP (United States)
Winnie N. Ye, Carleton University (Canada)

