

# PROCEEDINGS OF SPIE

## **Optoelectronic Devices and Integration VI**

**Xuping Zhang**  
**Baojun Li**  
**Changyuan Yu**  
*Editors*

**12–14 October 2016**  
**Beijing, 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) • Shanghai Institute of Optics and Fine Mechanics (China) • Changchun Institute of Optics and Fine Mechanics (China) • Institute of Semiconductors (China) • Institute of Optics and Electronics (China) • Institute of Physics (China) • Shanghai Institute of Technical Physics (China) • China Instrument and Control Society (China) • Optoelectronics Technology Committee, COS (China) • SPIE National Committee in China (China) • Optical Society of Japan (Japan) • Optical Society of Korea (Korea, Republic of) • The Australian Optical Society (Australia) • Optics and Photonics Society of Singapore (Singapore) • European Optical Society

*Supporting Organizations*  
CAST—China Association for Science and Technology (China)  
NSFC—National Nature Science Foundation (China)

*Published by*  
SPIE

**Volume 10019**

Proceedings of SPIE 0277-786X, V. 10019

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 *Optoelectronic Devices and Integration VI*, edited by Xuping Zhang, Baojun Li, Changyuan Yu, Proceedings of SPIE Vol. 10019 (SPIE, Bellingham, WA, 2016) Six-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510604575

ISBN: 9781510604582 (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 © 2016, 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 \$18.00 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/16/\$18.00.

Printed in the United States of America V m 7 i ff Ub '5 ggc WJUH Y gē bWZi bXYF JW bgY Zca GD-9.

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

- vii *Authors*
- ix *Symposium Committees*
- xi *Conference Committee*

---

## **SESSION 1 INTEGRATED OPTICS AND PHOTONIC INTEGRATED CIRCUITS**

---

- 10019 05 **Silicon nitride grating waveguide based directional coupler** [10019-5]

---

## **SESSION 2 DEVICES FOR PHOTONIC APPLICATIONS I**

---

- 10019 07 **980 nm tapered lasers with photonic crystal structure for low vertical divergence** [10019-7]
- 10019 08 **Tunable multi-channel dropping filters based on double-waveguide parallel-coupled microring resonators** [10019-8]
- 10019 09 **The realization of optical switching generated from the combination of Ag/a-Si/p-Si memristor and silicon waveguide** [10019-9]
- 10019 0A **High efficiency single transverse mode photonic band crystal lasers with low vertical divergence** [10019-10]
- 10019 0B **Preparation and evaluation of perovskite solar cells in the absolute atmospheric environment** [10019-19]

---

## **SESSION 3 EMERGING OPTOELECTRONIC APPLICATIONS**

---

- 10019 0C **Investigation of advanced pre- and post-equalization schemes in high-order CAP modulation based high-speed indoor VLC transmission system (Invited Paper)** [10019-12]
- 10019 0E **Optical implementation of neural learning algorithms based on cross-gain modulation in a semiconductor optical amplifier** [10019-14]
- 10019 0F **Detection of atmospheric boundary layer height in the plum rain season over Hangzhou area with three-dimensional scanning polarized lidar** [10019-15]
- 10019 0G **Design of real-time and high-precision photoelectric autocollimator** [10019-16]

---

**SESSION 4 DEVICES FOR PHOTONIC APPLICATIONS II**

---

- 10019 0H **Development of next-generation nanolithography methods to break the optical diffraction limit (Invited Paper)** [10019-17]
- 10019 0K **Gain-switched thulium-doped fiber laser with ultra-wide tuning range** [10019-20]
- 10019 0L **Er-doped fiber based Mach-Zehnder interferometer for simultaneous strain and temperature measurement** [10019-53]

---

**SESSION 5 OPTICAL FIBERS**

---

- 10019 0N **Mode evolution in polarization maintain few mode fibers and applications in mode-division-multiplexing systems (Invited Paper)** [10019-22]
- 10019 0P **Experimental measurement of effective refractive index difference for few mode polarization maintaining fibers using  $S^2$  method** [10019-24]
- 10019 0Q **Uniform flat-top interleaver consisting of a two-stage cascaded Mach-Zehnder interferometer** [10019-25]
- 10019 0R **A distributed optical fiber sensing system for dynamic strain measurement based on artificial reflector** [10019-26]
- 10019 0S **Improved hybrid polymer/PbS quantum dot infrared phototransistors incorporating single-layer graphene** [10019-27]
- 10019 0T **A calibration method for photon counters using a customized standard light source** [10019-28]
- 10019 0U **Coupling between fiber-optic microring and lithium niobate microwaveguide chip towards photonic interlink devices** [10019-29]
- 10019 0V **Investigation on a novel fiber-optic sensor based on up-taper-core-offset-up-taper structure** [10019-52]

---

**SESSION 6 PHOTONIC MATERIALS AND DEVICES/DETECTORS I**

---

- 10019 0W **A simple and low cost method to fabricate well controllable silicon nanowires based on electrostatic adsorption of PS nanospheres** [10019-30]

---

**SESSION 7 PHOTONIC MATERIALS AND DEVICES/DETECTORS II**

---

- 10019 11 **Performance optimization of Pnp InGaAs/InP heterojunction phototransistors** [10019-36]
- 10019 12 **On-chip integration for in-plane video transmission using visible light** [10019-37]

## POSTER SESSION

---

- 10019 13 **Optical characteristic analysis of optical fiber near-field and far-field** [10019-38]
- 10019 14 **Investigation on optical and acoustic fields of stimulated Brillouin scattering in As<sub>2</sub>S<sub>3</sub> suspended-core optical fibers** [10019-39]
- 10019 15 **A short-range optical wireless transmission method based on LED** [10019-40]
- 10019 17 **Directional emission micro-cavity lasers with different device structures** [10019-42]
- 10019 18 **The research of multi-alkali vacuum photodiode on heating and illuminating** [10019-43]
- 10019 19 **Chromatic dispersion and polarization mode dispersion insensitive optical signal to noise ratio monitoring based on electronic variable optical attenuators and optical bandpass filter** [10019-44]
- 10019 1A **All-optical quantization by slicing supercontinuum in a Ge<sub>11.5</sub>As<sub>24</sub>Se<sub>64.5</sub> rib waveguide** [10019-45]
- 10019 1B **High-performance transparent film heater with an embedded Ni metal-mesh based on selected metal electrodeposition process** [10019-46]
- 10019 1C **Multimode fiber focusing lens based on plasmonic structures** [10019-47]
- 10019 1D **High precision long-term stable fiber-based optical synchronization system** [10019-48]
- 10019 1E **A four-port vertical-coupling optical interface based on two-dimensional grating coupler** [10019-49]
- 10019 1F **RF spectral analysis for characterisation of mode-locked regimes in fibre lasers** [10019-50]
- 10019 1G **Solar cells based on InP/GaP/Si structure** [10019-51]