## PROCEEDINGS OF SPIE

# Physics and Simulation of Optoelectronic Devices XXV

Bernd Witzigmann Marek Osiński Yasuhiko Arakawa Editors

30 January–2 February 2017 San Francisco, California, United States

Sponsored and Published by SPIE

Volume 10098

Proceedings of SPIE 0277-786X, V. 10098

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 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 Physics and Simulation of Optoelectronic Devices XXV, edited by Bernd Witzigmann, Marek Osiński, Yasuhiko Arakawa, Proceedings of SPIE Vol. 10098 (SPIE, Bellingham, WA, 2017) Seven-digit Article CID Number.

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

ISBN: 9781510606371 ISBN: 9781510606388 (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

Copyright © 2017, 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. 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/17/\$18.00.

Printed in the United States of America Vm7 i ffUb 5 gpc WUHY gž to XYf W bgY Zfca GD-9.

Publication of record for individual papers is online in the SPIE Digital Library.



**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
- 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
- xi Conference Committee

#### PLASMONICS AND NANOPHOTONICS

- 10098 07 Nanophotonic modulators and photodetectors using silicon photonic and plasmonic device concepts (Invited Paper) [10098-6]
- 10098 08 Voltage control of surface plasmon and phonon interactions in doped semiconductordielectric interfaces [10098-84]

#### NONLINEAR OPTICS AND MODE-LOCKING

- 10098 0D Optical bistability, self-pulsing and XY optimization in silicon micro-rings with active carrier removal [10098-11]
- 10098 0E Characteristics of ultrafast passively mode-locking soliton fiber laser utilizing higher-order mode fibers [10098-12]
- 10098 OF Coherent pulse progression in nonlinear quantum-cascade laser medium under groupvelocity dispersion [10098-13]

#### **OPTICAL INJECTION AND FEEDBACK IN LASERS**

- 10098 0H Injection-locking criteria for simultaneously locking single-mode lasers to optical frequency combs from gain-switched lasers [10098-15]
- 10098 01 Wideband chaos in hybrid III-V/silicon distributed feedback semiconductor lasers under optical feedback [10098-16]
- 10098 0J Increasing stability by two-state lasing in quantum-dot lasers with optical injection [10098-17]
- 10098 0K Self-consistent rate-equation theory of coupling in mutually injected semiconductor lasers [10098-18]
- 10098 OL Large-signal analysis of directly modulated strongly injection-locked whistle-geometry ring lasers [10098-19]

10098 ON	Feedback control of photon statistics [10098-21]
10098 00	Spin transport in a Lindblad-driven isotropic quantum Heisenberg spin-chain [10098-22]
10098 OP	Momentum and rest mass of the covariant state of light in a medium [10098-23]
	SEMICONDUCTOR LASERS I
10098 OQ	What limits the power conversion efficiency of GaN-based lasers? (Invited Paper) [10098-24]
10098 OS	Seed laser diodes in pulsed operation: limitations and reliability [10098-26]
10098 OT	Analysis of carrier dynamic effects on frequency response of tin incorporated group-IV alloy-based transistor laser [10098-27]
	ELECTROMAGNETICS I
10098 OU	Investigation of light extraction efficiency comparison of AlGaN-based deep- and mid- ultraviolet flip-chip light-emitting diodes with patterned sapphire substrate [10098-28]
10098 0V	Quadrant detector sensitivity and linearity index measurement with Laguerre-Gaussian beams [10098-29]
10098 OW	Modeling and design of DBR fiber lasers for sensor applications [10098-30]
10098 OX	Characterization and modelling of multimode optical fiber for MOEMS applications using the elementary source method [10098-31]
	SEMICONDUCTOR LASERS II
10098 OZ	Stabilization of broad area semiconductor lasers [10098-34]
10098 10	High-speed directly modulated lasers based on high-order slotted surface gratings [10098-35]
10098 11	Lasing of metamorphic hybrid 1300nm spectral band VCSEL under optical pumping up to 120 °C [10098-36]
	OPTOELECTRONICS MODELING TECHNIQUES

- 10098 13 NEMO5: realistic and efficient NEGF simulations of GaN light-emitting diodes (Invited Paper) [10098-38]
- 10098 14 Novel BPM technique using leap frog method [10098-39]

#### QUANTUM DOTS

- 10098 16 Submonolayer quantum-dot lasers [10098-41]
- 10098 18 Excited state spectral blowup induced by carrier dynamics in the ground state of a quantum dot laser [10098-43]
- 10098 19 Modeling and simulation of the multi-population quantum-dot lasers based on equivalent circuit [10098-44]

#### PHOTONIC INTEGRATION AND SENSING

- 10098 1A **Photonic integrated devices and functions on hybrid polymer platform (Invited Paper)** [10098-45]
- 10098 1B Important parameters of printed polymer optical waveguides (POWs) in simulation and fabrication [10098-46]
- 10098 1C Fiber based flexure sensor utilizing the sensitivity of evanescent coupling [10098-47]
- 10098 1D High sensitive pressure sensor based on plasmonic Mach-Zehnder interferometer [10098-48]

#### METAMATERIALS

- 10098 1F Optical propagation in anisotropic metamaterials [10098-50]
- 10098 1G Numerical modeling of photoluminescence in anisotropic nano-layered aluminum-doped zinc-oxide metamaterial with hyperbolic dispersion [10098-51]

#### **ELECTROMAGNETICS II**

- 10098 11 Stopped microwave rainbow in 3D chirped photonic crystals [10098-53]
- 10098 1K Modeling and analysis of scattering from silicon nanoparticles with high excess carriers for MIR spectroscopy [10098-55]
- 10098 1L Device design for global shutter operation in a 1.1-µm pixel image sensor and its application to near infrared sensing [10098-56]

#### SENSORS MODELING

- 10098 1M Analysis of SiNx TIR mirror for polygonal ring resonator sensor structure [10098-58]
- 10098 1N Strain sensor based on sectional crosstalk change in dual-core fibers [10098-59]
- 10098 10 Autofocus changes the paradigm for camera technology [10098-60]
- 10098 1P Modeling of frequency response in strain balanced SiGeSn/GeSn quantum well infrared photodetector [10098-68]

#### **POSTER SESSION**

- 10098 10 Multi-parameter fiber optic sensing setup based on spectral overlap using Fabry-Perot interferometers [10098-61]
- 10098 1R Measurement of refractive index distribution using micro-lens array based on total internal reflection [10098-62]
- 10098 1S Optical J-K flip-flop using switching property of Mach-Zehnder interferometers [10098-63]
- 10098 1V **Tunable plasmon-induced transparency and slow-light based on graphene metamaterials** [10098-66]
- 10098 1X Solving the nonlinear diffusion model of the ion exchange process using finite element method [10098-69]
- 10098 1Y Stabilization of regular pulses utilizing double-delay loops [10098-70]
- 10098 1Z Generation of broadband chaos and stabilized regular pulses by quasi-periodic states in dual-feedback system [10098-71]
- 10098 21 Computer modeling and approximation of laser beam reshaper based on aspherical optics [10098-73]
- 10098 25 **Two-dimensional modeling of AllnAs avalanche photodiodes for high gain-bandwidth** product [10098-77]
- 10098 27 Highly accurate scanning attachment for SRS-lidar system [10098-80]
- 10098 29 Optimization of micro channel heat sinks for high-power 9xx-nm laser diodes [10098-82]