

PROCEEDINGS OF SPIE

Physics and Simulation of Optoelectronic Devices XXXII

**Bernd Witzigmann
Marek Osiński
Yasuhiko Arakawa**
Editors

**30 January – 1 February 2024
San Francisco, California, United States**

Sponsored and Published by
SPIE

Volume 12880

Proceedings of SPIE 0277-786X, V. 12880

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.

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 XXXII*, edited by Bernd Witzigmann, Marek Osiński, Yasuhiko Arakawa, Proc. of SPIE 12880, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510670204

ISBN: 9781510670211 (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.

**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

vii *Conference Committee*

SEMICONDUCTOR LASERS

12880 02 **Investigation of spatial hole burning and linewidth enhancement factor impact on distributed-feedback quantum cascade lasers dynamics** [12880-6]

NANOLASERS AND LEDS

12880 03 **Electro-optical modulator using tunable III-V semiconductor in nanocavity** [12880-12]

SENSORS

12880 04 **Design and optimization of a high-speed ITO-plasmon-based asymmetric Mach-Zehnder interferometer modulator** [12880-13]

12880 05 **Design and study of fiber optic interferometric devices applied to vibration detection systems** [12880-14]

12880 06 **Ge-on-Si single photon avalanche diode performance enhancement with photonic crystal nano-hole arrays** [12880-15]

12880 07 **Electromagnetically induced transparency-based optical gas sensor using plasmonic corrugated ring resonators** [12880-16]

12880 08 **Tolerance analysis of local evanescent array coupled (LEAC) sensors fabricated in silicon photonics foundries** [12880-17]

NONLINEAR DYNAMICS

12880 09 **Inverse model for semiconductor optical amplifiers in the short-pulse regime** [12880-21]

12880 0A **Modelling optical coherence tomography for biophotonics and photobiology using an electronically tunable mode-locked laser diode** [12880-22]

QD/QDASH LASERS

12880 OB **Electronic structure of GaSb/AlGaSb quantum dots formed by filling droplet-etched nanoholes** [12880-24]

PLASMONICS AND METAMATERIALS

12880 OC **Optical constants of digital alloy InGaAs** [12880-27]

12880 OD **Bimetallic-catalyst metal-assisted chemical etching for tailored formation of high-aspect-ratio III-V compound semiconductor submicron pillar arrays** [12880-30]

12880 OE **Design of all-solid-state photonic crystals for InP-based photonic integrated circuits** [12880-31]

NEUROMORPHIC COMPUTING

12880 OF **Neuromorphic XOR operation using QD spin-VCSEL neuron** [12880-33]

12880 OG **Optimization of 3x3 neuromorphic photonic network for programmable Boolean operations** [12880-34]

12880 OH **Neuromorphic reservoir for nonlinear optical signal equalization** [12880-35]

PASSIVE PHOTONIC DEVICES

12880 OI **Organizational disorder of nanostructured antireflective surfaces** [12880-36]

12880 OJ **Amorphous silicon grating couplers based on random and quadratic variation of the refractive index** [12880-38]

12880 OK **Multimode interference reflectors and output tuning using neural networks** [12880-39]

12880 OL **Adiabatic tapers based on photonic inverse design** [12880-40]

ELECTROMAGNETICS

12880 OM **Unique handedness of a circularly polarized plane wave in simulation** [12880-41]

12880 ON **Effects of resonances and surface texturing on light emission in emerging thin-film devices** [12880-42]

12880 OO **Indirect time-of-flight pixel study: 3D Monte Carlo simulation approach** [12880-43]

POSTER SESSION

12880 OP **Exploring nonlinear activation function within microring resonators for all-photonic neuromorphic computing** [12880-32]

12880 OQ **High-speed PIN photodiode design space exploration to break the speed-efficiency trade-off** [12880-46]

12880 OR **Direction of arrival sensing enabled by introducing asymmetric surface structures in photodetectors** [12880-47]

12880 OS **Design and analytical modeling of high-performance mid-wavelength infrared photodetectors: an nBn architecture** [12880-48]

12880 OT **Determination of PMMA etch rates using VASE modeling** [12880-50]

12880 OU **Unraveling the role of varying composition on electronic and optical properties of bilayer $\text{Mo}_x\text{W}_{(1-x)}\text{S}_2$ for photovoltaic applications** [12880-51]

12880 OV **Accelerating simulations in inverse photonic design through factorization caching** [12880-55]

12880 OW **Lens parameters optimization sensitivity prediction using Ansys Zemax multi-configuration composite feature** [12880-57]

12880 OX **Investigation of strain propagation, optical, and structural properties of a novel heterostructure with multilayer Stranski-Krastanov (S-K) strain-coupled quantum dots (QDs)** [12880-59]