

PROCEEDINGS OF SPIE

Novel In-Plane Semiconductor Lasers XVIII

Alexey A. Belyanin
Peter M. Snowton
Editors

4–7 February 2019
San Francisco, California, United States

Sponsored and Published by
SPIE

Volume 10939

Proceedings of SPIE 0277-786X, V. 10939

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 *Novel In-Plane Semiconductor Lasers XVIII*, edited by Alexey A. Belyanin, Peter M. Smowton, Proceedings of SPIE Vol. 10939 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510625204
ISBN: 9781510625211 (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 © 2019, 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/19/\$18.00.

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: *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	<i>Authors</i>
ix	<i>Conference Committee</i>

DEVELOPING LASER MATERIAL

10939 04	Comparison of quantum dot lasers with and without tunnel-injection quantum well [10939-3]
10939 05	Tapered monolithic mode-locked laser diode with 200pJ pulse energy for space applications [10939-4]

PHOTONIC BANDGAP AND MICROCAVITY EFFECTS

10939 0A	Photonic crystal laser based on Fano interference allows for ultrafast frequency modulation in the THz range [10939-9]
----------	---

NITRIDES

10939 0E	Laser-based visible light communications and underwater wireless optical communications: a device perspective (Invited Paper) [10939-13]
10939 0F	Analysis of AlGa_N substrate for high-efficiency 240-260nm deep-UV lasers [10939-14]
10939 0G	Semipolar III-nitride laser diodes for solid-state lighting (Invited Paper) [10939-15]

NITRIDES AND VISIBLE LASERS

10939 0I	Recent progress in distributed feedback InGa_N/Ga_N laser diodes (Invited Paper) [10939-17]
10939 0J	Visible and near-infrared emission images of (In,Ga,Al)N-based 450nm emitting-diode lasers [10939-18]
10939 0K	Design considerations for InGaAlP lasers and light-emitting diodes on high-index GaAs substrates for the yellow and green spectral range [10939-19]
10939 0L	Large intermixing in the InGaP/InAlGaP laser structure using stress engineering at elevated temperature [10939-20]

10939 OM **InP/AlGaInP quantum dot laser emitting at short wavelength of 660 nm** [10939-21]

LASERS ON SILICON I

10939 ON **Linewidth broadening factor and optical feedback sensitivity of silicon based quantum dot lasers (Invited Paper)** [10939-22]

10939 OP **Degradation mechanisms of InAs quantum dot 1.3 μ m laser diodes epitaxially grown on silicon** [10939-24]

LASERS ON SILICON II

10939 OS **Thermally insensitive determination of the chirp parameter of InAs/GaAs quantum dot lasers epitaxially grown onto silicon** [10939-27]

10939 OU **Doping technologies for InP membranes on silicon for nanolasers** [10939-29]

TUNABLE LASERS

10939 10 **Mode-hop free operation throughout lifetime confirmed in a 2 μ m distributed Bragg reflector laser for gas sensing** [10939-35]

10939 11 **Tunable external cavity laser diode based on wavelength controlled self-assembled InAs quantum dots for swept-source optical coherence tomography applications at 1100nm wavelength band** [10939-36]

10939 12 **Tuning of a widely tunable monolithically integrated InP laser for optical coherence tomography** [10939-37]

10939 13 **Tunable Y-branch dual-wavelength diode lasers in the VIS and NIR range for sensor applications** [10939-38]

MIR LASERS: MODE-LOCKING, COMBS, AND FREQUENCY NOISE

10939 1B **Frequency noise characterization of interband cascade lasers** [10939-46]

QCL FREQUENCY COMBS AND MODE LOCKING

10939 1E **Optomechanical control of quantum cascade laser frequency combs** [10939-50]

HIGH POWER/BRIGHTNESS

- 10939 1F **High spectral radiance distributed Bragg reflector tapered diode lasers at 1060 nm with novel internal output DBR-grating** [10939-51]
- 10939 1G **Reliability of high-power 1030nm DBR tapered diode lasers with different lateral layouts** [10939-52]
- 10939 1H **Multi-emitter 638-nm high-power broad area laser diodes for display application (Invited Paper)** [10939-53]
- 10939 1I **USHIO 3.5W red laser diode for projector light source** [10939-54]

QCL GROWTH AND DESIGN

- 10939 1L **Effects of elastic scattering on high-performance step-taper active-region quantum cascade lasers** [10939-57]

QCLS: NEW DESIGNS AND APPLICATIONS

- 10939 1Q **Quartz-enhanced photoacoustic spectroscopy employing a distributed feedback-quantum cascade laser array for nitrous oxide and methane broadband detection** [10939-62]