PROCEEDINGS OF SPIE

Nanophotonics and Micro/Nano Optics III

Zhiping Zhou Kazumi Wada *Fditors*

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 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) • 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) • Opticelectronics 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) • European Optical Society

Supporting Organizations

CAST—China Association for Science and Technology (China)

NSFC—National Nature Science Foundation (China)

Published by SPIE

Volume 10027

Proceedings of SPIE 0277-786X, V. 10027

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

Nanophotonics and Micro/Nano Optics III, edited by Zhiping Zhou, Kazumi Wada, Proc. of SPIE Vol. 10027, 1002701 · © 2016 SPIE · CCC code: 0277-786X/16/\$18 · doi: 10.1117/12.2265128

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 *Nanophotonics and Micro/Nano Optics III*, edited by Zhiping Zhou, Kazumi Wada, Proceedings of SPIE Vol. 10027 (SPIE, Bellingham, WA, 2016) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic) ISBN: 9781510604735

ISBN: 9781510604742 (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.ora

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. 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.

 $\hbox{Publication of record for individual papers is online in the SPIE Digital Library.}$



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 page of the manuscript.

Contents

∨ii	Authors
ix	Symposium Committees
xi	Conference Committee
SESSION 1	SILICON PHOTONICS
10027 05	Large-scale silicon optical switches for optical interconnection (Invited Paper) [10027-3]
10027 06	Silicon photonics process development based on a 200-mm CMOS platform [10027-4]
10027 07	Double Doppler effect in two-dimensional photonic crystal with negative effective index [10027-5]
SESSION 2	LASERS AND AMPLIFIERS
10027 08	Studies on the amplified spontaneous emission of a polymer fiber [10027-8]
SESSION 3	INTEGRATED OPTICS AND SURFACE PLASMONS
10027 0D	Optical waveguide materials, structures, and dispersion modulation (Invited Paper) [10027-11]
10027 0D 10027 0E	
	[10027-11]
10027 0E	[10027-11] Inherent error in interferometric surface plasmon microscopy (Invited Paper) [10027-12]
10027 0E 10027 0F	[10027-11] Inherent error in interferometric surface plasmon microscopy (Invited Paper) [10027-12] Hybrid WGM-SPP modes in metal-coated microcylinder [10027-13] Manipulating the effective index of the hybrid plasmonic waveguide based on
10027 0E 10027 0F 10027 0G	Inherent error in interferometric surface plasmon microscopy (Invited Paper) [10027-12] Hybrid WGM-SPP modes in metal-coated microcylinder [10027-13] Manipulating the effective index of the hybrid plasmonic waveguide based on subwavelength grating [10027-14]

SESSION 5	NANOPHOTONICS
10027 OL	1×5 optical splitter for TE modes in air-hole photonic crystal based on self-collimation effect [10027-20]
10027 OM	Gold nano sphere based fiber optic LSPR probe for biosensing measurement [10027-21]
10027 0N	Gold nanoparticle-induced diameter reduction and enhanced Raman shift in self-rolled-up InGaAs/GaAs microtubes [10027-23]
10027 0Q	Defect-free fabrication of nano-disk and nano-wire by fusion of bio-template and neutral beam etching (Invited Paper) [10027-19]
10027 OR	InGaAsP/InP-air-aperture microcavities for single-photon sources at 1.55- μ m telecommunication band [10027-27]
SESSION 6	WAVEGUIDES AND PASSIVE DEVICES
10027 OU	Versatile asymmetric directional couplers on silicon (Invited Paper) [10027-28]
SESSION 7	QUANTUM OPTICS
10027 10	Investigation of Ge _{1-x} Sn _x /Ge quantum-well structures as optical gain media [10027-34]
10027 11	Wavelength-controlled manipulation of colloidal quasi-resonant quantum dots under pulsed laser irradiation [10027-35]
	DOSTED SESSION
	POSTER SESSION
10027 14	Silver nanoparticles plasmonic effect on eosin and rhodamine 6G luminescence in various media [10027-38]
10027 15	Luminescence quantum yields of gold nanoparticles varying with excitation wavelength [10027-39]
10027 16	Optical resolution improvement by nanoparticle's amplitude and phase pattern [10027-40]
10027 17	Tunable optical properties of the core-shell nanoparticles [10027-41]
10027 18	Angular sensitivity for a Fabry-Perot structure incorporating different dielectric materials [10027-42]
10027 19	Improvement of metal-semiconductor contact on silicon micro-structured surface by electroless nickel technique [10027-43]
10027 1A	Near-infrared absorptance enhancement and device application of nanostructured black silicon fabricated by metal-assist chemical etching [10027-44]

10027 1B	Model of blocking dislocations for III-V semiconductor grown on nano-trench patterned Si substrates $[10027\text{-}45]$
10027 1E	Purcell enhancement of emitting from the quantum-dot-in-nanowire structure surrounded by Au [10027-48]
10027 1G	Optimized design of metal-coated optical fiber tips with embedded plasmonic slot nanoresonators for maximum field enhancement [10027-51]
10027 1H	Study of waveguide directly writing in LiNbO ₃ crystal by high-repetition-rate femtosecond laser [10027-52]
10027 11	Optical reflection efficiency modulation based on graphene film [10027-53]

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Aleksandrovsky, Aleksandr S., 11

Bai, Bowen, OG

Bryukhanov, Valery V., 14

Chai, Zhaoer, 0N Chang, Guo-En, 10

Chen, Dingbo, 11

Chen, Jiabi, 07 Chen, Linsen, 18

Chen, Qiang, 0F Chen, Shimeng, 0M

Chen, Weijuan, OL

Chen, Xiyao, 0L Cheng, H. H., 10

Cheng, Yuqing, 15 Cheng, Zhuo, 1B

Chu, Tao, 05 Dai, Daoxin, 0U

Fan, Yibing, 1B Fu, Ping, 0L Gao, Feng, 0E

Gao, Feng, OK Gao, Ruoyao, OR

Gao, Weiqing, 0K Gong, Qihuana, 15

Guang, Jianye, 0M Guo, Anran, 19

Guo, Guohui, 1A Guo, Sijie, 0R

He, Yingbo, 15 Higo, Akio, 0Q

Hong, Xin, 16, 17 Hu, Jigang, 0K

Huang, Anping, 0D Huang, Jie, 11

Huang, Lieyun, 19, 1A Huang, Wenbin, 18

Huang, Yongqing, 1B

Jiang, Qiang, 07 Jie, Feng, 1H

Ju, Yuhao, OR Kislyakov, I. M., OJ

Li, Chenlei, 0U

Li, Dongmei, 0K

Li, Hui, OL Li, Hui, 10 Li, Lixia, OM

Li, Mi, OF Li, Songtao, 08

Li, Wei, 19, 1A

Li, Wenxiu, 0D

Li, Zhihua, 06 Liang, Binming, 07

Liang, Binming, 07 Liao, Naiman, 1A

Lin, Guimin, 0L

Lin, Jian, 0D Lin, Yuanyuan, 0L

Liu, Chengkun, 0L

Liu, Daoqun, 06

Liu, Hao, 0N Liu, Jiamina, 0D

Liu, Yanhua, 18

Liu, Yu, 0E

Liu, Yuanyuan, 1B

Liu, Zigeng, 0M

Long, Fei, 19, 1A

Lua, Guowei, 15

Luo, Anlin, 1H

Luo, Minghui, 18

Ma, Haoyuan, 1B

Mao, Guoming, 0N

Mao, Jiangui, 1H

Meng, Lingkuan, 06

Miao, Yadong, 0F

Noda, Shuichi, 0Q Peng, Wei, 0M

Peng, Yunchong, 0F

Petropoulou, Afroditi, 1G

Qiao, Lei, 05 Qiao, Wen, 18

Qing, Yeming, 0K

Qiu, Yishen, OL

Ren, Xiaomin, ON, 1B, 1E

Ren, Rongze, OK

Ren, Zhilei, OR

Riziotis, Christos, 1G

Samukawa, S., OQ

Samusev, Ilia G., 14

Shen, Hongming, 15

Slabko, Vitaliy V., 11

Slezhkin, Vasiliy A., 14

Song, Hai-Zhi, OR

Song, Yuejiang, OF

Sun, Li-Chou, 10

Sun, Xiaoyaun, 16 Tang, Bo, 06

Tang, Fengling, 1E

Tang, renging, i

Tang, Weijie, 05 Tikhomirova, Nadezhda S., 14 Tong, Fei, 08

Tsibulnikova, Anna V., 14

Tsipotan, Aleksey S., 11

Venediktov, V. Yu., 0J

Venediktova, A. V., 0J

Vlasov, A. Yu., 0J

Wada, Kazumi, 0Q

Wang, Chenchen, 17

Wang, Guilei, 06

Wang, Jun, 1B

Wang, Le, 0E

Wang, Li, 08

Wang, Qi, 0N

Wang, Xiankun, 0N

Wang, Yanyan, 18

Wang, Zhiming M., OR

Wen, Zhengqian, OK

Weng, Zhuo, OR

Wu, Chuan, 1H

Wu, Shangliang, 18

Wu, Wenjun, 11

Wu, Xiaofeng, 08

Wu, Xiaohang, 0K

Xia, Keyu, 15

Xiang, Yu, 0F

Xiao, Zhisong, 0D

Xue, Xia, 0D

Yan, Jiang, 06

Yan, Peng, 0E

Yan, Xin, 1E

Yang, Junbo, 11

Yang, Yongjia, 1H

Yao, Haicheng, OR

Yasuda, Manabu, 0Q

Ye, Yan, 18

Yu, Feng, 19

Zervas, Michalis N., 1G

Zhai, Tianrui, 08

Zhang, Bei, OE

Zhang, Hao, 0D

Zhang, Jingjing, 11

Zhang, Lei, OR

Zhang, Qiancheng, 0E

Zhang, Ran, 1B

Zhang, Rui, 0G

Zhang, Xia, 1E

Zhang, Xinping, 08

Zhang, Zhuo, OF

Zhao, Jingyi, 15

Zheng, Yanzhen, OR

Zhong, Hao, 1A

Zhou, Yun, 18

Zhou, Zhiping, 0G

Zhou, Zigang, 1H

Zhuang, Songlin, 07

Zyubin, Andrey Yu., 14

viii

Symposium Committees

General Chairs

Robert Lieberman, SPIE President, Lumoptix, LLC (United States)
Guangcan Guo, Chinese Optical Society President, University of
Science and Technology of China (China)

General Co-chairs

Arthur Chiou, National Yang-Ming University (Taiwan, China) **Jianlin Cao**, China Ministry of Science and Technology (China) **Junhao Chu**, Shanghai Institute of Technical Physics (China)

Technical Program Chairs

Songlin Zhuang, University of Shanghai for Science and Technology (China)

Xingde Li, Johns Hopkins University (United States)

Technical Program Co-chairs

Bingkun Zhou, Tsinghua University (China)
Qiming Wang, Institute of Semiconductors (China)
Tianchu Li, National Institute of Metrology (China)
Wei Huang, Nanjing University of Technology (China)
Ying Gu, PLA General Hospital (China)
Huilin Jiang, Changchun University of Science and Technology (China)

Local Organizing Committee Chair

Qihuang Gong, Peking University (China)

Local Organizing Committee Co-chairs

Xu Liu, Zhejiang University (China)

Daoyin Yu, Tianjin University (China)

Guoqiang Ni, Beijing Institute of Technology (China)

Shusen Xie, Fujian Normal University (China)

Xiaomin Ren, Beijing University of Posts and Telecommunications (China)

General Secretary

Yan Li, Chinese Optical Society/Peking University (China)

Local Organizing Committee

Zhiping Zhou, Peking University (China)

Changhe Zhou, Shanghai Institute of Optics and Fine Mechanics, CAS (China)

Qingming Luo, Huazhong University of Science and Technology (China)

Chongxiu Yu, Beijing University of Posts and Telecommunication (China)

Hongda Chen, Institute of Semiconductors (China)

Yongtian Wang, Beijing Institute of Technology (China)

Yiping Cui, Southeast University (China)

Xuping Zhang, Nanjing University (China)

Feijun Song, Daheng Corporation (China)

Cunlin Zhang, Capital Normal University (China)

Yanting Lu, Nanjing University (China)

Yuejin Zhao, Beijing Institute of Technology (China)

Chunqing Gao, Beijing Institute of Technology (China)

Tiegen Liu, Tianjin University (China)

Xiaocong Yuan, Nankai University (China)

Weimin Chen, Chongqing University (China)

Zhongwei Fan, Academy of Optoelectronics (China)

Hanyi Zhang, Tsinghua University (China)

Lan Wu, Zhejiang University (China)

Yongsheng Zhang, University of Science and Technology of China (China)

Hong Yang, Peking University (China)

Xiaoying Li, Tianjin University (China)

Wei Xiong, Chinese Optical Society (China)

Conference Committee

Conference Chairs

Zhiping Zhou, Peking University (China) **Kazumi Wada**, The University of Tokyo (Japan)

Conference Program Committee

Eric Cassan, Institut d'Électronique Fondamentale (France) and Université Paris-Sud (France)

Tao Chu, Institute of Semiconductors (China)

David S. Citrin, Georgia Institute of Technology (United States)

Min Gu, RMIT University (Australia)

El-Hang Lee, Inha University (Korea, Republic of)

Ching-Fuh Lin, National Taiwan University (Taiwan, China)

Gong-Ru Lin, National Taiwan University (Taiwan, China)

Yan-Qing Lu, Nanjing University (China)

Jurgen Michel, Massachusetts Institute of Technology (United States)

Andrew W. Poon, Hong Kong University of Science and Technology (Hong Kong, China)

Haisheng Rong, Intel Corporation (United States)

Yikai Su, Shanghai Jiao Tong University (China)

Hon Ki Tsang, The Chinese University of Hong Kong

(Hong Kong, China)

Dan-Xia Xu, National Research Council Canada (Canada)

Changhe Zhou, Shanghai Institute of Optics and Fine Mechanics (China)

Weidong Zhou, The University of Texas at Arlington (United States)

Session Chairs

1 Silicon Photonics

Zhiping Zhou, Peking University (China)

2 Lasers and Amplifiers

Jian Wang, Huazhong University of Science and Technology (China)

- 3 Integrated Optics and Surface Plasmons
 - Yun-Feng Xiao, Peking University (China)
- 4 Resonator and Nonlinear Photonics

Zhisong Xiao, BeiHang University (China)

5 Nanophotonics Frederic Y. Gardes, University of Southampton (United Kingdom) Xingjun Wang, Peking University (China)

- Waveguides and Passive Devices
 Qiang Lin, University of Rochester (United States)
- 7 Quantum Optics **Daoxin Dai**, Zhejiang University (China)