PROCEEDINGS OF SPIE

2019 International Conference on Optical Instruments and Technology

Micro/Nano Photonics: Materials and Devices

Baojun Li Xingjun Wang Ya Sha Yi Editors

26–28 October 2019 Beijing, China

Sponsored by CIS— China Instrument and Control Society (China)

Cosponsored and Published by SPIE

Volume 11440

Proceedings of SPIE 0277-786X, V. 11440

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

2019 International Conference on Optical Instruments and Technology: Micro/Nano Photonics: Materials and Devices, edited by Baojun Li, Xingjun Wang, Ya Sha Yi, Proc. of SPIE Vol. 11440, 1144001 © 2020 SPIE · CCC code: 0277-786X/20/\$21 · doi: 10.1117/12.2566209

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 2019 International Conference on Optical Instruments and Technology: Micro/Nano Photonics: Materials and Devices, edited by Baojun Li, Xingjun Wang, Ya Sha Yi, Proceedings of SPIE Vol. 11440 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510636583

ISBN: 9781510636590 (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 © 2020, 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 \$21.00 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/20/\$21.00.

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.



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

V	Authors
vii	Symposium Committees
ix	Conference Committee
xi	Introduction
xiii	Conference Organizers
	MICRO/NANO PHOTONICS: MATERIALS AND DEVICES
11440 02	Enhancement in sensitivity of guided-wave surface plasmon resonance sensor using graphene [11440-1]
11440 03	High-performance microscale optoelectronic infrared-to-visible upconversion devices and their use as the biomedical light sources [11440-2]
11440 04	Heterofluorenes and 2,5-dihexylbenzene conjugated copolymers: new host materials for organic light-emitting diodes [11440-3]
11440 05	Spectral characteristics of an annular gap plasmonic structure and its application for filters [11440-4]
11440 06	Enhanced solar spectrum confinement in photo-voltaic cells investigated [11440-5]
11440 07	Imaging rule of diffractive ultrathin flat lens [11440-8]
11440 08	Automated design and optimization scheme of optical antenna for silicon photonic integrated circuit [11440-9]
11440 09	Demonstration of self-phase modulation in high-nonlinearity CdTe nanowires [11440-11]
11440 OA	Low series resistance N-type AlGaAs/AlAs distributed Bragg reflector grown by MOCVD [11440-12]
11440 OB	Spectral analysis for SPR sensor with monolayer metal film [11440-13]
11440 OC	A study of subwavelength grating waveguide and coupling structures for 0.18 μm CMOS process [11440-14]
11440 OD	Three-dimensional structure of MOFs as an optical sensor for carbon tetrachloride gas [11440-15]

11440 OE	Tunable, angle and polarization-insensitive broadband absorber [11440-18]
11440 OF	Photonic time-wavelength pulse interleaver on silicon (Invited Paper) [11440-30]
11440 0G	Etched diffraction grating with one-dimensional photonic crystal bandgap theory (Invited Paper) [11440-35]
11440 OH	Enhanced interaction of Tamm plasmon polaritons based on graphene/DBR/silver structure [11440-43]

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.

Cao, Hongkang, 0A
Cao, Jinzhu, 04
Chen, Renfeng, 04
Chen, Yunlin, 0D
Chen, Zhangyuan, 0F
Ding, He, 03
Guo, X., 09
Hou, Tianfei, 08, 0C
Hu, Jigang, 0H
Huang, Wei, 04
Iqbal, Muddassir, 06
Ji, Lingfei, 04
Jia, Baohua, 07
Jiang, Xinpeng, 0E
Jiang, Yijian, 04
Lang, Yaopu, 02, 0B
Li, Jianjun, 0A

Jiang, Yijian, 04
Lang, Yaopu, 02, 0B
Li, Jianjun, 0A
Li, Ke, 0G
Li, Xueyan, 07
Li, Yan, 0F
Li, Yanping, 0F
Li, Ying, 05
Lin, Han, 07
Liu, Qinggang, 02, 0B
Liu, Wei, 0H
Lu, Yonghua, 0H
Luo, Wenyang, 0D

Lu, Yonghua, 0H Luo, Wenyang, 0D Lv, Guoging, 03 Mao, Yuzheng, 0G Pan, Dafa, 05 Ruan, Xiaoke, OF Sheng, Xing, 03 Shi, Zhao, 03 Tong, L. M., 09 Wang, Bin, 08, 0C Wang, Fei, 0H Wang, Jun, 0A Wang, Shuo, 08, 0C Wang, Xiaoqian, 0A Wei, Shibiao, 07 Wen, Zhenyu, 0A Xie, Wanlin, 0E Xie, Weigiang, 0H Xin, C. G., 09 Xing, Yizhou, 0D

Yang, Jian, 03 Yang, Junbo, 0E Yao, Enxu, 0H Yu, Shilin, 05 Yue, Chong, 02, 0B Zhan, Kuo, 0D Zhan, Qiwen, 0H Zhang, Fan, 0F Zhang, Jingjing, 0E Zhang, Zhaojian, 0E Zhao, Fusheng, 08, 0C Zhao, Tonggang, 05 Zhao, Yuejin, 07 Zhou, Xinglin, 02, 0B Zhu, Jingping, 0G

Symposium Committees

Symposium Chairs

Zheng You, CIS (China), Tsinghua University (China) **Jim M. Oschmann**, Ball Aerospace (United States)

Symposium Committee

Tianchu Li, National Institute of Metrology (China)

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

Liwei Zhou, Beijing Institute of Technology (China)

Shenghua Ye, Tianjin University (China) **Yimo Zhang**, Tianjin University (China)

Guangjun Zhang, Southeast University (China)

Technical Program Chair

Guofan Jin, Tsinghua University (China)

Technical Program Co-chairs

Jinxue Wang, SPIE

Tiegen Liu, Tianjin University (China)

Local Organizing Committee Chair

Youhua Wu, China Instrument and Control Society (China)

Local Organizing Committee Co-chairs

Guoqiang Ni, Beijing Institute of Technology (China) **Qun Hao**, Beijing Institute of Technology (China)

General Secretary

Tong Zhang, China Instrument and Control Society (China)

Administrative Vice General Secretaries

Yu-nan Sun, Beijing Institute of Technology (China) **Liquan Dong**, Beijing Institute of Technology (China)

Vice General Secretaries

Yuejin Zhao, Beijing Institute of Technology (China) **Cunlin Zhang**, Capital Normal University (China)

Local Organizing Committee

Hongda Chen, Institute of Semiconductors, CAS (China)
Xuping Zhang, Nanjing University (China)
Shangzhong Jin, China Jiliang University (China)
Libo Yuan, Guilin University of Electronic Technology (China)
Yongcai Guo, Chongqing University (China)
Tian Lan, Beijing Institute of Technology (China)
Cuiling Li, Beijing Institute of Technology (China)

Conference Committee

Conference Chairs

Baojun Li, Jinan University (China) **Xingjun Wang**, Peking University (China) **Yasha Yi**, University of Michigan (United States)

Conference Program Committee

Renmin Ma, Peking University (China)

Di Liang, Hewlett Packard Laboratories (United States)

Daoxin Dai, Zhejiang University (China)

Hideo Isshiki, The University of Electro-Communications (Japan)

Yunfeng Xiao, Peking University (China)

Chongjun Jin, Sun Yat-Sen University (China)

Yuchao Li, Jinan University (China) Qingzhong Deng, IMEC (Belgium)

Yating Wan, University of California, Santa Barbara (United States)

Yongfeng Mei, Fudan University (China) **Xiangping Li**, Jinan University (China)

Weiwen Zhou, Shanghai Jiaotong University (China)

Bin Dong, Dalian Nationalities University (China)

Xiaochen Sun, LaXense Inc. (United States)

Qiaoqiang Gan, University at Buffalo (United States)

Ruitao Wen, Massachusetts Institute of Technology (United States)

Conference Secretary

Ming Jin, Peking University (China)

Session Chairs

- Micro/Nano Photonics: Materials and Devices
 Renmin Ma, Peking University (China)
 Tianrui Zhai, Beijing University of Technology (China)
- 2 Micro/Nano Photonics: Materials and Devices Xingjun Wang, Peking University (China) Ciyuan Qiu, Shanghai Jiao Tong University (China) Baojun Li, Jinan University (China)
- 3 Micro/Nano Photonics: Materials and Devices Qin,Fei, Jinan University (China) Jingping Zhu, Xi'an Jiaotong University (China)

- Micro/Nano Photonics: Materials and Devices
 Wanlong Zhang, Hong Kong University of Science and Technology (Hong Kong, China)
 Chao Peng, Peking University (China)
- 5 Micro/Nano Photonics: Materials and Devices **Xiaodi Tan**, Fujian Normal University (China)

Introduction

Micro/nano-photonics is a rising interdisciplinary field focused on the study of the behavior of light on the micro/nano meter scale. It is considered a branch of optical engineering which deals with optics, or the interaction of light with particles or substances, at deep subwavelength length scales. Micro/nano-photonics can provide high bandwidth, high speed and ultra-small optoelectronic components. This technology has the potential to revolutionize telecommunications, computation, sensing, optical storage, optical display, optical manipulation, solar energy utilization, and lithography, etc.

With the importance of this technology in mind, the Micro/Nano-photonics, Materials and Devices Conference of OIT 2019 was organized. The conference accepted over 40 presentations from different countries/areas of the world, which are focused on the design, fabrication, and application of micro/nanostructures, and crossed many research disciplines including silicon photonics integration, active nanomaterials, plasmonics, biophotonics, nonlinear optics, nanostructure device, and fabrication technology. We also invited renowned scholars to present their cutting-edge breakthroughs. These experts and contributors added to an intellectually stimulating environment.

As the Conference Chairs, we would like to express our appreciation to the committee members for their support, to the presenters for devoting their precious time to writing intriguing articles, and to the reviewers for their helpful comments. We are also grateful to the staff of SPIE for their efforts in publishing these Proceedings.

Baojun Li Xingjun Wang Yasha Yi

Conference Organizers

Opto-Electronic–Mechanic Technology and System Integration Chapter, CIS (China)

Committee on Optoelectronic Technology, COS (China)

Committee on Optics, China Ordnance Society (China)

Optical Instrument Chapter, CIS (China)

Beijing Institute of Technology (China)

Tianjin University (China)

Tsinghua University (China)

Peking University (China)

Nanjing University (China)

Zhejiang University (China)

Nankai University (China)

Capital Normal University (China)

Beijing University of Posts and Telecommunications (China)

Chongaing University (China)

University of Shanghai for Science and Technology (China)

Instrument Society of America (United States)

Institute of Measurement and Control (United Kingdom)

Hong Kong Institution of Engineers (Hong Kong, China)

The Society of Measurement and Control (Japan)