PROCEEDINGS OF SPIE

Photonic and Phononic Properties of Engineered Nanostructures VIII

Ali Adibi Shawn-Yu Lin Axel Scherer Editors

29 January—1 February 2018 San Francisco, California, United States

Sponsored and Published by SPIE

Volume 10541

Proceedings of SPIE 0277-786X, V. 10541

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 SPIEDigital Library.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 *Photonic and Phononic Properties of Engineered Nanostructures VIII*, edited by Ali Adibi, Shawn-Yu Lin, Axel Scherer, Proceedings of SPIE Vol. 10541 (SPIE, Bellingham, WA, 2018) Seven-digit Article CID Number.

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510615670

ISBN: 9781510615687 (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 © 2018, 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/18/\$18.00.

Printed in the United States of America.

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 vii	Authors Conference Committee
	LIGHT EMISSION IN PHOTONIC NANOSTRUCTURES
10541 07	Ultrafast single-photon spontaneous emission from an array of quantum-emitters along a photonic waveguide $[10541\text{-}6]$
	PHOTONIC METAMATERIALS
10541 OY	Experimental demonstration of broadband perfect invisibility cloak composed of all-dielectric materials [10541-34]
10541 OZ	An all silicon-based metamaterial for mid-IR energy harvesting [10541-35]
	OPTOELECTRONICS IN 2D MATERIALS
10541 13	Study of the effect of 2D metallic photonic crystals on GaSb TPV diode performance [10541-39]
	PLASMONIC NANOSTRUCTURES
10541 16	Superchiral light generation on achiral nanostructured surfaces [10541-43]
	NOVEL MATERIALS AND PHENOMENA IN ENGINEERED NANOSTRUCTURES
10541 1B	Characterization of tunable longwave infrared filters using quantum cascade lasers [10541-46]
10541 1D	Fabrication of ultra-thin Si nanopillar arrays for polarization-independent spectral filters in the near-IR $[10541\text{-}48]$
10541 1E	Photonic bound state and antibunching generations in atom-ring resonator-waveguide QED system [10541-49]

MODELING AND SIMULATION OF NANOPHOTONIC STRUCTURES 10541 11 Optical magnetism in core-satellite nanostructures excited by vector beams [10541-53] 10541 1K Reverse engineering of optical resonators: propose the state, obtain the structure that supports the state [10541-55] 10541 1L Enhanced super-prism effect with self-collimation by dispersion management in C1 symmetric photonic crystals [10541-79] NANOPHOTONIC STRUCTURES FOR SENSING 10541 1N Analysis of highly sensitive surface plasmon photonic crystal fiber biosensor [10541-58] 10541 10 Mid-infrared plasmonic gas sensor [10541-59] 10541 1Q Optical modulators and biochemical sensors based on low-symmetric nanophotonic structures with interferometric configurations [10541-61] **POSTER SESSION** 10541 1Z Light-harvesting capabilities of dielectric sphere multilayers [10541-72] 10541 20 Artifacts in fluorescence lifetime imaging of gold step-like nanostructures [10541-73] 10541 22 Giant phase retardation of terahertz waves by resonant hyperbolic metasurface [10541-75] 10541 24 Efficient pattern modeling of plasmonic nanostructures probed by nanoscale near-field scanning microscope tips with different polarized outputs [10541-77] Surface enhanced Raman scattering as a sensing technique using silicon nanowires and 10541 27 plasmonic nanoparticles [10541-81] 10541 28 Polarization-selective suppression and enhancement of forward stimulated Brillouin scattering in silica-glass subwavelength elliptical-core optical waveguides [10541-82] 10541 2B Phase-change band-pass filters for multispectral imaging [10541-85] 10541 2C Characterization of phase transitions and parameter retrieval in three-dimensional dielectric helix structures [10541-86] 10541 2E Two-octave dispersion flattening with five zero-dispersion wavelengths in the deep mid-IR [10541-88] 10541 2K A novel sensor for detecting $PM_{2.5}$ concentration based on refractive index sensing of a photonic crystal fiber [10541-94]

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.

Agarwal, Anu M., 2E Azab, Mohammad Y., 1N Baldycheva, Anna, 2B Baron, Damien, 1Z Botey, Muriel, 0Y Carlson, Emily S., 13 Chanda, Debashis, 16 Chang, Shu-Wei, 20, 24

Chen, Chi, 24
Chen, Shao-Pai, 20
Chen, Weimin, 2K
Chen, Zihao, 07, 1E
Cheng, Pi-Ju, 20, 24
DeMeo, Dante F., 13
Desouky, Mai, 0Z
Dewalque, Jennifer, 1Z
Elsayed, Mohamed Y., 27
El Shamy, Raghi S., 10

Fantini, Lisa, 13 Fountaine, Katherine T., 1D Franklin, Daniel, 16 Gan, Qiaoqiang, 10 Gauthier, Robert C., 1K Giden, Ibrahim Halil, 1L, 1Q Gouda, Abdelaziz, 27 Gray, Stephen, 11

Greer, Julia R., 1D Gumus, Melike, 1L Guo, Yuhao, 2E Gupta, Neelam, 1B

Hameed, Mohamed Farhat O., 1N

Han, Dae Seok, 28 Hayran, Zeki, 0Y Heikal, A. M., 1N Henrist, Catherine, 1Z Herrero, Ramon, 0Y Hsieh, Chi-Ti, 20 Hung, Yu-Chueh, 2C Ismail, Yehea, 27 Jafari, Zeinab, 2E Jiang, Ruei-Han, 24

Kang, BongJoo, 22 Kang, Ji-Hun, 22

Kang, Myeong Soo, 28 Khalil, Diaa, 10

Kim, WonTae, 22 Kimerling, Lionel C., 2E Kurt, Hamza, 0Y, 1L, 1Q

Lee, Il-Min, 28

Lee, Seojoo, 22 Li, Guifang, 2E Li, Xueming, 2K Licht, Abigail S., 13 Liu, Yunhong, 2K Loicq, Jérôme, 1Z Mahmoud, Ahmed M., 0Z

Michel, Jurgen, 2E Mirotznik, Mark S., 1B Ng, Ryan C., 1D Obayya, S. S. A., 1N Park, Kyung Hyun, 28 Park, Q-Han, 22 Parker, John, 11

Pfiester, Nicole, 13 Rotermund, Fabian, 22 Scherer, Norbert F., 11 Shemelya, Corey M., 13 Shen, Jung-Tsung, 07, 1E

Shen, Rui, 2K Staliunas, Kestutis, 0Y

Swillam, Mohamed A., 0Z, 1N, 1O, 27

Trimby, Liam, 2B Tung, Ho-Ting, 2C

Vandervelde, Thomas E., 13 Vázquez-Guardado, Abraham, 16

Wang, Can, 2K Wright, C. David, 2B Xu, Ke, 2K Xu, Lijuan, 2E

Yang, Jianchun, 2K Yasa, Utku G., 1Q Yen, Ta-Jen, 24 Zhang, Lin, 2E Zhou, Yao, 07, 1E

Conference Committee

Symposium Chairs

Connie J. Chang-Hasnain, University of California, Berkeley (United States)

Graham T. Reed, Optoelectronics Research Centre, University of Southampton (United Kingdom)

Symposium Co-chairs

Jean Emmanuel Broquin, IMEP-LAHC (France)
Shibin Jiang, AdValue Photonics, Inc. (United States)

Program Track Chair

Ali Adibi, Georgia Institute of Technology (United States)

Conference Chairs

Ali Adibi, Georgia Institute of Technology (United States)
Shawn-Yu Lin, Rensselaer Polytechnic Institute (United States)
Axel Scherer, California Institute of Technology (United States)

Conference Program Committee

Andrea Alù, The University of Texas at Austin (United States)
William L. Barnes, University of Exeter (United Kingdom)
Ali Asghar Eftekhar, Georgia Institute of Technology (United States)
Reginald K. Lee, California Institute of Technology (United States)
Marko Loncar, Harvard School of Engineering and Applied Sciences
(United States)

Arka Majumdar, University of Washington (United States)

Susumu Noda, Kyoto University (Japan)

Masaya Notomi, NTT Basic Research Laboratories (Japan)

Ekmel Özbay, Bilkent University (Turkey)

Yong Xu, Virginia Polytechnic Institute and State University (United States)

Eli Yablonovitch, University of California, Berkeley (United States) **Rashid Zia**, Brown University (United States)

Session Chairs

Recent Advances in Engineered Nanostructures
 Ali Adibi, Georgia Institute of Technology (United States)

- Light Emission in Photonic Nanostructures
 Amir Arbabi, University of Massachusetts Amherst (United States)
- 3 Photonic Metasurfaces
 Susumu Noda, Kyoto University Graduate School of Engineering (Japan)
- Phase Change Materials for Optoelectronics I
 Ali Adibi, Georgia Institute of Technology (United States)
- 5 Phase Change Materials for Optoelectronics II Matthias Wuttig, RWTH Aachen University (Germany)
- Photonic Crystal Structures
 Luca Dal Negro, Boston University (United States)
- Light-Matter Interaction in Engineered Nanostructures
 Juejun Hu, Massachusetts Institute of Technology (United States)
- 8 Photonic Metamaterials
 Ali Adibi, Georgia Institute of Technology (United States)
- 9 Optoelectronics in 2D Materials Yeshaiahu Fainman, University of California, San Diego (United States) Rajat Sharma, University of California, San Diego (United States)
- 10 Plasmonic Nanostructures Mark Lawrence, Stanford University (United States)
- 11 Novel Materials and Phenomena in Engineered Nanostructures **Mohamed A. Swillam**, The American University in Cairo (Egypt)
- 12 Modeling and Simulation of Nanophotonic Structures **Ekmel Özbay**, Bilkent University (Turkey)
- 13 Nanophotonic Structures for Sensing Osamu Matsuda, Hokkaido University (Japan)
- 14 Novel Phononic and Optomechanic Structures I Martin Wegener, Karlsruher Institut für Technologie (Germany)
- Novel Phononic and Optomechanic Structures II
 Amir Safavi-Naeini, Stanford University (United States)