

PROCEEDINGS OF SPIE

Photonic Microdevices/ Microstructures for Sensing IV

**Xudong Fan
Hai Xiao
Anbo Wang**
Editors

**26–27 April 2012
Baltimore, Maryland, United States**

Sponsored and Published by
SPIE

Volume 8376

Proceedings of SPIE, 0277-786X, v. 8376

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

Photonic Microdevices/Microstructures for Sensing IV, edited by Xudong Fan, Hai Xiao, Anbo Wang,
Proc. of SPIE Vol. 8376, 837601 · © 2012 SPIE · CCC code: 0277-786X/12/\$18 · doi: 10.1117/12.979354

Proc. of SPIE Vol. 8376 837601-1

The papers included 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. The papers published in these proceedings 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 this book:

Author(s), "Title of Paper," in *Photonic Microdevices/Microstructures for Sensing IV*, edited by Xudong Fan, Hai Xiao, Anbo Wang, Proceedings of SPIE Vol. 8376 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN 0277-786X
ISBN 9780819490544

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 © 2012, 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/12/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

The logo for SPIE Digital Library features the word "SPIE" in a bold, sans-serif font above the words "Digital Library" in a smaller, sans-serif font. To the right of the text is a stylized graphic consisting of three vertical bars of increasing height from left to right, with a curved line above them.

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first 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, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four 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. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

vii *Conference Committee*

SESSION 1 PHOTONIC MICRO-/NANOSTRUCTURES FOR SENSING I

- 8376 03 **Thermally modulated nano-trampoline material as smart skin for gas molecular mass detection (Invited Paper)** [8376-02]
H. Xia, GE Global Research (United States)
- 8376 04 **High-throughput nanostructured SERS substrates by self-assembly** [8376-03]
O. Rabin, R. M. Briber, Univ. of Maryland, College Park (United States); S. Y. Lee, Univ. of Maryland, College Park (United States) and Korea Institute of Science and Technology (Korea, Republic of); W. Lee, Univ. of Maryland, College Park (United States) and LG Chem Ltd. (Korea, Republic of)
- 8376 05 **Plasmonic enhancement of a whispering-gallery-mode biosensor for single nanoparticle detection in aqueous solution** [8376-04]
S. I. Shopova, R. Rajmangal, Polytechnic Institute of New York Univ. (United States); S. Holler, Polytechnic Institute of New York Univ. (United States) and Fordham Univ. (United States); S. Arnold, Polytechnic Institute of New York Univ. (United States)

SESSION 2 PHOTONIC MICRO-/NANOSTRUCTURES FOR SENSING II

- 8376 07 **Sensitivity enhancement and detection-limit improvement in whispering-gallery-mode-based biosensing (Invited Paper)** [8376-06]
B.-B. Li, X. Yi, Q.-S. Chen, Y.-C. Liu, Y.-F. Xiao, Peking Univ. (China)
- 8376 08 **Multi-axis, all-dielectric electric field sensors** [8376-07]
S. Chadderton, D. Perry, J. Van Wagoner, R. Selfridge, S. Schultz, Brigham Young Univ. (United States)

SESSION 3 PHOTONIC MICRO-/NANOSTRUCTURES FOR SENSING III

- 8376 09 **Porous materials for optical detection of chemicals, biological molecules, and high-energy radiation (Invited Paper)** [8376-08]
J. W. Mares, X. Wei, S. M. Weiss, Vanderbilt Univ. (United States)
- 8376 0B **In vivo experiments of laser thermotherapy on liver tissue with FBG temperature distribution sensor** [8376-10]
N. Chen, S. Chen, H. Zhu, S. Liu, Z. Chen, F. Pang, T. Wang, Shanghai Univ. (China)

- 8376 0C **Highly sensitive detection of glucose concentration with opto-fluidics ring resonator** [8376-11]
Y. Luo, Jinan Univ. (China) and Univ. of Michigan, Ann Arbor (United States); M. K. Khaing Oo, Univ. of Michigan, Ann Arbor (United States); J. Ge, Z. Chen, Jinan Univ. (China); X. Fan, Univ. of Michigan, Ann Arbor (United States)

SESSION 4 PHOTONIC MICRO-/NANOSTRUCTURES FOR SENSING IV

- 8376 0E **Optical fiber sensor interrogation improved by active fiber loop (Invited Paper)** [8376-13]
T. Wei, J. Huang, X. Lan, Missouri Univ. of Science and Technology (United States); Q. Han, Missouri Univ. of Science and Technology (United States) and Tianjin Univ. (China); H. Xiao, Missouri Univ. of Science and Technology (United States)
- 8376 0F **Interrogation of in-series double cladding fiber sensor for simultaneous refractive index and temperature measurement** [8376-14]
B. Qi, F. Pang, T. Wang, N. Chen, S. Huang, Z. Chen, Shanghai Univ. (China)
- 8376 0G **High-sensitivity electro-optic CO₂ gas sensing based on absorption spectroscopy** [8376-15]
S. N. Zhang, D. Y. Wang, J. Gong, Virginia Polytechnic Institute and State Univ. (United States); D. Fan, Wuhan Univ. of Technology (China); B. Dong, M. Fraser, A. Wang, Virginia Polytechnic Institute and State Univ. (United States)

SESSION 5 OPTICAL SENSOR FABRICATION

- 8376 0H **Photonic crystal electro-optic devices in engineered thin film lithium niobate substrates** [8376-16]
J. E. Toney, V. E. Stenger, P. Pontius, N. Smith, J. Scholl, A. Pollick, SRICO, Inc. (United States); B. Sadani, H. Lu, M.-P. Bernal, Institut FEMTO-ST (France); S. Sriram, SRICO, Inc. (United States)
- 8376 0J **Cathodoluminescence of conducting gratings and implications for electron-beam investigations of nano-photonic devices** [8376-18]
J. Nath, C. Schwarz, E. Smith, C. Ghosh, R. E. Peale, L. Chernyak, Univ. of Central Florida (United States); W. R. Buchwald, Solid State Scientific Corp. (United States)

SESSION 6 OPTICAL MATERIALS AND DETECTORS

- 8376 0M **Exact analytical solutions to one-dimensional variable mass problems** [8376-21]
J. M. López R., Univ. EAFIT (Colombia)
- 8376 0N **Novel approach to improve reliable color recognition in α -Si:H photodiodes** [8376-22]
K. Watty, A. Bablich, K. Seibel, C. Merfort, M. Böhm, Univ. of Siegen (Germany)
- 8376 0O **III-nitride/SiC avalanche photodetectors for enabling compact biological agent identification and detection** [8376-23]
A. V. Sampath, R. W. Enck, C. S. Gallinat, H. Shen, M. Wraback, U.S. Army Research Lab. (United States); Q. Zhou, D. McIntosh, J. C. Campbell, Univ. of Virginia (United States)

8376 OP **Monolithic integration of high-speed Ge photo-detectors on SOI-based WDM receivers**
[8376-24]
W. Qian, D. Feng, H. Liang, J. Zhou, Y. Liu, S. Liao, C.-C. Kung, J. Fong, B. J. Luff, R. Shafiiha,
D. Lee, W. White, M. Asghari, Kotura, Inc. (United States)

8376 OQ **FIB-assisted α -SiGe:H/ α -SiC:H alloy analysis for ultra-low biased multispectral p⁺n sensors
with enhanced color separation features and low-reflective ZnO:Al back-contacts** [8376-25]
A. Bablich, K. Watty, C. Merfort, M. Böhm, Univ. of Siegen (Germany)

POSTER SESSION

8376 OR **Transformation optics designed general optical Luneburg lens with flattened shapes**
[8376-26]
B. Arigong, K. Ohlinger, H. S. Kim, Y. Lin, H. Zhang, Univ. of North Texas (United States)

Author Index

Conference Committee

Symposium Chair

Kevin P. Meiners, Office of the Secretary of Defense (United States)

Symposium Cochair

Kenneth R. Israel, Lockheed Martin Corporation (United States)

Conference Chairs

Xudong Fan, University of Michigan (United States)

Hai Xiao, Missouri University of Science and Technology (United States)

Anbo Wang, Virginia Polytechnic Institute and State University (United States)

Program Committee

Hatice Altug, Boston University (United States)

Junhang Dong, University of Cincinnati (United States)

Henry H. Du, Stevens Institute of Technology (United States)

Erica Forzani, Arizona State University (United States)

Bai-Ou Guan, Jinan University (China)

Wei Jin, The Hong Kong Polytechnic University (Hong Kong, China)

Radislav A. Potyrailo, GE Global Research (United States)

Stephen Schultz, Brigham Young University (United States)

Venkataraman S. Swaminathan, U.S. Army Armament Research, Development and Engineering Center (United States)

Ian M. White, University of Maryland, College Park (United States)

Tian Yang, Shanghai Jiao Tong University (China)

Yibing Zhang, ExxonMobil Research and Engineering Company (United States)

Mohammed M. Zourob, Institut National de la Recherche Scientifique (Canada)

Session Chairs

- 1 Photonic Micro-/Nanostructures for Sensing I
Xudong Fan, University of Michigan (United States)
- 2 Photonic Micro-/Nanostructures for Sensing II
Sharon M. Weiss, Vanderbilt University (United States)

- 3 Photonic Micro-/Nanostructures for Sensing III
Miao Yu, University of Maryland, College Park (United States)
- 4 Photonic Micro-/Nanostructures for Sensing IV
Ian M. White, University of Maryland, College Park (United States)
- 5 Optical Sensor Fabrication
Hai Xiao, Missouri University of Science and Technology (United States)
- 6 Optical Materials and Detectors
Hai Xiao, Missouri University of Science and Technology (United States)