

PROCEEDINGS OF SPIE

Advanced Sensor Systems and Applications IX

Tiegen Liu
Gang-Ding Peng
Zuyuan He
Editors

21–22 October 2019
Hangzhou, 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 Shanghai for Science and Technology (China) • Capital Normal University (China) • Huazhong University of Science and Technology (China) • Beijing Jiaotong University (China) • China Jiliang University (China) • Shanghai Institute of Optics and Fine Mechanics, CAS (China) • Changchun Institute of Optics, Fine Mechanics and Physics, CAS (China) • Institute of Semiconductors, CAS (China) • Institute of Optics and Electronics, CAS (China) • Institute of Physics, CAS (China) • Shanghai Institute of Technical Physics, CAS (China) • China Instrument and Control Society (China) • Japan Optical Society (Japan) • Korea Optical Society (Korea, Republic of) • Australia Optical Society (Australia) • Singapore Optical Society (Singapore) • European Optical Society

Supporting Organizations

China Association for Science and Technology (CAST) (China)
Department of Information of National Nature Science Foundation, China (NSFC) (China)

Published by
SPIE

Volume 11191

Proceedings of SPIE 0277-786X, V. 11191

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 *Advanced Sensor Systems and Applications IX*, edited by Tiegeng Liu, Gang-Ding Peng, Zuyuan He, Proceedings of SPIE Vol. 11191 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510630994
ISBN: 9781510631007 (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 \$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/19/\$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.

**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>Symposium Committees</i>
xiii	<i>Conference Committee</i>

SESSION 1 BIOCHEMICAL AND ENVIRONMENTAL SENSORS

11191 04	Experimental study on the detection of trace H₂S and H₂O in high-voltage combination appliances based on TDLAS technology [11191-3]
11191 05	Comparison studies between the pulsed lidar technique and the Scheimpflug lidar technique on a near-horizontal measurement path [11191-4]

SESSION 2 DISTRIBUTED AND MULTIPLEXED SENSORS

11191 08	Quasi-single mode operated few-mode fiber for distributed acoustic sensing [11191-7]
11191 0A	3D shape sensing medical needle based on the multiplexing of optical backscattering reflectometry [11191-9]

SESSION 3 MICRO/NANOSTRUCTURE SENSORS I

11191 0C	Miniaturized fiber optic Fabry-Perot pressure measuring system used for marine pressure measurement [11191-12]
11191 0D	Temperature dependence of a refractive index sensor based on core-offset in-line fiber Mach-Zehnder interferometer [11191-13]

SESSION 4 MICRO/NANOSTRUCTURE SENSORS II

11191 0H	Double-core D-type photonic crystal fiber refractive index sensor based on grid coating [11191-17]
11191 0J	Measurement of rotation angle by response of nanostructured metasurfaces [11191-19]

SESSION 5 NEW SENSOR DEVICES AND APPLICATIONS I

- 11191 0L **Arrayed waveguide grating-based high-frequency ultrasonic sensors [11191-21]**
- 11191 0M **Estimation of permissible deviations of geometrical parameters of the ring confocal resonator [11191-22]**

SESSION 6 NEW SENSOR DEVICES AND APPLICATIONS II

- 11191 0O **Measurement of electric current by the optical current sensor based on magneto-optical crystal [11191-25]**
- 11191 0P **Fiber-optic water pressure sensor fabricated by a 3D printing technique [11191-26]**
- 11191 0R **Review on fiber optic sensing technologies applicable for hypersonic wind tunnel experiments [11191-28]**

POSTER SESSION

- 11191 0T **Intensity-modulated optical fiber sensor for static strain and vibration monitoring [11191-29]**
- 11191 0V **Quintuple fano-like MIM plasmonics structure based on coupling resonators for refractive index nano-sensor [11191-31]**
- 11191 0W **Experimental study of transversal-stress-induced polarization crosstalk behaviors in polarization maintaining fibers [11191-32]**
- 11191 0X **Fabrication of a helical structure on a commercial plastic optical fiber for refractive index sensing [11191-33]**
- 11191 0Y **Quasi-distributed temperature sensor based on cascaded quantum-dot fiber [11191-34]**
- 11191 10 **Study on high sensitivity measurement method of hydrogen sulfide gas under long optical path [11191-36]**
- 11191 11 **Study on measurement of Cl₂ emission concentration by differential absorption spectroscopy [11191-37]**
- 11191 12 **Research on measurement of urban C₈H₈ by open optical path detection system [11191-38]**
- 11191 13 **Compound spatial imaging systems optimized by global synthesis [11191-39]**
- 11191 14 **Embedded fiber Bragg grating strain sensor with enhanced sensitivity [11191-40]**

- 11191 15 **Miniaturized underwater polarized radiation measuring instrument [11191-41]**
- 11191 17 **The development of chemical oxygen demand monitoring technology and instrument in seawater based on spectrum analysis [11191-43]**
- 11191 18 **Research and development of an optical gyrocompass using a three-axis FOG [11191-44]**
- 11191 1A **Research on visibility detection based on forward scattering technology [11191-46]**